

## F-01 Highlighted Symposium - Move to the Rhythm: Circadian Orchestration of Exercise and Muscle Biology

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
Room: 201

2844 **Chair:** John C. Quindry, FACSM. *University of Montana, Missoula, MT.*

(No relationships reported)

2845 June 2 1:10 PM - 1:40 PM

### Keynote - Can Circadian Clocks Anticipate Periods of Activity and Energetic Demand?

Martin E. Young. *University of Alabama at Birmingham, Birmingham, AL.*

**Reported Relationships:** M.E. Young: *Consulting Fee; Merck.*

2846 June 2 1:40 PM - 1:55 PM

### Does the Cardiomyocyte Circadian Clock Influence Size of the Heart?

Graham R. McGinnis, John C. Chatham, Martin E. Young. *University of Alabama at Birmingham, Birmingham, AL.*

(No relationships reported)

Circadian clocks, driven by the transcription factors Clock (circadian locomotor output cycles kaput) and Bmal1 (brain and muscle arnt-like 1), are sophisticated mechanisms that regulate 24-hr rhythms in numerous physiological processes ranging from gene expression to behavior. The cardiomyocyte clock has been shown to regulate cardiac metabolism and function, and its disruption decreases lifespan. However, the role of the circadian clock in regulating cardiomyocyte growth remains unknown. **PURPOSE:** To determine the role of the cardiomyocyte circadian clock in regulating hypertrophic growth of the heart. **METHODS:** We used mice with genetically disrupted clocks specifically within the heart (Cardiomyocyte-specific Bmal1 Knockout; CBK) and littermate control mice (CON) to investigate the role of the cardiomyocyte circadian clock on cardiac growth/size. Signaling was assessed through Western blotting, while rates of protein synthesis were measured using radiolabeled tracers (both in vivo and ex vivo). Rapamycin feeding (14 ppm and 42 ppm, 10 days) was utilized to pharmacologically inhibit mTOR. **RESULTS:** We found that disruption of the cardiomyocyte circadian clock leads to increased activation of the Akt/mTOR/S6 signaling axis in the heart. Rates of protein synthesis displayed a diurnal rhythm in CON mice (highest at ZT0) in vivo, which was chronically elevated in CBK mice; the same genotype effect was seen in ex vivo perfused hearts. CBK hearts exhibited increased heart size (relative to CON hearts), which was normalized by rapamycin feeding. **CONCLUSION:** Genetic disruption of the cardiomyocyte circadian clock leads to chronic activation of the Akt/mTOR/S6 signaling axis in the heart, associated with increased protein synthesis and size.

2847 June 2 1:55 PM - 2:25 PM

### Keynote - Time of Exercise as a Muscle Clock Setter

Karyn A. Esser, FACSM. *University of Florida, Gainesville, FL.*

(No relationships reported)

2848 June 2 2:25 PM - 2:40 PM

### Regulation of the Skeletal Muscle Circadian Transcriptome by the Master Myogenic Regulatory Factor, Myod1

Brian A. Hodge<sup>1</sup>, Xiping Zhang<sup>2</sup>, Karyn A. Esser, FACSM<sup>2</sup>. <sup>1</sup>*Buck Institute for Research on Aging, Novato, CA.* <sup>2</sup>*University of Florida, Gainesville, FL.*

(No relationships reported)

Molecular clocks are comprised of interlocking transcriptional:translational feedback loops that promote circadian rhythms in physiology through controlling downstream gene expression in a temporal and tissue-specific fashion. The mechanisms in which the core clock factors (ubiquitously expressed in all tissues) target skeletal muscle specific genes are poorly understood. **PURPOSE:** Here we investigate the role of the muscle specific factor MYOD1 in regulating skeletal muscle circadian gene expression. **METHODS:** Dual-luciferase assays and real-time bioluminescence (Lumicycle) were performed in C2C12 myotubes to determine transcriptional responses and rhythmic expression patterns of the muscle specific circadian gene, Titin-cap (Tcap), with over expression of the core-clock genes BMAL1:CLOCK with

MYOD1. To identify genome-wide binding sites for BMAL1:CLOCK and MYOD1 we performed chromatin immunoprecipitation and ultra-high throughput sequencing (ChIP-Seq) in wildtype C57BL/6 quadriceps and C2C12 myotubes. HOMER software was utilized for Next-Gen sequencing analysis. **RESULTS:** We utilized a bioinformatics approach to identify Tcap as a skeletal muscle specific, circadian gene. Interestingly, we found that MYOD1 transactivates Tcap in a synergistic fashion with BMAL1:CLOCK and enhances Tcap's circadian amplitude. Three e-box elements within the Tcap promoter are required for cooperativity between the clock factors and MYOD1. ChIP-Seq analysis in skeletal muscle indicated that MYOD1 targets a large subset of the skeletal muscle circadian transcriptome. **CONCLUSION:** These findings support the hypothesis that MYOD1 is a key regulator of circadian gene expression in skeletal muscle.

June 2 2:40 PM - 3:00 PM

### Overall Discussion

## F-08 Basic Science World Congress - Thematic Poster - Neuroplasticity and Cerebral Perfusion

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
Room: 304

2875 **Chair:** Hirofumi Tanaka, FACSM. *University of Texas at Austin, Austin, TX.*

(No relationships reported)

2876 Board #1

June 2 1:00 PM - 3:00 PM

### Habitual Physical Activity Mitigates the Adverse Effects of Metabolic Syndrome on Arterial Stiffness and Cerebral White Matter Integrity

Evan P. Pasha, Alex C. Birdsill, Stephanie Oleson, Andreana P. Haley, Hirofumi Tanaka, FACSM. *The University of Texas at Austin, Austin, TX.* (Sponsor: Hirofumi Tanaka, FACSM)

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(No relationships reported)

**PURPOSE:** Metabolic syndrome (MetS) adversely affects the vasculature and cerebral white matter integrity. Arterial stiffening has been associated with diminished cerebral white matter integrity. Habitual physical activity (PA) can ameliorate components of MetS and subsequently affect arterial stiffening and white matter integrity. Our aim was to determine the role of habitual PA on mitigating the adverse influence of MetS on arterial stiffness and cerebral white matter integrity. **METHODS:** Sixty-six middle-aged adults (40-62 years) composed of 27 healthy, 18 sedentary MetS (Sed MetS), and 21 physically active MetS individuals (Active MetS) were studied. Carotid artery stiffness was assessed via simultaneous ultrasound and tonometry. Cerebral white matter integrity was measured using diffusion tensor imaging through metrics of fractional anisotropy (FA) and mean diffusivity (MD). **RESULTS:** Carotid  $\beta$ -stiffness index in Active MetS was lower than Sed MetS but was not different from Healthy controls ( $6.6 \pm 1.5$ ,  $7.7 \pm 2.1$ , and  $5.6 \pm 1.6$  au,  $p=0.001$ ). The same group pattern was observed with white matter microstructural integrity in regions of interest (ROIs). Mean ROI FA was significantly greater in Active MetS compared with Sed MetS but was not different from Healthy controls ( $0.54 \pm 0.03$ ,  $0.51 \pm 0.02$ , and  $0.53 \pm 0.02$  au,  $p=0.012$ ). Mean ROI MD was significantly lower in Active MetS compared with Sed MetS but was not different from Healthy controls ( $0.85 \pm 0.05$ ,  $0.89 \pm 0.05$ , and  $0.86 \pm 0.05$  mm<sup>2</sup>/s,  $p=0.019$ ). **CONCLUSION:** Middle-aged individuals with MetS who habitually perform PA demonstrated lower arterial stiffness and more favorable cerebral white matter integrity than their sedentary peers, indicating that habitual exercise may be effective in mitigating the adverse effects of MetS on the vasculature and brain at midlife.

This work was supported by grants from the NIH, NINDS (to APH) and the NSF (to AB).

2877 Board #2 June 2 1:00 PM - 3:00 PM  
**Changes in Brain Perfusion Following Weight Loss are Associated with Changes in Body Mass Index**

Chelsea M. Stillman<sup>1</sup>, Jennifer C. Watt<sup>2</sup>, Renee J. Rogers<sup>3</sup>, John M. Jakicic, FACSM<sup>3</sup>, Kirk I. Erickson<sup>3</sup>. <sup>1</sup>University of Pittsburgh School of Medicine, Pittsburgh, PA. <sup>2</sup>University of Pittsburgh, Pittsburgh, PA. <sup>3</sup>University of Pittsburgh, Pittsburgh, PA.  
 (Sponsor: John Jakicic, FACSM)  
 (No relationships reported)

**PURPOSE:** Being overweight or obese, defined as having a body mass index (BMI) of 25 or greater, is associated with brain hypoperfusion. However, it is unknown to what extent obesity-related hypoperfusion can be reversed following weight loss. Further, the relative contributions of diet and physical activity (PA) on brain perfusion are poorly understood. The aim of the present study was to examine changes in brain perfusion following weight loss, and to relate changes in perfusion to changes in BMI. **METHODS:** 121 healthy adults (M±SD = 44.3±8.6 years old; 95 female) completed a 12-month randomized controlled trial involving an energy restricted diet (diet-only), a diet + 150 minutes of moderate intensity PA per week (Mod-PA), or diet and 250 minutes of moderate intensity PA per week (High-PA). Participants also completed MRI scans before and after the intervention, including a pseudocontinuous arterial labeling (pcASL) scan. Changes in brain perfusion were assessed with a voxelwise linear regression to examine regions where changes in brain perfusion covary with changes in BMI. Results were corrected for multiple comparisons at a threshold of  $p < .05$ ,  $k > 15$ . **RESULTS:** There was a significant reduction in BMI following the intervention, suggesting that it was effective at facilitating weight loss, regardless of group ( $M(SD) = 2.4 \pm 3.3$  kg/m<sup>2</sup>,  $p < .001$ ). Brain perfusion following the intervention increased across the brain, particularly in the medial temporal lobe and prefrontal cortex. Changes in BMI were correlated with baseline-to-post intervention increases in brain perfusion in two clusters in the right medial prefrontal cortex ( $r(105) = .21$ ,  $p = .03$ , peak MNI xyz = 43,98,40,  $k = 42$ ;  $r(105) = .21$ ,  $p = .03$ , peak MNI = 42, 80, 27,  $k = 37$ ). **CONCLUSIONS:** A 12-month intervention involving diet alone, or diet combined with PA effectively increased brain perfusion across the brain. Collapsing across intervention groups, the magnitude of weight loss (via changes in BMI) was positively correlated with changes in prefrontal brain perfusion. The regional specificity of this later finding is important as it suggests that weight-loss may have the greatest effects on brain health in regions that are particularly vulnerable to obesity. Future work will identify whether these effects are being driven by changes in PA, diet, or both.

2878 Board #3 June 2 1:00 PM - 3:00 PM  
**Effect of Sex on arterial hemodynamics and Cerebral Blood Flow Dynamics Following Acute Resistance Exercise.**

Alexander J. Rosenberg, Sang Ouk Wee, Elizabeth C. Schroeder, Kanokwan Bunsawat, Georgios Grigoriadis, Badeia M. Saed, Bo Fernhall, FACSM, Tracy Baynard, FACSM. University of Illinois at Chicago, Chicago, IL.  
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 (No relationships reported)

Resistance exercise (RE) is recommended for men and women and is important for improving cardiovascular (CV) and metabolic disease risk factors. High-intensity RE acutely increases arterial stiffness and blood pressure (BP), coupled with reduced cerebral blood flow velocity (CBFv) and greater flow pulsatility in the cerebral circulation, which may be detrimental to cerebral microvasculature. Because females have different CV control mechanisms, it is important to assess potential sex differences in cerebral vascular responses to acute RE. **PURPOSE:** To examine the effect of sex on hemodynamics and cerebral vascular responses following acute RE in young recreationally active men and women. **METHODS:** Healthy men ( $n = 11$ , 28 yrs, BMI = 24.6) and women ( $n = 9$ , 25 yrs, BMI = 23.2) performed RE (3 sets of 10 repetitions of isokinetic concentric/concentric unilateral knee flexion/extension). Measurements were obtained at baseline and post-exercise (1, 5, 30 min). Beat-to-beat heart rate (HR), brachial BP (bSBP, bDBP, bMAP), cardiac output (CO), stroke volume (SV) and end-tidal CO<sub>2</sub> were collected. CBFv was measured by transcranial Doppler. Carotid BP (cSBP, cDBP, cMAP) measurements were obtained using applanation tonometry. Central pulse wave velocity (PWV) was measured by an automated ambulatory BP monitor. **RESULTS:** See table. Mean CBFv increased 1-min post-exercise and decreased below baseline 5-min post-exercise ( $p < 0.01$ ) in both groups. CBFv pulsatility increased following RE and was elevated above baseline 5-min post-exercise ( $p < 0.01$ ) in both groups. PWV increased 1-min post-exercise ( $p < 0.01$ ) in both groups. Most variables returned to baseline at 30 min. **CONCLUSION:** RE increased central arterial stiffness, mean CBFv and CBFv pulsatility similarly for both sexes. Although CO increased at 5-min, CBFv dropped below baseline and pulsatility continued to rise above baseline. This temporary disruption in cerebral autoregulation may impact brain health in both sexes.

2879 Board #4 June 2 1:00 PM - 3:00 PM  
**Effects Of Exercise-induced Hypohydration On Brain Structure And Function, A MRI Study**

X. r. Tan<sup>1</sup>, Ivan C. C. Low<sup>1</sup>, Mary C. Stephenson<sup>2</sup>, T. Kok<sup>2</sup>, Heinrich W. Nolte<sup>3</sup>, T. W. Soong<sup>1</sup>, Jason K. W. Lee, FACSM<sup>4</sup>. <sup>1</sup>National University of Singapore, Singapore, Singapore. <sup>2</sup>Agency for Science, Technology Research, Singapore, Singapore. <sup>3</sup>ERGOnomics TEChnologies, Pretoria, South Africa. <sup>4</sup>DSO National Laboratories, Singapore, Singapore.  
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 (No relationships reported)

Hypohydration exceeding 2% body mass is known to impair endurance capacity. It is hypothesized that the central nervous system, specifically the brain, is negatively affected by hypohydration, leading to a decline in endurance capacity.

**PURPOSE:** To investigate the effects of exercise-induced hypohydration on the brain. **METHODS:** Ten trained endurance males (mean±sd: age 23.3±1.1 years; body fat 10.5±2.4%; VO<sub>2peak</sub> 65±5 ml kg<sup>-1</sup> min<sup>-1</sup>) were dehydrated to -3% body mass by running on a treadmill at 65% VO<sub>2peak</sub> in a 25°C environment, before drinking to replace 100% or 0% of fluid losses in two randomized, counterbalanced trials. Participants underwent MRI scans at baseline and post-fluid replacement to examine brain volume, functional activity and cerebral perfusion. Magnetic resonance spectroscopy was used to measure brain temperature (at primary motor cortex) before and during the dehydration run. Endurance capacity was assessed by running to exhaustion at 75% VO<sub>2peak</sub>. Results were assessed using paired sample T-test with  $p < 0.05$  considered significant. **RESULTS:** MRI results demonstrated a reduction in total brain volume in hypohydration (HH) as compared to euhydration (EU) trials (EU: 1.007, HH: 0.993;  $p = 0.003$ ). BOLD (blood-oxygen-level dependent) activation in the primary motor (M1) and somatosensory cortex (S1) during a plantar flexion task were similar between conditions (M1:  $p = 0.314$ , S1:  $p = 0.332$ ). Global and regional cerebral perfusion remained unchanged between conditions (Global:  $p = 0.055$ , M1:  $p = 0.447$ , S1:  $p = 0.458$ ). Brain temperature measured at baseline was higher than core temperature (Brain: 37.7±0.5°C, Core: 36.7±0.3°C;  $p < 0.0001$ ). However, both temperatures were similar during exercise (Brain: 38.2±0.4°C, Core: 38.6±0.3°C;  $p = 0.110$ ). Endurance capacity was reduced with hypohydration (EU: 45.2±9.3 min, HH: 38.4±10.7 min;  $p = 0.033$ ). **CONCLUSION:**

Under hypohydration, the endurance capacity is impaired and total brain volume is reduced. Brain functional activity and cerebral perfusion are notably well-preserved. Brain temperature could be regulated within a narrower homeostatic range than the core temperature. Supported by DIRP Grant, PA No. 9015102335 and funding from ERGOTECH, South Africa.

2880 Board #5 June 2 1:00 PM - 3:00 PM  
**Cerebral Blood Flow during Dynamic Exercise Correlates with Blood Pressure in Autonomic Brain Regions**

Mikio Hiura<sup>1</sup>, Akitaka Muta<sup>2</sup>, Muneyuki Sakata<sup>3</sup>, Satoshi Wagatsuma<sup>3</sup>, Tetsuro Tago<sup>3</sup>, Jun Toyohara<sup>3</sup>, Kenji Ishibashi<sup>3</sup>, Kenji Ishii<sup>2</sup>, Tadashi Nariai<sup>2</sup>. <sup>1</sup>Hosei University, Tokyo, Japan. <sup>2</sup>Tokyo Medical and Dental University, Tokyo, Japan. <sup>3</sup>Tokyo Metropolitan Institute of Gerontology, Tokyo, Japan.  
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 (No relationships reported)

**PURPOSE:** During dynamic exercise changes in cerebral blood flow (CBF) has been demonstrated. While global CBF remains stable in the prolonged exercise via cerebral autoregulation, alterations in BP would be associated with fluctuation of regional CBF (rCBF). However, association between rCBF and BP during exercise has not been elucidated. The aim of the present study is to examine changes in rCBF evoked by dynamic exercise using positron emission tomography (PET) and to identify brain regions where rCBF correlates with BP. **METHODS:** Twelve healthy young males performed 20 min cycling exercise and rCBF were measured using oxygen-15-labeled water and PET (Discovery PET/CT, GE) at the baseline (Rest), during and after exercise. Heart rate (HR) and mean blood pressure (MBP) were monitored. With the accumulated image and the measured arterial input function, rCBF was calculated using the autoradiographic method. For an anatomical reference, individual brain MRI scans were acquired and the image data were analyzed using SPM software and the quantitative analysis of rCBF was performed using Dr. View software. **RESULTS:** During exercise HR and MBP increased to 119 ± 8 bpm and 107 ± 13 mmHg, respectively, at the endpoint of exercise. At 20 min after exercise, MBP significantly decreased compared to Rest, from 91 ± 8 to 86 ± 10 mmHg ( $P < 0.05$ ). rCBF increased in the sensorimotor cortex and cerebellar vermis during exercise ( $P < 0.001$ , uncorrected). Following exercise rCBF decreased in the frontal lobe in the

( $P < 0.005$ , uncorrected). rCBF increased by 35 % during exercise and decreased by 12 % at 20 min after exercise compared with Rest. Regression analysis revealed that rCBF in the midbrain, left hippocampus and right anterior cingulate gyrus over the course of exercise ( $P < 0.05$ , corrected).

**CONCLUSIONS:** The present study suggest that dynamic exercise induced fluctuation in rCBF as well as BP. The regression analysis implies that brain regions including brainstem hippocampus and cingulate gyrus might be susceptible to changes in BP. As light- to moderate-intensity exercise evoked post exercise hypotension, these findings are associated with brain center of autonomic function which is regulated via connection between brainstem regions and cardiovascular structures, the central baroreflex network.

2881 Board #6 June 2 1:00 PM - 3:00 PM  
**Fitness, Independent Of Physical Activity Is Associated With Cerebral Blood Flow In Older Adults At-risk For Alzheimer's Disease**

Ryan J. Dougherty, Elizabeth A. Boots, Karly A. Cody, Stephanie A. Schultz, Dorothy F. Edwards, Sterling C. Johnson, Jean Einerson, Ozioma C. Okonkwo, Dane B. Cook, FACSM.  
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Cardiorespiratory fitness (CRF) and physical activity (PA) are positively associated with cognition and may mitigate pathological changes that occur with age and Alzheimer's disease (AD). However, there is limited information on the interaction between CRF and PA in predicting brain health in older adults. Throughout aging and the AD cascade, patterns of decreased cerebral blood flow (CBF) are apparent and vascular health abnormalities have been postulated as a precursor to downstream pathologies such as amyloid-beta accumulation and neuronal dysfunction. Limited research suggests that CRF is positively associated with CBF. However, no study to date has examined CRF and PA concomitantly with CBF. **Purpose:** To determine the unique contributions of CRF and moderate-vigorous physical activity (MVPA) when predicting CBF in an older adult population at-risk for AD. **Methods:** 159 cognitively healthy (MMSE  $\geq 24$ ) adults (mean age = 63.8, SD = 5.4) from the Wisconsin Registry for Alzheimer's Prevention participated in this study. Participants performed a graded maximal exercise test to measure CRF ( $VO_{2peak}$ , ml/kg/min) and wore a triaxial accelerometer on their hip for seven consecutive days to quantify their PA behaviors. Participants also underwent MRI scanning where CBF was measured using pseudocontinuous ASL. CBF was sampled from 5 brain regions implicated in AD using the Alzheimer's Disease Neuroimaging Initiative FDG Meta-ROI suite. **Statistical analyses:** Pearson correlation was used to examine the association between CRF and MVPA. Multiple linear regression was used to determine whether CRF and/or MVPA were significant and independent predictors of CBF. **Results:** CRF and MVPA were moderately correlated ( $r = .37$ ;  $p < .05$ ), suggesting these two constructs may provide unique contributions to CBF. Regression analysis revealed CRF was significantly and positively associated with CBF while accounting for minutes of MVPA, accelerometer wear time, age, gender, and global cerebral blood flow ( $p < .05$ ). **Conclusions:** Results suggest fitness level, independent of physical activity, is associated with greater CBF in regions that decline with aging and AD. Cardiorespiratory fitness appears to be an important physiological component of brain health in older adulthood that is not explained by physical activity behaviors.

2882 Board #7 June 2 1:00 PM - 3:00 PM  
**Resting-state Connectivity Differences In Alzheimer's Disease Risk: Effects Of An 8-month Exercise Intervention**

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Apolipoprotein E (*APOE*)  $\epsilon 4$  allele carriers (carriers) are at high risk for Alzheimer's Disease (AD). Evidence suggests that carriers have altered resting-state brain connectivity (rs-conn), which may be a precursor to cognitive decline and pathological changes. Exercise, however, has been shown to be beneficial for cognitive function and is capable of changing rs-conn. **Purpose:** Our purpose was to assess differences in rs-conn between carriers and non-carriers before and after an exercise intervention. **Methods:** Participants completed resting-state fMRI scans at the beginning (pre) and end (post) of a 3 day/week, 8-month, moderate-intensity exercise program ( $n=12$ ; 8 carriers & 4 non-carriers; mean age = 59.5 yrs). Independent samples  $t$  tests with a false discovery rate correction for multiple comparisons were used to determine differences in rs-conn between carriers and non-carriers (contrast=carriers > non-carriers) at pre and post with alpha set *a priori* at  $\alpha=.05$ . **Results:** Before

intervention, the carriers exhibited significantly more rs-conn as compared to non-carriers between cerebellum 10 (left (L)) and the middle frontal gyrus (L) ( $t(10)=7.88$ ,  $p=.002$ ), planum temporale (L) ( $t(10)=5.82$ ,  $p=.01$ ), anterior cingulate ( $t(10)=4.99$ ,  $p=.02$ ), and cerebellum 4/5 (L) ( $t(10)=4.8$ ,  $p=.02$ ). There was also significantly more rs-conn for the carriers as compared to non-carriers between the anterior parahippocampal gyrus (right (R)) and the frontal orbital cortex (L) and between the occipital pole (L) and cerebellum 10 (R) ( $p$ 's  $< .05$ ). In contrast, carriers had less rs-conn compared to the non-carriers in the paracingulate gyrus (L) and the occipital fusiform gyrus (R) ( $t(10)=-5.97$ ,  $p=.02$ ). Following treatment, however, there were no group differences in rs-conn in the aforementioned regions ( $p > .05$ ). **CONCLUSION:** We found significantly more rs-conn in various motor and attention regions before the exercise intervention in the *APOE*  $\epsilon 4$  carriers suggesting a compensatory mechanism. These differences were no longer evident after an 8-month exercise intervention suggesting that exercise may reorganize carriers' neural connectivity towards that of non-carriers. Since alterations in rs-conn have been suggested as a precursor to AD, exercise interventions may be especially beneficial for *APOE*  $\epsilon 4$  carriers.

2883 Board #8 June 2 1:00 PM - 3:00 PM  
**Assessing Cerebrovascular Responsiveness: Comparing Functional Magnetic Resonance Imaging With Doppler Ultrasound**

Claire V. Burley<sup>1</sup>, Karen J. Mullinger<sup>2</sup>, Susan T. Francis<sup>3</sup>, Anna C. Phillips<sup>1</sup>, Samuel J.E. Lucas<sup>1</sup>. <sup>1</sup>University of Birmingham, Birmingham, United Kingdom. <sup>2</sup>University of Birmingham / University of Nottingham, Birmingham / Nottingham, United Kingdom. <sup>3</sup>University of Nottingham, Nottingham, United Kingdom. (Sponsor: Prof Damian Bailey, FACSM)  
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Cerebrovasculature responsiveness (CVR) to alterations in arterial carbon dioxide ( $PCO_2$ ) content is a common test to assess brain health. Traditionally, higher CVR is associated with higher aerobic fitness, while natural aging and brain-related diseases are associated with lower CVR. However, recent findings challenge some of these relations, but may be related to inconsistent neuroimaging methodologies. **PURPOSE:** 1) to examine fitness effects on CVR between active and sedentary individuals using functional magnetic resonance imaging (fMRI) and transcranial Doppler (TCD), and 2) compare different stimulus concentrations for CVR measures between fMRI and TCD. **METHODS:** Fourteen volunteers participated ( $26 \pm 7$  yrs; 8 active, 6 sedentary), with 10 pair-matched for age and sex to examine fitness effects (5 active, 5 sedentary). Following medical screening, participants completed an aerobic fitness test ( $VO_2$  max) and the CVR protocol familiarisation. Participants then completed two experimental sessions on separate days (randomized and counter-balanced). For both sessions, CVR was assessed using two concentrations of  $CO_2$  via the same Douglas bag open circuit (4-min cycles of room air, 5%  $CO_2$ , room air, 7%  $CO_2$ ). CVR was measured using fMRI (EPI-based sequence allowing simultaneous acquisition of blood-oxygen level dependent and perfusion responses) and TCD (middle cerebral artery flow velocity). CVR measures were correlated (Pearson's) with fitness and differences between stimulus concentration within and between approaches compared. **RESULTS:** 1) Higher  $VO_2$  max was associated with higher CVR derived from 5% and 7%  $CO_2$  stimuli, but were higher for fMRI (5%:  $r=.640$ ,  $p=.06$ ; 7%:  $r=.690$ ,  $p=.04$ ) than TCD (5%:  $r=.209$ ,  $p=.30$ ;  $r=.365$ ,  $p=.17$ ). 2) When comparing CVR between fMRI and TCD, values obtained from the 5% stimulus correlated ( $r=.626$ ,  $p < .05$ ); while there was no correlation between values obtained from the 7% stimulus ( $r=.252$ ,  $p=.46$ ). Paired  $t$ -tests comparing  $CO_2$  concentration (5% vs 7%  $CO_2$ ) revealed no difference for fMRI-derived CVRs ( $p=.93$ ), but a trend between TCD-derived CVRs ( $p=.10$ ). **CONCLUSION:** Both fMRI and TCD-CVR approaches differentiated active and sedentary groups. The CVR measure between and within neuroimaging approaches was differentially influenced by  $CO_2$  concentration.

**F-09 Thematic Poster - Cardiovascular Regulation**

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
Room: 403

**2884 Chair:** Russell S. Richardson. *University of Utah, Salt Lake City, UT.*

*(No relationships reported)*

**2885 Board #1 June 2 1:00 PM - 3:00 PM**

**Are Vascular Conductance and Muscle Blood Flow During Exercise Affected by Hypoxia and Arterial Perfusion Pressure?**

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*(No relationships reported)*

**PURPOSE:** To investigate the combined effect of hypoxia and altered arterial perfusion pressure on vascular conductance (VC), muscle blood flow (MBF), and O<sub>2</sub> delivery (DO<sub>2est</sub>) during exercise. **METHODS:** Ten healthy volunteers repeated plantar flexion contractions at 20% (low power output = LPO) and 30% (higher power output = HPO) of their maximal voluntary contraction in 35° head-down-tilt (HDT) and 45° head-up-tilt (HUT) to modify muscle perfusion pressure (MPP) while breathing normoxic and then hypoxic air. Popliteal diameter and muscle blood flow velocity were measured by ultrasound to determine MBF. VC was estimated by dividing MBF by MPP, and DO<sub>2est</sub> was estimated from MBF and saturation. **RESULTS:** From normoxia to hypoxia in LPOHUT, there were no changes in VC (0.9 ± 0.4 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> and 0.8 ± 0.4 mL·min<sup>-1</sup>·mmHg<sup>-1</sup>) and MBF (127.2 ± 58.8 mL·min<sup>-1</sup> and 119.5 ± 53.2 mL·min<sup>-1</sup>), resulting in reduced DO<sub>2est</sub> (123.9 ± 57.2 mL·O<sub>2</sub>·min<sup>-1</sup> and 109.6 ± 48.5 mL·O<sub>2</sub>·min<sup>-1</sup>, p < 0.05). In LPOHDT, there was an increase in VC from 2.9 ± 0.8 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> in normoxia to 3.3 ± 0.8 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> in hypoxia (p < 0.05) and MBF from 146.3 ± 34.2 mL·min<sup>-1</sup> in normoxia to 167.3 ± 38.1 mL·min<sup>-1</sup> in hypoxia (p < 0.05), maintaining DO<sub>2est</sub> (142.2 ± 33.2 mL·O<sub>2</sub>·min<sup>-1</sup> and 152.6 ± 34.3 mL·O<sub>2</sub>·min<sup>-1</sup>). From normoxia to hypoxia during HPOHUT, there were no changes in VC (1.4 ± 0.5 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> and 1.4 ± 0.6 mL·min<sup>-1</sup>·mmHg<sup>-1</sup>), MBF (203.3 ± 74.3 mL·min<sup>-1</sup> and 210.3 ± 84.2 mL·min<sup>-1</sup>), and DO<sub>2est</sub> (197.0 ± 72.4 mL·O<sub>2</sub>·min<sup>-1</sup> and 190.8 ± 75.0 mL·O<sub>2</sub>·min<sup>-1</sup>). During HPOHDT, there was an increase in VC from 3.6 ± 1.0 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> in normoxia to 4.1 ± 1.2 mL·min<sup>-1</sup>·mmHg<sup>-1</sup> in hypoxia (p < 0.05), MBF from 186.8 ± 55.4 mL·min<sup>-1</sup> in normoxia to 221.6 ± 68.7 mL·min<sup>-1</sup> in hypoxia (p < 0.05), and DO<sub>2est</sub> (180.9 ± 53.3 mL·O<sub>2</sub>·min<sup>-1</sup> and 201.0 ± 60.8 mL·O<sub>2</sub>·min<sup>-1</sup>, p < 0.05). In hypoxia, VC reached its upper functional limit and the consequence was revealed by increased muscle activation. **CONCLUSION:** During HPOHDT in hypoxia, a functional limitation for the recruitment of VC constrained MBF and DO<sub>2est</sub>, which contribute to a greater metabolic stress and advance of muscle fatigue. During LPOHDT, LPOHUT and HPOHUT in hypoxia, changes in VC compensated for the alterations in O<sub>2</sub> availability and MPP with no apparent functional limitation in the VC recruitment, which would allow further rises in MBF to maintain DO<sub>2est</sub>.

**2886 Board #2 June 2 1:00 PM - 3:00 PM**

**Blood Flow Regulation and Oxygen Uptake during High Intensity Forearm Exercise**

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*(No relationships reported)*

The vascular strain is very high during heavy handgrip exercise, but the intensity and kinetics to reach peak blood flow, and peak oxygen uptake, are uncertain. **PURPOSE:** We included 9 young (25±2yr) healthy males to evaluate blood flow and oxygen uptake responses during continuous dynamic handgrip exercise with increasing intensity. **METHODS:** Blood flow was measured using Doppler-ultrasound and venous blood was drawn from a deep forearm vein to determine arteriovenous oxygen difference (a-vO<sub>2diff</sub>) during 6-minutes bouts of 60, 80 and 100% of maximal work rate (WR<sub>max</sub>), respectively. **RESULTS:** Blood flow and oxygen uptake increased (p<0.05) from 60%WR<sub>max</sub> (557±177(SD) mL·min<sup>-1</sup>; 56.0±21.6 mL·min<sup>-1</sup>) to 80%WR<sub>max</sub> (679±190 mL·min<sup>-1</sup>; 70.6±24.8 mL·min<sup>-1</sup>), but no change was seen from 80%WR<sub>max</sub> to 100%WR<sub>max</sub>. Blood velocity (49.5±11.5 cm·sec<sup>-1</sup> to 58.1±11.6 cm·sec<sup>-1</sup>) and brachial diameter (0.49±0.05cm to 0.50±0.06 cm) showed concomitant increases (p<0.05) with blood flow from 60% to 80%WR<sub>max</sub>, while no differences were observed in a-vO<sub>2diff</sub>. Shear rate also increased (p<0.05) from 60% (822±196 s<sup>-1</sup>) to 80% (951±234 s<sup>-1</sup>) of WR<sub>max</sub>. The mean response time (MRT) was slower (p<0.05) for blood flow (60%WR<sub>max</sub>:50±22s; 80%WR<sub>max</sub>:51±20s; 100%WR<sub>max</sub>:51±23s) than a-vO<sub>2diff</sub> (60%WR<sub>max</sub>:29±9s; 80%WR<sub>max</sub>:28±5s; 100%WR<sub>max</sub>:20±5s), but not different

from oxygen uptake (60%WR<sub>max</sub>:44±25s; 80%WR<sub>max</sub>:43±14s; 100%WR<sub>max</sub>:41±32s). No differences were observed in MRT for blood flow or oxygen uptake with increased exercise intensity. **CONCLUSION:** When approaching maximal intensity, oxygen uptake appeared to reach a critical level at ~80% of WR<sub>max</sub> and be regulated by blood flow. This implies that high, but not maximal, exercise intensity may be an optimal stimulus for shear stress-induced small muscle mass training adaptations.

**2887 Board #3 June 2 1:00 PM - 3:00 PM**

**Regional Cerebral Blood Flow Responses to Graded Sympathetic Activation in Young Healthy Subjects**

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*(No relationships reported)*

Numerous studies have investigated cerebral blood flow (CBF) responses during orthostatic stress, primarily using middle cerebral artery (MCA) blood velocity. Due to methodological limitations associated with this measurement, there has been a recent transition towards measuring blood flow in vertebral (VA), internal carotid (ICA) and external carotid arteries (ECA) using duplex Doppler ultrasound. Limited studies have simultaneously characterized the response of all these cerebral vessels to simulated orthostatic stress. Likewise, previous studies examining the influence of the sympathetic nervous system on the cerebral vasculature have also relied mainly on MCA velocity measures, primarily performed during infusion of α-adrenergic receptor agonists or antagonists. **PURPOSE:** To investigate regional CBF responses to a moderate and high level of reflex-mediated sympathetic activation via lower body negative pressure (LBNP) at -10 and -40 Torr, respectively. **METHODS:** In 8 young men, beat-to-beat arterial pressure (finger photoplethysmography), heart rate (ECG), VA, ICA, ECA and brachial artery blood flow (duplex Doppler ultrasound) and MCA blood velocity (transcranial Doppler) were measured at rest and during 5 min of -10 and -40 Torr LBNP performed in random order. Conductance was calculated as blood flow of the respective artery/mean arterial pressure. **RESULTS:** In both LBNP trials, there was a significant decrease in brachial artery blood flow and conductance (-10 Torr: -26.0±10.6 % baseline; -40 Torr: -42.3±4.4 % baseline, p=0.006). In contrast, VA, ICA and ECA blood flow and conductance were unaffected (e.g., VA conductance, -10 Torr: -5.8±4.6 % baseline; -40 Torr: -0.03±2.5 % baseline, p=0.654). MCA blood velocity was also unchanged by LBNP (p=0.648). **CONCLUSION:** Despite the large sympathetically-mediated reductions in brachial artery conductance, cerebral vascular conductance, assessed in multiple arteries, was unaffected by graded sympathetic activation with LBNP. These preliminary data suggest minimal direct effect of reflex-mediated elevations in sympathetic nerve activity on CBF. Supported by NIH grant 1 RO1 HL 127071.

**2888 Board #4 June 2 1:00 PM - 3:00 PM**

**Muscle Blood Flow Responses to Dynamic Handgrip Exercise in Young Obese Adults**

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**INTRODUCTION:** Exercise intolerance is a hallmark characteristic of obesity, which may be related to an impaired ability to appropriately increase blood flow to the contracting muscles. Limited evidence suggests that steady-state vasodilator responses to dynamic forearm exercise are preserved or even increased in young obese humans compared with lean peers, but this topic still remains poorly understood. **PURPOSE:** To evaluate exercise-induced changes in hemodynamics in young obese adults compared with lean adults. **METHODS:** Thirteen lean (female=6; 26±1 yrs; 22.4±0.5 kg/m<sup>2</sup>) and 14 obese adults (female=7; 27±1 yrs; 32.6±0.6 kg/m<sup>2</sup>) performed 2-min of dynamic forearm exercise at 15 and 30% of maximal voluntary contraction (1-s contraction: 2-s relaxation). Ultrasonography [brachial diameter, forearm blood flow (FBF), forearm vascular conductance (FVC)], and beat-to-beat hemodynamics [mean arterial pressure (MAP), heart rate (HR), stroke index (SI), systemic vascular resistance index (SVRI), cardiac index (CI), systemic arterial compliance index (SACI)] were collected. FBF and FVC were normalized to lean forearm mass, and hemodynamics were indexed to body surface area. **RESULTS:** There were no group differences in any variable at baseline. Brachial artery diameter, FBF, FVC, and HR increased from baseline at 15% and 30% of MVC similarly in both groups (P<0.05). There was an interaction for SVRI (P<0.05), where SVRI decreased from baseline at 15% and 30% MVC only in the lean group (P<0.05). **CONCLUSION:** Although young obese adults did not exhibit an impairment in exercise-induced increases in

blood flow, systemic vascular resistance did not decrease with exercise in obese adults. Future studies in an older population may reveal more consistent obesity-related impairments, whereas our current cohort is young and lack comorbidities.

Variable	Group	Baseline	15MVC	30MVC
Brachial Artery Diameter (mm) *	Lean	3.46±0.15	3.51 ±0.15	3.64 ±0.14
	Obese	3.62±0.14	3.69 ±0.14	3.76 ±0.14
FBF (mL/min*100 g tissue) *	Lean	11 ±1	13±1	30±2
	Obese	10±1	14±1	27±2
FVC (mL/min*100mmHg*100 g tissue) *	Lean	11±1	14±1	30±2
	Obese	10±1	13±1	27±2
MAP (mmHg)	Lean	101±2	103±2	102±3
	Obese	100±2	99±2	103±3
HR (bpm) *	Lean	62±2	66±2	67 ±2
	Obese	64±2	63±2	67±2
SI (mL/min/m <sup>2</sup> )	Lean	53±3	54±3	55±3
	Obese	48±3	46±3	47±3
CI (L/min/m <sup>2</sup> )	Lean	3.3±0.2	3.5±0.2	3.7±0.2
	Obese	3.0±0.2	2.9±0.2	3.2±0.2
SVRI (L/min/mmHg/m <sup>2</sup> ) †	Lean	32.2±1.9	30.2±2.0*	29.2 ±1.8*
	Obese	33.9±1.8	35.4±1.9	33.8±1.8
SACI (mL/mmHg/m <sup>2</sup> )	Lean	0.96±0.04	0.97±0.04	0.99±0.04
	Obese	0.88±0.04	0.86±0.04	0.86±0.04

Data are mean±SE. \* $P<0.05$ , time effect. † $P<0.05$ , interaction. ‡ $P<0.05$ , different from baseline.

2889 Board #5 June 2 1:00 PM - 3:00 PM

### Reduced Skeletal Muscle Blood Flow In Persons With Multiple Sclerosis Exhibiting Autonomic Nervous System Dysfunction

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(No relationships reported)

Multiple Sclerosis (MS) is a demyelinating disease of the central nervous system characterized by a variety of symptoms including fatigue, reduced exercise capacity, and autonomic nervous system (ANS) dysfunction. **PURPOSE:** The purpose of this study was to determine whether persons with MS (PwMS) demonstrate reduced skeletal muscle blood flow during exercise compared to age matched controls.

**METHODS:** The first analysis included 7 PwMS (age: 52.0 ± 9.8, 6 women) and 6 controls (age: 49.2 ± 9.8, 4 women). ANS function was assessed in both groups using the 31 item Composite Autonomic Symptom Score (COMPASS-31) questionnaire. A subset of 3 women with MS exhibiting ANS dysfunction (age: 55.3 ± 7.0, Patient Determined Disease Steps: 1-3) were then age, sex, and workload matched with controls (age: 51.3 ± 9.5) for the second analysis. Mean blood velocity was measured (Doppler Ultrasound) and femoral blood flow (FBF) and conductance (FVC) were calculated during submaximal single leg knee extension with a modified cycle ergometer on the right leg at 20% and 40% of work-rate max (WRmax). FBF and FVC were normalized per 100g of thigh fat free mass. Comparisons for analysis 1 were made with unpaired 1-tailed T-Tests and comparisons for analysis 2 with paired 1-tailed T-Tests.

**RESULTS:** Analysis 1: FVC tended to be lower in the MS group at 20% WRmax ( $P = 0.13$ ) and 40% WRmax ( $P = 0.13$ ). However, there was no difference in FVC when absolute workloads were matched (MS 40% WRmax vs. Con 20% WRmax: MS: 6.3 ± 1.0 watts, Con: 5.0 ± 0.8 watts) between groups ( $P = 0.41$ ). Analysis 2: Absolute and relative workloads were matched for each group (20% WRmax, MS: 4.2 ± 0.8 watts, Con: 4.0 ± 1.0 watts; 40% WRmax, MS: 8.3 ± 1.7 watts, Con 8.0 ± 2.0 watts). FBF was lower at 40% WRmax ( $P = 0.05$ ), while FBF at 20% WRmax ( $P = 0.13$ ) and FVC at both workloads tended to be lower in MS (20% WRmax,  $P = 0.13$ , 40% WRmax,  $P = 0.14$ ).

**CONCLUSIONS:** These results suggest that PwMS exhibiting ANS dysfunction may have reduced blood flow during exercise at similar relative and absolute workloads compared to age/sex matched controls. These findings warrant further investigation into the regulation of skeletal muscle blood flow in PwMS to determine whether impaired blood flow contributes to common symptoms of MS such as reduced exercise capacity and fatigue.

2890 Board #6 June 2 1:00 PM - 3:00 PM

### Oxygen Extraction Reserve Immediately After Ramp Incremental Maximal Exercise: Beyond the Deoxy-hemoglobin Breaking Point

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(No relationships reported)

Towards the end of a ramp incremental (RI) test to exhaustion, the near-infrared spectroscopy (NIRS)-derive deoxygenated hemoglobin ([HHb]) signal plateaus, suggesting an upper limit in oxygen ( $O_2$ ) extraction. However, it is unknown whether this plateau is the highest level of  $O_2$  extraction, or if a "reserve" in  $O_2$  extraction exists, such that the plateau in the [HHb] in the presence of a still raising  $O_2$  utilization ( $VO_2$ ) towards the end of a RI test is indicative of a local increase in blood flow.

**PURPOSE:** To assess the existence of a "reserve" in  $O_2$  extraction immediately at the end of a RI cycling test to exhaustion.

**METHODS:** Nine male participants (27 ± 4.6 yrs; 79.9 ± 8.6 kg) performed a RI (30W·min<sup>-1</sup>) test to exhaustion on a cycle ergometer (Velotron Dynafit Pro, Seattle, WA, USA) to determine the  $VO_2$  (Quark CPET, Cosmed, Rome, Italy) and the [HHb] (Oxiplex TS, ISS, Champaign, USA) responses. The [HHb] signal was measured on the Vastus Lateralis (VL) muscle. An automatic rapid inflation cuff was used to occlude blood flow to the leg (300 mmHg), at the upper portion of the thigh, for two minutes immediately at test failure. A paired samples t-test was used to compare the  $VO_2$  (onset of the plateau in the [HHb] signal and end-exercise) and the normalized (0-100% of the response during RI test) [HHb] signal (plateau and peak value obtained during occlusion).

**RESULTS:** The end-exercise  $VO_2$  ( $VO_{2max}$ ; 4.35 ± 0.57 L·min<sup>-1</sup>) was larger than that observed at the onset of the plateau in the [HHb] response (3.77 ± 0.52 L·min<sup>-1</sup>;  $p < 0.05$ ). Post-exercise peak [HHb] (following occlusion) was higher compared to its plateau value ( $p < 0.05$ ), with a mean difference of 38.1 ± 18.9%.

**CONCLUSIONS:** This study demonstrated the existence of a "reserve" in  $O_2$  extraction, despite a continuous increase in the  $VO_2$  response towards the end of a RI cycling test. These data suggest that the observed plateau in the [HHb] response is not related to  $O_2$  extraction reaching its upper limit, but likely due to increased local blood flow.

2891 Board #7 June 2 1:00 PM - 3:00 PM

### The Exercise Pressor Reflex in Hyper- and Hypo-Responsive Humans

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The exercise pressor reflex has been hypothesized to help preserve muscle perfusion (i.e., a flow-maintaining reflex rather than a pressure-raising reflex). Therefore, people with a hyper-responsive exercise pressor reflex should be better able to sustain exercise when blood flow is compromised. **PURPOSE:** To compare exercise tolerance in people with exaggerated and blunted exercise pressor reflexes. **METHODS:** From a large cohort of college age men and women we recruited groups of subjects identified as high (>75<sup>th</sup> percentile) and low (<25<sup>th</sup> percentile) blood pressure responders to static exercise (30% maximal voluntary contraction for 3 min). The groups were matched for body size, grip strength, and resting blood pressure. Subjects initiated rhythmic handgrip exercise (30 contractions/minute) at 10% MVC for 3 min and continued exercising while blood flow was progressively restricted with a cuff gradually inflated on the upper arm (3 mmHg/15 sec). Blood pressure (Finometer), heart rate (ECG) and blood flow (Doppler ultrasound) were measured continuously. Exercise ended when a rating of perceived exertion (Borg scale) of 19-20 was reached, or when blood flow was less than 10% of the steady-state exercise flow. **RESULTS:** Each group stopped exercising at a similar RPE and with similar blood flow. As expected, the high responder group had approximately double the increase in mean arterial pressure at the end of exercise and during post-exercise circulatory arrest when compared to the low responder group (31±12 vs. 15±7 and 29±13 vs. 12±6 mmHg respectively,  $P<0.02$ ). The high responder group was able to exercise for 14±1 min, but exercise duration was significantly less for the low responder group (12±1 min,  $P<0.05$ ). **CONCLUSIONS:** Inter-individual variation in the exercise pressor reflex has functional effects. People with an exaggerated exercise pressor reflex may be able to better maintain perfusion and exercise intensity.

2892 Board #8 June 2 1:00 PM - 3:00 PM  
**Determining The Window Of Effect In The Human Vasculature For The Nitric Oxide Synthase Inhibitor N(G)-monomethyl-L-arginine (L-NMMA)**

Andrew C. Kithas, Ryan M. Broxterman, Joel D. Trinity, Jayson R. Gifford, Oh-Sung Kwon, Jay R. Hydren, Ashley D. Nelson, Jacob E. Jessop, Amber D. Bledsoe, David E. Morgan, Russell S. Richardson. *University of Utah, Salt Lake City, UT.*  
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 (No relationships reported)

**Purpose:** As nitric oxide (NO) is both an important vasodilator and considered antiatherogenic, inhibiting nitric oxide synthase (NOS), to assess the role and bioavailability of NO, is commonplace. However, the physiologic window of effect in the human vasculature for the often used NOS inhibitor, L-NMMA, has not been well characterized and hence, this form of NOS inhibition is typically employed last in experimental protocols or on a separate day. Therefore, this study sought to quantify the duration of the measurable physiologic effects of L-NMMA in the peripheral vasculature. **Methods:** The passive leg movement (PLM) assessment of vascular function, which has been documented to be predominantly NO mediated, was performed in 7 young male subjects under baseline conditions, immediately following L-NMMA infusion (0.24 mg/dl/min) into the common femoral artery and then again at 45-60 and 90-105 minutes post infusion. The leg blood flow (LBF) response to PLM, assessed with Doppler ultrasound and expressed as the change from baseline to peak ( $\Delta$ LBF<sub>peak</sub>) and area under the curve (AUC), was utilized to assess the effect of L-NMMA on NO-mediated vascular function over the course of the experiment. **Results:** Immediately after the L-NMMA infusion,  $\Delta$ LBF<sub>peak</sub> and LBF AUC were significantly attenuated by 38% and 69%, respectively. However, within 45-60 minutes following the L-NMMA infusion neither PLM-induced  $\Delta$ LBF<sub>peak</sub> nor LBF AUC were significantly different from baseline and this was still the case at 90-105 minutes post infusion. **Conclusions:** These findings reveal that the potent reduction in NO bioavailability afforded by NOS inhibition with L-NMMA has a window of effect of less than 45-60 minutes in the human vasculature. These data can be used to guide experimental design using this pharmacological approach.

**F-10 Thematic Poster - Don't be a Cry Baby: Research in Pregnancy, Child Birth, and Early Life**

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
 Room: 505

2893 **Chair:** James M. Pivarnik, FACSM. *Michigan State University, East Lansing, MI.*

(No relationships reported)

2894 Board #1 June 2 1:00 PM - 3:00 PM  
**Longitudinal Trends for Pregnancy Physical Activity as Assessed through Objective and Self-Report Methods**

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 (No relationships reported)

Previous investigations have suggested an overall decrease in physical activity (PA) as pregnancy progresses. Longitudinal investigations of these trends are scarce and have primarily utilized self-report assessments, rather than objective methods. **PURPOSE:** To 1) longitudinally examine month-specific trends in PA during pregnancy and to 2) compare self-report and objective methods of assessing month-specific PA. **METHODS:** Pregnant women (N=23) were recruited to participate in a longitudinal investigation examining anthropometric change, dynamic balance, and PA levels throughout gestation. The assessment of PA occurred each month of pregnancy via two methods: 1) wearing a validated pedometer for seven days and 2) taking an online survey. Following each monthly visit to our laboratory for testing, participants were provided with the pedometer and wearing instructions. Pedometer data included number of steps and amount of time (minutes) each participant was active each day. For analytic purposes, data for a minimum of three week days and one weekend day (converted to steps/day) was used to represent participant activity each month. The monthly online survey queried participants on typical moderate and vigorous-intensity physical activity (MVPA) per day (converted to minutes/week). Month-to-month contrasts and trend analyses were conducted for both pedometer steps/day and minutes/week of MVPA. **RESULTS:** Participants had a mean age 28.7 years at recruitment, with 55.2% being first-time mothers. Mean pedometer-recorded steps/day during pregnancy was 5,491  $\pm$  2,086 and mean self-reported minutes/week of MVPA was 106.8  $\pm$  150.6. Mean steps/day significantly differed month-to-month as pregnancy progressed ( $F(7, 56)=4.79$ ,  $p<0.001$ ), with a reduced overall trend. Specifically, steps/

day recorded for pregnancy months five and eight were significantly lower ( $p<0.05$ ) than month four. Our findings reveal a reduced overall trend for MVPA minutes/week as pregnancy progressed, but no significant differences were found month-to-month ( $F(7, 56)=1.37$ ,  $p=0.236$ ). **CONCLUSION:** Pregnant women become less active in the later months of pregnancy according to both objective and self-report methods. Clear variability exists between objective and self-reported PA among pregnant women.

2895 Board #2 June 2 1:00 PM - 3:00 PM  
**Wrist-Worn Accelerometry Usage in Primiparous Early Postpartum Women**

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The early postpartum period (6 weeks) presents major lifestyle change to new parents. Is wearing a wrist-worn accelerometer acceptable to first-time mothers in early postpartum? **PURPOSE:** To describe wrist-worn accelerometry usage in primiparous, early postpartum women.

**METHODS:** We analyzed wear characteristics, including mean ( $\pm$ SD) days of wear and the mean minutes ( $\pm$ SD) of wear/day, of women enrolled in the first year of the Motherhood And Pelvic Health Study and determined the proportion of women who met the wear time standards of large published surveillance studies. We asked women to wear a tri-axial accelerometer continuously on the non-dominant wrist (1440 minutes=24 hours) over two specific 7-day periods, 12 to 25 days (T1) and 33 to 46 days (T2) postpartum. Study staff delivered accelerometers to women and verbally reinforced the protocol. We used the Choi et al. (2011) algorithm to determine wear/non-wear time. We assigned 0 days and 0 minutes of wear to women who wore the device outside of prescribed time periods. We excluded from analysis women that we were unable to contact before T1/T2 and those who had device failure.

**RESULTS:** For T1, 201 were eligible; 17 could not be contacted and 6 had device failures, leaving 178 women for analysis. For T2, 161 were eligible; 10 could not be contacted and 5 had device failures, leaving 146 women for analysis. At T1, most women (N=166, 93.3%) wore the device for 7 days (mean=6.8 $\pm$ 1.0 days) with an average wear time of 1348.0 $\pm$ 135.8 minutes/day. A slightly lower proportion of women (N=126, 86.3%) wore the device for 7 days (mean=6.7 $\pm$ .88 days) at T2 with an average wear time of 1311.3 $\pm$ 148.0 minutes/day. Two women at T2 and 1 woman at T1 did not wear the device during the prescribed time intervals. Nineteen women at T1 and 17 at T2 averaged 1440 minutes per day (perfect wear). At T1, 96.1% (N=171) and at T2, 93.2% (N=136) of women met the NHANES wear standards. At T1, 90.4% (N=161) and at T2, 82.2% (N=120) of women met the Whitehall II Study wear standards.

**CONCLUSION:** Despite the challenges inherent in conducting research about physical activity in newly postpartum women, our results indicate that adherence to wrist-worn accelerometry in this population is high.

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2896 Board #3 June 2 1:00 PM - 3:00 PM  
**Physical Activity Monitor Accuracy Among Pregnant Women During Overground Walking**

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Various physical activity monitors have demonstrated respectable step-count accuracy when worn by pregnant women during treadmill walking, particularly at faster speeds. However, it is unclear if this accuracy extends to overground walking, a far more common free-living modality. **PURPOSE:** This study examined the step-count accuracy of five commonly-used physical activity monitors among pregnant women during overground walking at self-paced speeds. **METHODS:** Twenty-nine pregnant women (19 second trimester, 10 third trimester) completed six overground walking trials while wearing three consumer-grade activity monitors (FB, OM, NL) and two research-grade activity monitors (AG, SW). All walking trials consisted of 100 steps, as measured by a hand-tally counter, which served as our criterion measure. Participants were instructed to walk the first three trials at a "normal pace" and the final three trials at a "brisk pace". Steps recorded during each trial were recorded or downloaded for each device in order to calculate mean absolute percentage error (MAPE) ( $[(\text{criterion measure} - \text{monitor measure}) / \text{criterion measure}] \times 100$ ). One-way ANOVAs were performed to determine whether MAPE differed between monitors and also whether pregnancy trimester affected monitor accuracy. Pairwise comparisons with Bonferroni adjustments were performed to explore specific differences between monitors. **RESULTS:** Significant differences were found between monitor MAPE

for normal-pace walking trials ( $F(4, 140)=8.66, p<0.001$ ) and also brisk-pace trials ( $F(4, 140)=30.07, p<0.001$ ). For normal-pace trials, MAPE for the SW (2.67%), NL (4.61%), and OM (4.82%) was significantly lower/better ( $p<0.05$ ) than that for the AG (12.34%) and FB (13.66%). For brisk-pace trials, MAPE for the SW (2.01%) was significantly lower ( $p<0.05$ ) than that for the NL (4.95%), AG (10.64%), and FB (24.61%), but not the OM (2.74%). Trimester was not found to significantly affect accuracy of any monitor at either normal or brisk paces.

**CONCLUSIONS:** The research-grade SW monitor is highly accurate for overground walking during pregnancy. The OM and NL, while not research-grade, are also accurate tools for overground walking and represent a cost-effective alternative for the consumer or for future pregnancy walking intervention trials.

2897 Board #4 June 2 1:00 PM - 3:00 PM  
**The Effects of Childbirth on Activity Levels in a Cohort of Adolescent Girls**

Bonny Rockette-Wagner<sup>1</sup>, Alison E. Hipwell<sup>1</sup>, Marquis Hawkins<sup>2</sup>, Lewis H. Kuller<sup>1</sup>, Dara D. Mendez<sup>1</sup>, Andrea M. Kriska, FACSM<sup>1</sup>, Kristi L. Storti<sup>3</sup>, Kathleen M. McTigue<sup>1</sup>.

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Reduced Physical activity (PA) levels have been associations with female-specific life events including pregnancy. Studies in adult women suggest that decreases in PA may persist after childbirth. However, there is little understanding of post-birth PA trends in adolescent females.

**Purpose:** To examine changes in PA after childbirth in adolescents.

**Methods:** The Pittsburgh Girls Study collected time-stamped step count data for 7 days, annually from 2010-2013 with a validated monitor, in a local population representative sample of 1045 adolescent females in Pittsburgh, PA (baseline age: 14-17 years). This analysis examines PA in the 95 participants with  $\geq 3$  days of valid step data who gave birth for the first time between 2009 and 2013. Change in average total steps/day over the 4 years was determined with mixed models (using a step down approach). All models were adjusting for, age cohort, winter wear time (y/n), weekend wear time (y/n), and average daily wear time (minutes/day). The effects of age at pregnancy and race/ethnicity [Non-Hispanic African American (NHAA)/ All Others] were also examined.

**Results:** At baseline, girls that gave birth during the study period were more likely to identify as NHAA, have lower socio-economic status (all  $p<0.001$ ), and were slightly older (mean [sd] age 16 [.98] vs. 15.4 [1.1] years) than girls who did not give birth. The mean (sd) age at pregnancy was 17 (1.3) years. The final model included the *a priori* covariates and race/ethnicity. Adjusted mean (sd) step counts/day were 7260(577) in the year before pregnancy. The adjusted mean (sd) change in step counts/day from the year before to the year after pregnancy was -2065 (735);  $p=0.004$ . Overall, 61% of the girls recorded < 5000 mean steps/day in the year after pregnancy versus 41% in the year before pregnancy. There was a non-significant upward trend in mean step counts in subsequent post-pregnancy years. For comparison, girls not experiencing a pregnancy had little change in step counts over the 4 year follow-up (adjusted mean [sd] change: -152 [140 ],  $p=0.05$ ).

**Conclusions:** There was a significant drop in PA levels post-pregnancy in this cohort. More than half of these girls could be considered *sedentary* post-pregnancy (<5000 steps/day). Based on this cohort, efforts to improve post-pregnancy PA levels are warranted in adolescent mothers.

2898 Board #5 June 2 1:00 PM - 3:00 PM  
**Comparison of Physical Activity Obtained Via Questionnaire and Accelerometry During Pregnancy and Postpartum**

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(No relationships reported)

The Pregnancy Physical Activity Questionnaire (PPAQ) is a commonly used tool to assess pregnant women's current physical activity levels. However, few studies have evaluated the level of agreement between the PPAQ and physical activity measurement devices during free living conditions at multiple time points throughout pregnancy.

**PURPOSE:** The purpose of this study was to compare the PPAQ and device based physical activity assessment across phases of pregnancy and postpartum.

**METHODS:** Physical activity behaviors of 38 women were quantified by the PPAQ and accelerometers worn at the right hip and ankle, at approximately 21 and 32 weeks of pregnancy, and 12 weeks postpartum. Women were evaluated at least eight hours

per day for at least five days of a week. Percent time spent in light, moderate, and vigorous physical activity were compared between the PPAQ and accelerometers using a two-way repeated measures analysis of variance (ANOVA).

**RESULTS:** Percent of total physical activity time spent in light and moderate activity levels was similar between hip (93.1, 5.7%, respectively) and ankle (89.4, 5.7%, respectively) accelerometers, compared to 47.8, 40.3%, respectively, for the PPAQ ( $P<0.01$ ). Specifically, the PPAQ results indicated significantly less time in light physical activity and more time in moderate activity. In addition, the hip and ankle accelerometers and the PPAQ showed significantly different percent of total physical activity time spent in vigorous activity (1.0, 4.7, 11.8%, respectively,  $P<0.01$ ).

**CONCLUSIONS:** In free living conditions, accelerometer placement at hip and ankle resulted in similar percent wear time among physical activity intensities, regardless of pregnancy time point. In contrast, greater moderate and vigorous physical activity was recorded via PPAQ survey. These results are similar to those found with nonpregnant adults (Troiano et al., 2008). Researchers should use caution when utilizing and comparing the results of these two physical activity measurement modalities during pregnancy and the postpartum period.

2899 Board #6 June 2 1:00 PM - 3:00 PM  
**Mother's Smoking Status during Pregnancy on Child's Motor Development: A Propensity Score Analysis**

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**PURPOSE:** To determinate the impact of a mother's smoking status during pregnancy on a child's motor development using a propensity score (PS) analysis, a statistical method for evaluating treatment effects when using nonexperimental or observational data.

**METHODS:** Five NHANES National Youth Fitness Survey 2012 data sets, "Demographic Variables," "Physical Functioning," "Early Childhood," in which mother's smoking status during pregnancy was asked, "Physical Activity," and "Test of Gross Motor Development (TGMD-2)" were merged. By matching 10 variables, including "Sex of the child," "At least one adult aged 60 years or older living in the participant's household," "the household reference person's sex," "Weight at birth, pounds," "Your child was overweight," "Crawl, walk, run, play limitations," "Impairment requiring special equipment," "Receive Special Ed or Early Intervention," "Days physically activity least 60 min," and "Hours watch TV or video past 30 days," a regression model was employed for the PS analysis (with inverse probability weighting adjustment and greedy algorithms with 1:1 matching; the covariate adjustment were used to estimate the effect of "Did biological mother smoke at any time while she was pregnant" on a child's gross motor development). The full sample weights were used for the analysis. **RESULTS:** The negative impacts of a mother smoking while pregnant on their child's motor development, with and without the PS analysis, are summarized below:

	Total		Loco Motor		Objective control	
	No-PS	PS	No-PS	PS	No-PS	PS
Smoked	91.18 ±14.30	91.18 ±14.30	26.09 ± 11.28	26.09± 11.28	18.33 ±7.89	18.33± 7.89
Didn't-Smoke	96.06 ±14.57	99.27 ±12.32	28.62± 10.26	29.06± 8.81	21.64 ±8.42	22.51± 7.81
Difference	4.88	8.09	2.53	2.96	3.31	4.18
t-value	-1.85	-2.65	-1.23	-1.25	-2.27	-2.16
p-value	0.07	0.01	0.22	0.21	0.02	0.03
ES	0.34	0.60	0.23	0.29	0.40	0.53

**CONCLUSION:** By applying the PS analysis, the negative impact of mothers smoking status during pregnancy on children's gross motor development was further confirmed.

2900 Board #7 June 2 1:00 PM - 3:00 PM  
**Early Pregnancy Leisure Time Physical Activity and Circulating MicroRNAs**  
 Sylvia E. Badon<sup>1</sup>, Alyson J. Littman<sup>1</sup>, KC Gary Chan<sup>1</sup>, Michelle A. Williams<sup>2</sup>, Daniel A. Enquobahrie<sup>1</sup>. <sup>1</sup>University of Washington, Seattle, WA. <sup>2</sup>Harvard T.H. Chan School of Public Health, Boston, MA.  
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Leisure time physical activity (LTPA) during pregnancy is associated with pregnancy complications and fetal outcomes. Epigenetic mechanisms potentially play key roles in these associations. Few studies have investigated epigenetic biomarkers in relation to LTPA.  
**Purpose:** To determine if maternal LTPA in early pregnancy is associated with candidate circulating microRNAs (miRNAs), epigenetic biomarkers with post-transcription regulatory roles.  
**Methods:** This was a cross-sectional study conducted among participants (N=74) of the Omega study, a pregnancy cohort study. Participants self-reported LTPA duration (hours/week) and energy expenditure (MET-hours/week) during an interview in early pregnancy (16 weeks gestation, on average). LTPA was considered both as a continuous variable and categorized according to current American College of Sports Medicine recommendations for physical activity (not active, active<150 minutes/week, active≥150 minutes/week). Levels of circulating microRNAs (miR-126-3p, 146b-5p, miR-155-5p, miR-21-3p, miR-210-3p, miR-222-3p, miR-223-3p, miR-517-5p, miR-518a-3p, miR-29a-3p), selected based on their role in pathophysiological pathways (e.g. inflammation, oxidative stress, and placental function) related to pregnancy complications and outcomes, were measured using qRT-PCR. Linear regression adjusted for maternal age and gestational age at blood draw was used to determine beta estimates and 95% confidence intervals.  
**Results:** Each additional hour or MET-hour/week of LTPA was not associated with levels of circulating miRNAs (all P>0.05). Compared to women who were not active, women who were active but did not meet recommendations had higher levels of circulating miR-517-5p (β=0.24; 95% CI: 0.06, 1.0; P=0.05). Compared to women who were active below recommended levels, meeting or exceeding recommendations was associated with higher levels of circulating miR-517-5p (β=3.7; 95% CI: 0.99, 14; P=0.05). Early pregnancy LTPA was not associated with levels of other circulating miRNAs.  
**Conclusion:** Maternal LTPA in early pregnancy may be associated with circulating levels of miR-517-5p, a placenta-specific miRNA related to placental growth, development, and function.

2901 Board #8 June 2 1:00 PM - 3:00 PM  
**Step-Count Accuracy of Physical Activity Monitors During Pregnancy in Free-Living Conditions**  
 Jordana B. Dahmen<sup>1</sup>, Christopher P. Connolly<sup>1</sup>, Alexander H. K. Montoye<sup>2</sup>. <sup>1</sup>Washington State University, Pullman, WA. <sup>2</sup>Alma College, Alma, MI. (Sponsor: James M. Pivarnik, FACSM)  
 (No relationships reported)

Previous studies have assessed the validity and reliability of physical activity monitors worn by pregnant women under laboratory conditions. However, physical activity monitors have not been assessed under free-living conditions in pregnant women.  
**PURPOSE:** 1) Determine the step-count accuracy of four commercially-available physical activity monitors worn by pregnant women under free-living conditions and 2) examine the effect of pregnancy trimester on monitor accuracy. **METHODS:** Participants were pregnant women (n=28) in their second or third trimesters who were 18-40 years of age and free of contraindications to exercise during pregnancy. Participants wore three consumer-grade activity monitors (FB, OM, NL) and two research-grade activity monitors (AG, SW) for three days of free-living activity during all waking hours. Steps recorded over the three days for the FB, OM, NL, and AG were compared to SW recorded steps (the criterion measure) in order to calculate percentage of actual steps taken ([measured steps / actual steps] x 100). Paired-samples t-tests were performed to determine differences in accuracy between monitors and one-way ANOVAs were utilized to determine whether pregnancy trimester affected monitor accuracy. **RESULTS:** The analytical sample consisted of 18 women in their second trimester and 10 women in their third trimester with an overall mean gestational age of 23.9 ± 8.19 weeks and a mean daily step-count of 9354.3 ± 3363.9 steps (as determined by SW). Steps taken per day did not significantly differ between second and third trimester women (F(1, 26)=0.69, p=0.42). The FB and NL were most accurate with mean percentage of actual steps taken recorded at 69.9% and 69.5% respectively. The AG (t(27)=-3.13, p<0.01) and OM (t(27)=-6.27, p<0.001) performed significantly worse with 62.7% and 52.1% of actual steps. Trimester did not significantly affect monitor accuracy. **CONCLUSION:** Compared to the criterion, all other monitors underestimated actual steps taken, with the FB and NL demonstrating smaller underestimations than the AG and OM in a free-living environment. Accuracy of these monitors appears to be worse during pregnancy free-living conditions compared to results of studies performed in controlled laboratory conditions.

F-11 Thematic Poster - Hydration  
 Friday, June 2, 2017, 1:00 PM - 3:00 PM  
 Room: 404

2902 **Chair:** Sam Cheuvront, FACSM. U.S. Army Research Institute of Environmental Medicine, Natick, MA.  
 (No relationships reported)

2903 Board #1 June 2 1:00 PM - 3:00 PM  
**Voluntary Drinking Cessation Is Associated With Recovery Of Plasma Osmolality But Not Of Thirst Perception, Usg, Or Body Mass**  
 Catalina Capitan-Jimenez, Luis Fernando Aragon-Vargas, FACSM. University of Costa Rica, San Jose, Costa Rica. (Sponsor: Luis Fernando Aragon-Vargas, FACSM)  
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 (No relationships reported)

Post-exercise rehydration has been widely studied, with special emphasis on retention of ingested fluid; little research has been done on why we drink more or less. **Purpose:** To identify if voluntary drinking cessation coincides with a return to pre-exercise physiological values. **Methods:** 9 males consented to participate. They exercised intermittently (30 min bicycle-30 min treadmill, at 70-80% HRmax) in the heat (WBGT= 28.1±0.7°C), to a dehydration of 3.6±0.3% body mass (BM). Upon exercise termination, participants were instructed to drink as long and as much as they needed while monitoring water intake. When intake was less than 100mL in 15 min, that was considered the point of voluntary drinking cessation. Urine color (U<sub>color</sub>), specific gravity (USG), and osmolality (U<sub>osm</sub>), plasma osmolality (P<sub>osm</sub>), fullness, and thirst perception (TP) were measured pre- and post-exercise, and post-rehydration. Matched pairs analyses were performed to compare pre-exercise and post-rehydration. **Results:** At the point of drinking cessation, participants had recovered 58.7±12% (1445-2427mL, min-max) of body mass loss.

Variable	Pre-exer (mean±SD)	Post- rehy (mean±SD)	t	p
P <sub>osm</sub>	289.5±2.3	287.3±5.4	-1.11	0.300
U <sub>osm</sub>	870.7±2.3	763.7±193.9	-1.49	0.175
Thirst	36.2±19.1	25.0±18.2	-2.32	0.049
BM	83.0±12.6	81.8±12.0	-3.99	0.004
USG	1.022±0.004	1.029±0.004	5.82	0.0004
U <sub>color</sub>	3.4±0.7	6.3±1.1	6.83	0.0001
Fullness	3.1±0.9	2.1±1.1	-1.80	0.1080

**Conclusion:** the results suggest that voluntary drinking cessation coincided with a return to pre-exercise values of P<sub>osm</sub>, U<sub>osm</sub>, and fullness, even though rehydration was under 60%. Nevertheless, body weight, thirst perception, urine color and USG had not returned to pre-exercise values at the same point

2904 Board #2 June 2 1:00 PM - 3:00 PM  
**Dehydration Impairs Exercise Performance Independent of Thirst Perception: A Blinded Study**  
 J.D. Adams, Yasuki Sekuguchi, Adam Seal, Hyun-Gyu Suh, Cameron Sprong, Lisa Jansen, Stavros A. Kavouras, FACSM. University of Arkansas, Fayetteville, AR. (Sponsor: Stavros A. Kavouras, FACSM)  
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Hypohydration >2% body mass loss impairs endurance exercise performance, but the majority of previous studies are confounded by the lack of subject blinding. Previous blinding hydration studies have used intravenous infusion methods which bypass the oropharyngeal receptors and gastrointestinal tract which seems to play an important role on thirst, thermoregulation, and performance. **PURPOSE:** The purpose of this study was to examine the effect of hypohydration on exercise performance in a blinded manner using intra-gastric water delivery to manipulate hydration status, while thirst was matched between trials. **METHODS:** Seven male cyclists (weight: 71±8 kg, body fat: 14±6%, VO<sub>2peak</sub>: 59.4±6 ml/kg/min) exercised for 2 hours on a cycle ergometer at 55% VO<sub>2peak</sub> in a hot-dry environment (35 °C, 30% rh), with a nasogastric (NG) tube under euhydrated (EUH) and hypohydrated (HYP) conditions. In both trials, thirst was matched by drinking 25 mL every 5 min (300 mL/h). In the EUH sweat losses fully were replaced via the NG tube (calculated from the familiarization visit). Following the 2 hours of steady state, the cyclists completed a 5-kilometer cycling time trial at 4% grade. **RESULTS:** Following 2 hours of steady state cycling, post-exercise body mass loss for EUH trial was -0.1% compared to the HYP trial which was -2.2%. Thirst (28±11 vs. 42±12 mm) and stomach fullness (41±8 vs. 38±8 mm) did not

differ between EUH and HYP trials ( $P>0.05$ ). Cyclists completed the 5km time trial faster in the EUH trial compared to the HYP trial ( $777\pm 47$  vs.  $822\pm 55$  sec,  $P<0.05$ ), while producing higher power output ( $295\pm 29$  vs.  $270\pm 26$  W,  $P<0.05$ ). During the 5 km time trial, core temperature was higher in the HYP trial ( $39.2\pm 0.3$  °C) compared to the EUH trial ( $38.8\pm 0.2$  °C;  $P>0.05$ ). **CONCLUSIONS:** These data indicated that hypohydration decreased cycling performance and impaired thermoregulation in the absence of thirst, while the subjects were unaware of their hydration status.

2905 Board #3 June 2 1:00 PM - 3:00 PM  
**Thirst Modulates Cycling Performance in the Heat in Dehydrated Males**  
 Yasuki Sekiguchi<sup>1</sup>, J.D Adams<sup>2</sup>, Adam Seal<sup>2</sup>, Hyun-Gyu Suh<sup>2</sup>, Cameron Sprong<sup>2</sup>, Lisa Jansen<sup>2</sup>, Stavros A. Kavouras, FACSM<sup>2</sup>.  
<sup>1</sup>University of Connecticut, Storrs, CT. <sup>2</sup>University of Arkansas, Fayetteville, AR.  
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 (No relationships reported)

It has been suggested that thirst can influence exercise performance independently of hydration.

**PURPOSE:** Therefore, the purpose of this study was to examine the effect of thirst on exercise performance during cycling exercise in the heat in dehydrated subjects. **METHODS:** Six male cyclists (weight:  $71\pm 8$  kg, body fat:  $14\pm 6\%$ ,  $VO_{2peak}$ :  $59.4\pm 6$  ml/kg/min) exercised for 2 hours on a cycle ergometer at 55%  $VO_{2peak}$ , in a hot-dry environment ( $35$  °C,  $30\%$  rh), while wearing a nasogastric tube. Two experimental trials were performed: a) Dehydration without thirst (DEH-NT) which participants drank 25 mL every 5 min ( $300$  mL/h) with no infusion in nasogastric tube, and b) Dehydration with thirst (DEH-T) which participants were infused with 25 mL every 5 min via nasogastric tube but without drinking. Following the 2 hours of steady state, the cyclists completed a 5-kilometer cycling time trial at 4% grade. During the study, cyclists were unaware of the trial that were participating, the amount of water infused via the nasogastric tube and could not get any feedback regarding their cycling performance or their heart rate. **RESULTS:** Following 2 hours of steady state cycling, post-exercise body mass loss for the DEH-NT trial was  $-2.2\pm 0.4\%$  compared to the DEH-T trial which was  $-2.8\pm 0.3\%$ . Thirst ( $42\pm 12$  mm vs.  $61\pm 15$  mm;  $P=0.007$ ) and stomach fullness ( $35\pm 8$  mm vs.  $54\pm 10$  mm;  $P=0.007$ ) were both significantly different between DEH-NT and DEH-T trials. Finishing time in the 5-km time trial was faster in the DEH-NT trial ( $784\pm 35$  s) compared to the DEH-T trial ( $795\pm 47$  s), however, two out of six participants in the DEH-T trial felt exhausted and could not even start the 5 K, time trial following 2 hours of steady state cycling. **CONCLUSION:** The data suggested that thirst had detrimental effect on cycling performance independent of hydration.

2906 Board #4 June 2 1:00 PM - 3:00 PM  
**Effects of Dose Timing on Fluid Retention during Sodium-Aided Hyperhydration Protocols**  
 David Morris<sup>1</sup>, Shelby Greene<sup>1</sup>, Elizaveta Roslanova<sup>2</sup>. <sup>1</sup>University of Texas, Odessa, TX. <sup>2</sup>University of Texas, odessa, TX.  
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Co-consumption of sodium and water has been shown to be superior in promoting hyperhydration compared to consumption of an equal amount of water alone. Most sodium-aided hyperhydration studies have provided subjects with a bolus of fluid followed by a urine collection period. However the effect of providing equal amounts of fluid in a single vs. multiple doses over time on fluid retention has not been systematically studied. **PURPOSE:** To compare the effects of different dosing strategies on urine excretion levels following the consumption of consistent amounts of sodium and water. **METHODS:** Urine excretion was measured during three separate 2-hr hyperhydration protocols in 10 well hydrated male subjects ( $23\pm 3$  yr,  $176.1\pm 10.1$  cm,  $82.2\pm 19.4$  kg) who were free from known renal, digestive, and cardiovascular disease. Each protocol began with a complete bladder void and assessment of urine specific gravity (USG). Subjects then consumed 20 mL  $H_2O \cdot kg^{-1}$  and 110 mg  $NaCl \cdot kg^{-1}$  in three different dosing strategies: the entire dose was consumed at the beginning of the period (1X),  $\frac{1}{2}$  of the dose was consumed at the beginning and  $\frac{1}{2}$  consumed after 60 min (2X), and  $\frac{1}{3}$  of the dose was consumed at the beginning and  $\frac{1}{3}$  was consumed after 45 and 90 min (3X). Protocols were administered in a randomized, crossover fashion. Total urine excretions (TUE) during the 2 hr collection periods were expressed as a percent of the  $H_2O$  consumed. USG and TUE were compared using repeated-measures ANOVA and Sidak *post hoc* analyses. **RESULTS:** USGs were  $1.006\pm 0.004$  (1X),  $1.007\pm 0.003$  (2X), and  $1.008\pm 0.005$  (3X) ( $P=0.20-0.78$ ) indicating that subjects were well and similarly hydrated for each trial. TUE expressed as a percentage of  $H_2O$  consumed were  $76\pm 15\%$  (1X),  $68\pm 12\%$  (2X) and  $55\pm 15\%$  (3X). No significant difference in TUE was detected between 1X and 2X ( $P=0.25$ ) but significant differences were observed between 1X and 3X ( $P=0.02$ ) and 2X and 3X ( $P=0.01$ ). **CONCLUSION:** The data suggest that

hyperhydration is better achieved when water and sodium are consumed in three equal doses over 90 min when compared to consuming an equal amount of a sodium and water dose in a single bolus or in two equal doses over a 60 min period.

2907 Board #5 June 2 1:00 PM - 3:00 PM  
**Time-course Of Diuresis During Sodium-aided Hyperhydration Protocols With And Without Caffeine**  
 Elizaveta Roslanova, David M. Morris. University of Texas, Odessa, TX. (Sponsor: Alan Utter, FACSM)  
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 (No relationships reported)

When used alone, both caffeine and sodium-aided hyperhydration (SAH) can be ergogenic. Caffeine, when used in conjunction with SAH, promotes diuresis, but hyperhydration is still achieved, albeit at lower levels. Caffeine has been shown to be ergogenic when taken as little as 5 min, or as much as 6 hr prior to the start of exercise. Thus, determining the temporal aspects of caffeine induced diuresis when used in conjunction with SAH may lead to superior pre-exercise nutritional strategies. **PURPOSE:** To investigate the time-course of caffeine-induced diuresis during a 90 min SAH protocol. **METHODS:** Subjects were 15 males ( $21\pm 2$  yr,  $176\pm 6$  cm,  $80.2\pm 10.1$  kg) free from known renal, digestive, and cardiovascular disease. Each underwent 2 hyperhydration strategies in a randomized, double-blind fashion. Both protocols began with a complete bladder void and measurement of urine specific gravity (USG) followed immediately by ingestion of a bolus of 20 mL  $H_2O \cdot kg^{-1}$  combined with either 110 mg  $NaCl \cdot kg^{-1}$  (Na) or 5 mg caffeine  $\cdot kg^{-1}$  + 110 mg  $NaCl \cdot kg^{-1}$  (CafNa). Subjects then rested quietly for 90 min, performing a measured bladder void every 15 min. Urine excretions were expressed as a percentage of the total fluid consumed during each of the hyperhydration protocols. USG and total urine excreted (TUE) during the trials were compared using paired t-tests. Urine excretion (UE) for each of the 15 min collection periods for the two conditions were compared using a two-way repeated measures ANOVA with Sidak *post hoc* analyses. Levels of significance were set *a priori* at  $P<0.05$ . **RESULTS:** USGs were  $1.007\pm 0.003$  (Na) and  $1.005\pm 0.004$  (NaCaf) ( $P=0.34$ ). TUE were  $62.7\pm 13.2\%$  (Na) and  $78.7\pm 12.5\%$  (NaCaf) ( $P=0.001$ ). UE for the Na and NaCaf for each collection period were  $13.1\pm 7.5\%$ ,  $21.9\pm 12.9\%$  (15 min,  $P=0.001$ ),  $11.7\pm 3.3\%$ ,  $13.8\pm 3.8\%$  (30 min,  $P=0.30$ ),  $13.2\pm 2.8\%$ ,  $15.3\pm 2.4\%$  (45 min,  $P=0.32$ ),  $12.2\pm 4.1\%$ ,  $13.7\pm 5.1\%$  (60 min,  $P=0.46$ ),  $8.4\pm 6.3\%$ ,  $8.9\pm 4\%$  (75 min,  $P=0.80$ ) and  $4.7\pm 3.6\%$ ,  $4.4\pm 2.8\%$  (90 min  $P=0.87$ ). **CONCLUSIONS:** Results indicated that both protocols resulted in hyperhydration. TUE was significantly higher in NaCaf compared to Na; however, increased diuresis in NaCaf occurred only during the initial 15 min following consumption of the treatments.

F-12 Thematic Poster - Neuromechanics of Concussion  
 Friday, June 2, 2017, 1:00 PM - 3:00 PM  
 Room: 101

2908 Chair: Kevin Guskiewicz, FACSM. University of North Carolina, Chapel Hill, NC.  
 (No relationships reported)

2909 Board #1 June 2 1:00 PM - 3:00 PM  
**The Effect of Tackling Form on Head Accelerations Experienced by Youth Football Players**  
 Eric Schussler<sup>1</sup>, Richard Jagacinski<sup>2</sup>, John Buford<sup>2</sup>, Ajit Chaudhari, FACSM<sup>2</sup>, Susan White<sup>2</sup>, James Onate<sup>2</sup>. <sup>1</sup>Old Dominion University, Norfolk, VA. <sup>2</sup>The Ohio State University, Columbus, OH.  
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A head-up tackling style has been recommended to decrease head contact experienced during tackling. Specific performance metrics have been set to describe and instruct this tackling style including: extended neck position, vertical trunk, head across the front of the target, short steps, and low center of gravity. However, limited information exists regarding the effectiveness of the components of this tackling style on the head accelerations experienced by youth tacklers. **PURPOSE:** Determine the effect of components of a head up, tackling style on head accelerations. **METHODS:** Youth football players ages 9-13 ( $11.8\pm 0.8$  age,  $2.5\pm 2$  years of experience) were fitted with the xPatch monitoring system (X2 Biosystems, Seattle WA) and tackled a weighted dummy in a laboratory setting. Out of 470 tackles the xPatch system recorded 231 tackles with a peak head acceleration over 6g. Motion data during these tackles were analyzed for cervical angle, trunk angle, pelvic height, step length, and head

and pelvic velocity. Correlational analyses were performed between each movement variable and peak linear acceleration (PLA), peak rotational acceleration (PRA) and Head Impact Criterion over 15ms (HIC15) measures from the xPatch. **RESULTS:** Significant correlations were found between: shoulder extension and PLA ( $r=-.141$ ,  $r^2=.020$ ,  $p=.033$ ), trunk angle and PLA ( $r=.224$ ,  $r^2=.050$ ,  $p=.001$ ), trunk angle and PRA ( $r=.202$ ,  $r^2=.040$ ,  $p=.002$ ), trunk angle and HIC15 ( $r=.156$ ,  $r^2=.023$ ,  $p=.018$ ), step length and PLA ( $r=.138$ ,  $r^2=.019$ ,  $p=.037$ ) and step length and HIC15 ( $r=.131$ ,  $r^2=.018$ ,  $p=.048$ ). **CONCLUSIONS:** Despite significant correlations between measures of head acceleration and shoulder extension, trunk angle and step length the linear relationship between these values appears clinically negligible. The low strength of these relationships indicate these performance variables may not be responsible for the amount of head acceleration in low speed tackles. Additional analysis on this data should be completed to identify non-linear relationships and identify the interdependence of these variables. Measurements of live tackles during games and identification of other biomechanical parameters best correlated with head acceleration should also be determined, which could lead to more specific and effective tackling instruction.

2910 Board #2 June 2 1:00 PM - 3:00 PM  
**Isometric Cervical Muscle Strength Does Not Affect Head Impact Kinematics in High School Boys' Lacrosse**  
 Patricia Kelshaw<sup>1</sup>, Nelson Cortes<sup>1</sup>, Amanda Caswell<sup>1</sup>, Andrew Lincoln<sup>2</sup>, Shane Caswell<sup>1</sup>. <sup>1</sup>George Mason University, Manassas, VA. <sup>2</sup>MedStar Sports Medicine, Baltimore, MD.  
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Male high school lacrosse has the second highest incidence of concussion in high school sports. Limited research has identified modifiable risk factors that may reduce head impact kinematics. Cervical muscle strength is a proposed modifiable risk factor for head impact kinematics.

**PURPOSE:** To assess the effects of isometric cervical muscle strength (ICMS) on head impact kinematics in high school boys' lacrosse. **METHODS:** Thirteen male high school varsity lacrosse players volunteered for this study (age =  $16.5 \pm 1.3$  years, height =  $1.76 \pm 0.1$  m, mass =  $69.9 \pm 10.6$  kg). ICMS was measured for forward flexion, extension, and bilateral flexion. Data were collected for neck circumference, head circumference, and neck length. Participants' helmets were instrumented with an accelerometer for an entire season of game play. Video of all game play was captured and time synchronized with accelerometer data. All ICMS measures were normalized to the participants' body mass. Normalized ICMS tertiles were calculated and compared to impact kinematic data using a MANOVA. The relationship of neck anthropometric data and ICMS was investigated using a Pearson's correlation. An alpha level 0.05 was used for all analyses.

**RESULTS:** 12 games with 367 confirmed impacts (linear acceleration =  $54 \pm 36$  g, rotational velocity =  $1362 \pm 1258$  °/s) were recorded during the 2015 season. Neck circumference showed a positive moderate to strong relationship with ICMS in extension ( $r=.63$ ,  $p=.02$ ). No significant difference existed between ICMS tertiles for linear acceleration and rotational velocity ( $p>0.05$ ).

**CONCLUSIONS:** Our findings contradict previous research that identified ICMS as a modifiable risk factor for mitigating head impact kinematics. Results suggest that cervical muscle strengthening programs for the reduction of head impact kinematics are not indicated at this time. However, our sample size was small and cervical muscle strengthening may have other potential benefits. Therefore, cervical muscle strengthening programs and potentially modifiable risk factors for reducing head impact kinematics should be further investigated. Supported by the US Lacrosse Sports Science and Safety Committee.

2911 Board #3 June 2 1:00 PM - 3:00 PM  
**Head Impact Density A Better Estimator Of Concussion Than Threshold**  
 Steven P. Broglio, FACSM<sup>1</sup>, Andrew Lapointe<sup>1</sup>, Kathryn O'Connor<sup>1</sup>, Michael McCrea<sup>2</sup>. <sup>1</sup>University of Michigan, Ann Arbor, MI. <sup>2</sup>Medical College of Wisconsin, Milwaukee, WI.  
 (No relationships reported)

**PURPOSE:** Researchers have sought to identify a single or set of biomechanical variables that can accurately identify a concussive impact *in vivo*. The majority of this work has focused on the final impact prior to injury, failing to account for the influence of prior head impacts over time. This investigation sought to evaluate the relationship between both number and magnitude of head impacts over time in relation to concussion risk. **METHODS:** As part of an ongoing investigation of head impact mechanics, concussions in 29 high school football athletes ( $16.2 \pm 0.9$  years,  $180.4 \pm 5.9$  cm,  $83.5 \pm 12.5$  kg, and  $0.8 \pm 1.2$  prior concussions) were captured between 2007 and 2014. Matched control athletes ( $n=29$ ,  $16.2 \pm 0.7$  years,  $179.9 \pm 9.0$  cm,  $94.0 \pm 12.1$  kg, and  $0.4 \pm 1.2$  prior concussions) were selected based on similar final impact linear and rotational acceleration and the prior number of impacts in the season. Impact

magnitude occurring in the 24 hours prior to injury was evaluated using multivariate analyses of variance between groups. Impact counts were evaluated using visual inspection for the 24 hours prior to injury and independent samples *t*-tests in the final three hours. **RESULTS:** In the 24 hours prior to injury, there was no difference between groups in impact number, nor were there differences in cumulative linear or rotational acceleration magnitudes ( $p>0.05$ ). Impact Density (ie impact magnitude divided by time from previous impact) was significantly greater for linear ( $p=0.01$ ) and rotational ( $p=0.04$ ) acceleration among the concussed athletes. **CONCLUSION:** This investigation is the first to account for both impact magnitude and time from previous impact in a concussion estimation model. The findings suggest that concussion tolerance may not be solely dependent on impact magnitude, but also influenced by time. That is, each impact may lower the concussion threshold, but the biological drive to return to homeostasis allows for recovery given enough time before the next impact. This investigation was funded by *The National Institutes of Health: National Institute of Neurological Disorders and Stroke* (1R15NS081691-01)

2912 Board #4 June 2 1:00 PM - 3:00 PM  
**Concussion History And Kinematics Of Dynamic Balance In Division I Athletes: A Pilot Study**  
 Moira K. Pryhoda, Jenna Powell, Hammam Belgasem, Connor Landusky, Kevin B. Shelburne, Ann-Charlotte Granholm-Bentley, Bradley S. Davidson. *University of Denver, Denver, CO.*  
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A concussion is one of the most complex injuries in sports and can have potentially catastrophic results if not treated correctly. The central nervous system (CNS) integrates visual, proprioceptive, and vestibular sensory information to maintain balance during all movements. Ample clinical evidence exists that a concussion disrupts normal function of the CNS and results in postural instability. However, the long-term effects of concussion on balance control, particularly during dynamic functional movements, are not clear. **PURPOSE:** To determine the effects of concussion history on the kinematics of athletes performing dynamic balance tasks on dynamic balance on athletes. **METHODS:** Division I athletes without ( $n=5$ ;  $20.0 \pm 1.0$  yrs) and with a history of concussion ( $n=5$ ;  $19.4 \pm 0.9$  yrs  $1.5 \pm 1.2$  yrs post injury) performed dynamic balance tasks including gait, gait while stepping over an obstacle, get up and go (GUG), and GUG with a dual task. Speed was recorded for each task, and straightness of trajectory was calculated for normal gait and stepping over an obstacle as a root mean square (RMS) of the mediolateral deviation of the pelvis trajectory from a straight line. Cohen's *d* effect sizes between groups were bootstrapped given the small sample size. Effect sizes greater than 0.8 were considered large, 0.5-0.8 moderate, and less than 0.5 as no effect. **RESULTS:** Athletes with history of concussion performed the dual task GUG 1.7 m/s slower than the control (large effect size:  $d=0.90$ ). In addition, those with history of concussion performed normal gait with an RMS deviation of 30.9 cm compared to 25.1 cm in control (mod effect size:  $d=0.66$ ) when instructed to maintain a straight trajectory. No effect of concussion history occurred for normal gait speed, speed of stepping over an obstacle, speed of GUG without dual task, or mediolateral deviation when stepping over an obstacle. **CONCLUSIONS:** Deficits in dynamic balance control during functional movements in Division I athletes were evident even as long as 1.5 years following concussion event. These data are part of a large prospective investigation (current enrollment:  $n=207$ ), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.

2913 Board #5 June 2 1:00 PM - 3:00 PM  
**The Relationship Between Post-Concussion Neurocognitive Performance and Postural Control**  
 Katelyn Grimes<sup>1</sup>, Emily Lasko<sup>1</sup>, Megan E. Mormile<sup>1</sup>, Brian J. Szekeley<sup>1</sup>, Barry A. Munkasy<sup>1</sup>, Douglas W. Powell<sup>2</sup>, Nicholas G. Murray<sup>1</sup>. <sup>1</sup>Georgia Southern University, Statesboro, GA. <sup>2</sup>University of Memphis, Memphis, TN.  
 (No relationships reported)

Executive function (EF) is characterized as an individual's ability to control complex cognition during non-routine tasks. While EF is comprised of several cognitive domains, the ability to maintain task goals and decision making, and to direct attention, known as working memory, is one of the critical components. If a task has sufficient cognitive load to tax working memory, individual's compromise speed for accuracy, known as speed accuracy trade-off (SAT). However, the effect of concussion on SAT, and the ability to perform a physical task has not been well studied. **PURPOSE:** To identify the relationship between neurocognitive and postural control deficits post-concussion. **METHODS:** 15 NCAA Division I athletes (11 male, 4 female;  $20.5 \pm 1.1$  yrs) with diagnosed concussions underwent computerized neurocognitive testing, and a postural control assessment battery within 24-48 hrs of injury. The postural control assessment consisted of 3 trials of eyes open (EO) and eyes closed (EC) quiet standing for 30 sec and the Wii Fit Soccer Heading Game (WFS). The WFS requires

participants to shift their weight in the appropriate medial-lateral direction to hit targets and avoid obstacles. As such, the WFS provides a sport relevant task while simultaneously exerting a cognitive load. Raw Center of Pressure (CoP) was collected using a force platform (1000Hz). From the raw CoP data 95% Confidence Ellipse (CE), along with Peak Excursion Velocity (PEV), and Sample Entropy (SampEn) in anteroposterior (AP) and mediolateral (ML) directions were calculated. **RESULTS:** The results of a Pearson's Product Correlation, indicate a negative relationship between verbal memory (VBMC) and EO PEV ML ( $r = -0.611$ ,  $p = .016$ ), and 95% Confidence Ellipse (CE) ( $r = -0.555$ ,  $p = 0.016$ ). There was a positive relationship ( $r = 0.778$ ,  $p = 0.001$ ) between impulse control and EO PEV AP. During WFS there was a positive relationship between PEV ML and VBMC ( $r = 0.532$ ,  $p = 0.041$ ), and visual motor speed ( $r = 0.532$ ,  $p = 0.041$ ) and CE ( $r = 0.531$ ,  $p = 0.042$ ). Finally, a negative relationship was observed found during the WFS between SampEn ML and Total Symptom Score ( $r = -0.582$ ,  $p = 0.023$ ). **CONCLUSIONS:** The results of the study suggest that participants did have a SAT, sacrificing postural stability for enhanced memory processing while attempting to accomplish an unfamiliar task.

2914 Board #6 June 2 1:00 PM - 3:00 PM  
**Gender Specific Differences In Knee Kinematics  
 Between Participants With And Without A Concussion  
 History**

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**PURPOSE:** To evaluate differences in knee kinematics during the impact phase between young adult participants with and without a concussion history.  
**METHODS:** 10 controls (6 males, 4 females) and 9 concussed (4 males, 5 females) between the ages of 18 and 26, capable of completing a jump cut motion. All participants were former high school athletes and right foot dominant. Concussed subjects were tested on average 3.3 years post-injury ( $SD = 0.65$  years). Measures of knee rotation were taken in the X, Y and Z orientation during single limb support of a cutting maneuver. All values are presented as the mean and standard error of the mean.  
**RESULTS:** An initial analysis of variance showed a significant group by gender interaction in peak right knee abduction/adduction [ $F = 82.0$ ,  $p < .01$ ] and peak internal/external rotation [ $F = 17.9$ ,  $p < .01$ ] between control and concussed groups. Accordingly, post-hoc tests were performed, adjusting for all pairwise comparisons using a Bonferroni correction. The aforementioned post-hoc tests revealed that males and females with a concussion history were differentially affected; with concussed males showing increased peak abduction (Controls:  $9.7 \pm 0.5$  degrees, Concussed:  $3.2 \pm 0.3$  degrees) and females showing increased peak adduction (Controls:  $5.6 \pm 0.3$  degrees, Concussed:  $7.2 \pm 0.5$  degrees). Concussed males showed an increase in peak internal rotation (Controls:  $3.1 \pm 0.3$  degrees, Concussed:  $5.5 \pm 0.3$  degrees) whereas concussed females showed a slight increase in peak external rotation of the knee (Controls:  $7.3 \pm 0.4$  degrees, Concussed:  $6.4 \pm 0.5$  degrees).  
**CONCLUSION:** Our findings, showing small but significant gender specific changes between groups, advise future researchers to use prudence when generalizing post-concussive kinematics across genders as they may not be equally affected. This may have implications for injury risk, however further work is needed, especially in the understudied female population. Collectively, these findings cautiously provide a possible biomechanical underpinning to support recent reports that individuals are at a much higher risk of lower body injuries post-concussion.

2915 Board #7 June 2 1:00 PM - 3:00 PM  
**Assessments Of Standing Balance In Division I  
 Athletes With History Of Concussion: A Pilot Study**

Jenna J. Powell, Moira K. Pryhoda, Hammam Belgasem, William Sanders, Kevin B. Shelburne, Ann-Charlotte Granholm-Bentley, Bradley S. Davidson. *University of Denver, Denver, CO.*  
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Concussion, an especially common injury in athletes, can result in notable balance dysfunction arising from disturbance of the somatosensory and vestibular neural networks. Although standing balance is known to be deficient in acute concussion, the rate at which postural control is recovered after symptoms have subsided is not well studied. Center of pressure (COP) can be utilized to quantify balance dysfunction arising from these neural impairments. Current NCAA concussion assessment includes the Balance Error Scoring System (BESS), which is arguably less sensitive than COP variations to detect long term effects.

**PURPOSE:** To assess measures of standing balance in athletes with recent history of concussion and non-concussed athlete controls.

**METHODS:** Division I athletes without ( $n = 5$ ;  $19.4 \pm 0.8$  yrs) and with a history of concussion ( $n = 5$ ;  $20.0 \pm 1.0$  yrs;  $1.5 \pm 1.3$  yrs post injury) performed the BESS tasks while standing on 2 force platforms. COP was recorded during the 4 bipedal BESS

conditions: eyes open versus closed, and hard surface versus memory foam. Average COP velocity and 95% confidence ellipse area were calculated. Trials were also scored per BESS clinical criteria. Cohen's d effect sizes between groups were bootstrapped given the small sample size.

**RESULTS:** COP velocity was 1.3 mm/s higher (moderate effect size:  $d = 0.62$ ) in the concussion group than controls during eyes closed, hard surface, while BESS score was 10 for all athletes in both conditions. The remaining variables indicated no deficits in the concussion group.

**CONCLUSIONS:** Differences between concussed and control groups in the eyes closed condition may suggest continuing low-grade vestibular impairment detectable when visual feedback is removed, even after clinical symptoms have resolved. Past work indicates changes in COP velocity are related to vestibular dysfunction. In addition, these data allude to a higher sensitivity of COP measures than clinical BESS scoring when assessing balance deficits, particularly these deficits are subtle. These data are part of a large prospective investigation (current enrollment:  $n = 207$ ), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.

2916 Board #8 June 2 1:00 PM - 3:00 PM  
**Postural and Gaze Stability Deficits Following  
 Concussion**

Nicholas G. Murray<sup>1</sup>, Brian Szekely<sup>1</sup>, Megan E. Mormile<sup>1</sup>, Peter Chrysosferidis<sup>1</sup>, Katelyn Grimes<sup>1</sup>, Barry A. Munkasy<sup>1</sup>, Douglas Powell<sup>2</sup>. <sup>1</sup>Georgia Southern University, Statesboro, GA. <sup>2</sup>University of Memphis, Memphis, TN.  
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Postural instability and visual system dysfunction are two of the highest reported signs immediately following a sport-related concussion. However, little research has examined both systems simultaneously using sensitive measurements techniques following concussion in the same sample. **PURPOSE:** To investigate and compare postural and gaze stability between a control group of healthy non-injured athletes (NORM) and a group of athletes with concussions (CONC) 24-48 hours post-injury. **METHODS:** 18 post-concussed NCAA Division I athletes ( $20 \pm 1.3$  years of age) and 18 matched athletes ( $19 \pm 0.9$  years of age) completed two trials of a sport-like antisaccade postural control task, the WiiFit Soccer Heading Game (WFS). During play, all participants were instructed to minimize gaze deviations away from a central fixed area, while simultaneously swaying in a medial-lateral direction to direct an on screen avatar to meet the demands of the game. Monocular raw ocular point of gaze coordinates (240Hz, Argus Science) and raw center of pressure (1000Hz, AMTI) data were collected simultaneously and further analyzed using a custom algorithm. Independent t-tests analyzed gaze Resultant Distance (RD), Prosaccade Errors (PE), Peak Horizontal Velocity (HV), and Vertical Horizontal Velocity (VV) along with center of pressure Root Mean Square (RMS) and Peak Velocity (PV) in the anteroposterior (AP) and mediolateral (ML) directions between groups. **RESULTS:** CONC had a significantly greater RD (CONC =  $6.98 \pm 0.5$  pixels, NORM =  $5.2 \pm 0.3$  pixels;  $p = .013$ ), PE (CONC =  $7.11 \pm 1.2$  errors, NORM =  $2.5 \pm 0.7$  errors;  $p = .040$ ), HV (CONC =  $2075 \pm 415.4$  pixels/s, NORM =  $1078 \pm 135.6$  pixels/s;  $p = .018$ ), and VV (CONC =  $2128 \pm 481$  pixels/s, NORM =  $979 \pm 144.6$  pixels/s;  $p = .044$ ) when compared to NORM. No significant differences were observed for RMS in the AP ( $p = .838$ ) and ML ( $p = .543$ ) directions and PV in the AP ( $p = .288$ ) and ML ( $p = .115$ ) directions between groups. **CONCLUSION:** These results suggest that CONC gaze travelled a greater distance and had less control of gaze in the horizontal and vertical directions during play of the WFS. Conversely, no postural deficits were present during play of the WFS. This could indicate that gaze instability is present even in the absence of postural instability following concussion when comparing CONC to NORM.

**F-13 Free Communication/Slide - Cardiovascular Assessment and Training Responses**

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
Room: 402

2917 **Chair:** Mark A. Sarzynski, FACSM. *University of South Carolina, Columbia, SC.*  
(No relationships reported)

2918 June 2 1:00 PM - 1:15 PM  
**Effect of Prolonged Endurance Training on Ambulatory Systolic Blood Pressure and Arterial Function**

Erin J. Howden<sup>1</sup>, Justin S. Lawley<sup>2</sup>, Mitchel Samels<sup>3</sup>, Dean Palmer<sup>3</sup>, Braden Everding<sup>3</sup>, Sheryl Livingston<sup>3</sup>, Satyam Sarma<sup>2</sup>, Benjamin D. Levine, FACSM<sup>2</sup>. <sup>1</sup>*Baker IDI Heart and Diabetes Institute, Melbourne, Australia.* <sup>2</sup>*UT Southwestern Medical Center, Dallas, TX.* <sup>3</sup>*Texas Health Presbyterian Dallas, Dallas, TX.* (Sponsor: Benjamin D Levine, FACSM)  
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Healthy, sedentary aging is associated with marked increased risk for developing (systolic) hypertension, which is partially driven by changes in arterial stiffness. In contrast, lifelong exercise training mitigates the effects of aging on arterial stiffness. **Purpose:** We compared the effects a prolonged, intensive supervised exercise training intervention to two-years of sedentary aging on arterial function and ambulatory BP. **Methods:** Sixty one healthy subjects (52.4±5.1 years, 46% male) were randomized to either non-exercise control (Con; n=27) or aerobic exercise training (ExT; n=34). A comprehensive assessment of arterial function including aortic PWV and indices derived from the central BP waveform, plus resting hemodynamics were performed at baseline (Pre), 10 months (Mid) and two-years (Post). Ambulatory blood pressure was measured at Pre and Post. **Results:** There was excellent adherence to the training intervention (89±9%) resulting in a 21% increase in VO<sub>2</sub> max, with no change in Con. Ambulatory systolic BP was significantly increased, while ambulatory and resting HR were significantly reduced in the ExT group (Table 1). In contrast to our hypothesis, large artery function (AIx75, time to reflected wave, aortic PWV) was not improved following exercise training. **Conclusion:** Despite improved exercise capacity and excellent training adherence, large artery function was not improved in the ExT group. Consequently, ambulatory systolic BP was significantly increased, partially due to the lack of change in stiffness and the increased stroke volume associated with training.  
Supported by NIH Grant R01 AG017479

**Table 1. Effect of two-years of supervised endurance training on hemodynamics and arterial function**

	Control			ExT		
	Pre	Mid	Post	Pre	Mid	Post
24 hr SBP, mmHg	123 ± 2	-	125 ± 2	120 ± 1	-	124 ± 2*
24 hr DBP, mmHg	74 ± 1	-	74 ± 2	72 ± 1	-	73 ± 2
24 hr HR, bpm	75 ± 2	-	77 ± 2	73 ± 2	-	68 ± 1*
Brachial SBP, mmHg	104 ± 2	106 ± 2	105 ± 2	104 ± 2	103 ± 2	104 ± 2
Brachial DBP, mmHg	67 ± 2	71 ± 1	68 ± 2	66 ± 1	67 ± 1	66 ± 1
HR, bpm	63.9 ± 1.6	63.1 ± 1.9	65.3 ± 1.8	65.4 ± 1.6	58.7 ± 1.6*	58.7 ± 1.8*
aPWV, m/sec	7.2 ± 2.4	7.6 ± 2.1	7.5 ± 2.1	7.1 ± 2.6	7.2 ± 1.9	7.0 ± 2.0
AIx HR75, %	16.6 ± 2.0	18.8 ± 1.7	19.0 ± 1.9	18.1 ± 1.7	18.4 ± 1.9	17.6 ± 16.8
T <sub>IR</sub> , ms	150.4 ± 13.2	147.6 ± 9.7	145.3 ± 9.5	151.9 ± 16.1	152.1 ± 16.2	146.8 ± 14

Values are mean ± SEM, \* P< 0.05 compared to Pre. SBP, systolic blood pressure; DBP diastolic blood pressure; HR, heart rate; bpm, beats per minutes; PWV, pulse wave velocity; AIxHR75, augmentation index heart rate corrected; T<sub>IR</sub>, time to reflected wave

2919 June 2 1:15 PM - 1:30 PM  
**Safety, Detection and Hemodynamic Effects of Acute Xenon Inhalation: Implications for Athletic Doping Practices**

Justin S. Lawley<sup>1</sup>, Gatterer Hannes<sup>2</sup>, Erin J. Howden<sup>1</sup>, Satyam Sarma<sup>1</sup>, Michinari Hieda<sup>1</sup>, Christopher Hearon Jr.<sup>1</sup>, Max Hendrix<sup>3</sup>, Thomas Piper<sup>4</sup>, Mario Thevis<sup>4</sup>, Benjamin D. Levine, FACSM<sup>1</sup>. <sup>1</sup>*Institute for Exercise and Environmental Medicine, Dallas, TX.* <sup>2</sup>*University Innsbruck, Innsbruck, Austria.* <sup>3</sup>*University of Texas Southwestern Medical Center, Dallas, TX.* <sup>4</sup>*German Sport University Cologne, Cologne, Germany.*  
(No relationships reported)

**PURPOSE:** Xenon is an inhalation anesthetic, which has the potential to increase plasma erythropoietin, red cell mass and thus endurance performance. This study aimed to describe the sedative effects, detection rates and cardiovascular responses of an open circuit breathing system to deliver increasing concentrations of Xenon. **METHODS:** On three occasions, participants breathed increasing concentrations of xenon (Xenon, 30% for 20 min; Xenon, 50% for 5 min; Xenon, 70% for 2 min and oxygen, 21% with balance Nitrogen) in a non-blinded design. Xenon inhalation has been completed in 6 (30%), 5 (50%) and 4 (70%) subjects to date. The level of sedation was monitored by a board certified anesthesiologist (Richmond Agitation and Sedation Scale (RASS)). Over 48 hours post administration, Xenon was measured in blood and urine by gas chromatography-mass spectrometry. All reported beat-by-beat hemodynamics were measured continuously by photoplethysmography (Nexfin; BMEYE, Netherlands) for 10 minutes prior to and throughout xenon administration. **RESULTS:** Xenon caused variable levels of sedation and restlessness between subjects (e.g. 50% xenon RAAS, -2, briefly awakens to voice to +2 frequent nonpurposeful movements), with the greatest symptoms occurring at 50 and 70%. Xenon was detected, albeit in trace amounts, up to 6 hours post xenon inhalation in blood (e.g. 30% 6 hours post, 2.2±2.7 nmol/mL) and urine (e.g. 30% 1.5±0.82 nmol/mL) in all subjects. Over the first minute, xenon cause a substantial reduction in total peripheral resistance (Δ2.7±0.49,mmHg·L·min), which caused a reflex increase in cardiac output (Δ2.7±0.54, L·min). By the end of xenon inhalation, hypertension was observed after all three dosages (MAP: 30%, Δ7±11; 50% Δ12±2; 70%, Δ19±5 mmHg). **CONCLUSIONS:** We show that three different conceivable dosages of xenon inhalation cause a level of sedation incompatible with self-operation of breathing apparatus and a persistent hypertensive state. Dispute begin acute (<5 mins), high dosages (50 and 70%) of xenon caused near anesthesia and thus could present a life threatening condition in the absence of an anesthesiologist. Xenon can be reliability detected in blood and urine up to 6 hours post dosing. These studies were supported in part by funding from the Partnership for Clean Competition Research Collaborative.

2920 June 2 1:30 PM - 1:45 PM  
**Prevalence Of Vo2max Low Response Across Nine Aerobic Exercise Interventions**

Leanna M. Ross<sup>1</sup>, Timothy S. Church, FACSM<sup>2</sup>, Steven N. Blair, FACSM<sup>1</sup>, J. Larry Durstine, FACSM<sup>1</sup>, James M. Hagberg, FACSM<sup>3</sup>, Corby K. Martin<sup>4</sup>, Tuomo Rankinen, FACSM<sup>4</sup>, Robert Ross, FACSM<sup>5</sup>, Claude Bouchard, FACSM<sup>4</sup>, Mark A. Sarzynski, FACSM<sup>1</sup>. <sup>1</sup>*University of South Carolina, Columbia, SC.* <sup>2</sup>*ACAP Health, Dallas, TX.* <sup>3</sup>*University of Maryland, College Park, MD.* <sup>4</sup>*Pennington Biomedical Research Center, Baton Rouge, LA.* <sup>5</sup>*Queen's University, Kingston, ON, Canada.*  
(No relationships reported)

There is considerable inter-individual variation in the ability to improve VO<sub>2max</sub> in response to regular exercise. Thus, identifying individuals who do not experience clinically significant gains in cardiorespiratory fitness with aerobic training (i.e., VO<sub>2max</sub> low response) is of interest. **PURPOSE:** To assess the prevalence of VO<sub>2max</sub> low response across nine large aerobic exercise interventions. **METHODS:** The prevalence of VO<sub>2max</sub> low response was examined in 1,432 previously sedentary adults (461 males, 971 females) who completed one of nine exercise programs from five exercise training studies: DREW (n=361), E-MECHANIC (n=117), Energy Flux (n=65), GERS (n=171), and HERITAGE (n=715). The training programs ranged from doses of 4-35 kcal·kg<sup>-1</sup>·week<sup>-1</sup> (KKW); intensities of 50-85% VO<sub>2max</sub>; and durations of 20-24 weeks. Baseline and post-training VO<sub>2max</sub> was assessed via maximal exercise testing. VO<sub>2max</sub> low response was defined in both absolute (gain <120 ml/min from baseline value) and relative (gain < 5% of study-specific baseline average VO<sub>2max</sub>) terms based on technical error and coefficient of variation values derived from three repeatability studies in HERITAGE. **RESULTS:** All studies showed significant mean increases in VO<sub>2max</sub> with training. Using the above definitions, 32.6% (absolute) and 21.3% (relative) of the total sample

was considered low responsive for  $VO_{2max}$ . The distribution of low response across the individual exercise programs is shown in Table 1. Prevalence of low response ranged from 7.4% (HERITAGE) to 84% (DREW 4 KKW).

**CONCLUSION:** Our study found a high prevalence of  $VO_{2max}$  low response across five diverse exercise training studies, which differed based on how low response was defined. These results underscore the need for further investigation to refine the identification of  $VO_{2max}$  low response to enhance future exercise program development.

2921 June 2 1:45 PM - 2:00 PM

### Skeletal Muscle Mitochondrial and Whole-Body Metabolic Performance After An Ultra Endurance Mountain Bike Race

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(No relationships reported)

At the annual Colorado Trail Race (CTR), participants cycled for up to 24 hours per day to complete 70,000 feet of elevation gain over 500 miles between the altitudes of 5,500 to 13,200 feet. **PURPOSE:** To characterize skeletal muscle mitochondrial and whole-body metabolic performance after prolonged stress (exercise, sleep deprivation, hypoxia). **METHODS:** One race participant (43yr male;  $VO_{2Max}$ , 58 ml/kg/min; BMI, 21 kg/m<sup>2</sup>) was studied before and after completing >360 miles of the CTR and a normal activity period (control) separated by 45 days. Each visit the participant arrived fasted overnight for a skeletal muscle biopsy followed by an oral glucose (75g) tolerance test (OGTT). High-resolution respirometry was performed on permeabilized skeletal muscle fibers using 3 different substrate-uncoupler-inhibitor-titration (SUIT) protocols. SUIT1 examined maximal fatty acid-supported respiration with sequential addition of complex I- and complex II-linked carbohydrate substrates and FCCP to determine substrate-specific coupled oxidative phosphorylation (OXPHOS) and uncoupled electron transport system (ETS) capacity. SUIT2 was designed to investigate carbohydrate-supported respiration without fat supply during maximal OXPHOS and ETS capacity. SUIT3 used an ADP titration to determine mitochondrial ADP sensitivity followed by maximal OXPHOS and ETS flux. **RESULTS:** In each SUIT protocol, ETS capacity was >200 pmol/s/mg tissue which are amongst the highest values published for human muscle. Despite the high ETS capacity, carbohydrate linked OXPHOS and ETS capacity (SUIT2) was severely decreased after the CTR. However, the decrease in respiration appeared to be attenuated during fatty acid-linked respiration (SUIT1). Conversely, ADP sensitivity was increased after the CTR and was accompanied by a lower glucose and insulin area under the curve during the OGTT. **CONCLUSIONS:** This study provides a comprehensive characterization of skeletal muscle mitochondrial respiration after an ultra endurance event. The highly trained participant presented with preeminent mitochondrial capacity but was unable to maintain maximal mitochondrial respiration when faced with the extreme stress of an ultra endurance mountain bike race.

2922 June 2 2:00 PM - 2:15 PM

### Monitoring Cardiovascular, Hepatic, Renal, And Hematological Markers Of Health In Collegiate Soccer Players

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(No relationships reported)

Clinical biomarkers of general health status may indicate health impacts of overtraining in athletes attempting to optimize performance using long-term tracking tools.

**PURPOSE:** To test the hypothesis that biomarkers of cardiovascular, liver, kidney and hematological function reflect athlete health and performance over the course of a collegiate soccer season.

**METHODS:** 20 NCAA Division I male soccer players (mean±SD; height, 181±6cm; body mass, 77.9±6.2kg; BF%, 11.9±2.4%;  $VO_{2max}$ , 52.9±6.1 mL·kg<sup>-1</sup>·min<sup>-1</sup>) provided blood samples for a test panel of 53 biomarkers at 5 time points: before preseason (PS), week 1 (W1), week 4 (W4), week 8 (W8), and week 12 (W12). Significant changes were assessed via repeated measures ANOVA and post hoc testing ( $p \leq 0.05$ ).

**RESULTS:** Markers of potential organ damage markers aspartate amino transferase (AST) (U·L<sup>-1</sup>) and creatinine (mg·dL<sup>-1</sup>) were elevated at W1 (AST, creatinine; 29±11, 1.11±0.13), W8 (31±11, 1.11±0.11), and W12 (28±11, 1.15±0.13) vs. PS (18±4, 1.02±0.13, all  $p < 0.05$ ). Alanine amino transferase (ALT) (U·L<sup>-1</sup>) levels were also significantly higher at W8 (24±8) and W12 (24±9) vs. PS (18±5, both  $p < 0.05$ ). Hematocrit (%) measures were significantly reduced at W1 (45.5±2.3,  $p = 0.015$ ) vs.

PS (47.2±2.8); W4 (46.4±2.6) and W12 (46.4±3.1) values suggest that values returned to PS levels ( $p > 0.05$ ) later in season. Additional markers of anemia, mean corpuscular volume, mean corpuscular hemoglobin concentration, red cell distribution width were reduced at W12 vs. all time points (all  $p < 0.007$ ). We observed reductions in cardiovascular/metabolic health markers (mg·dL<sup>-1</sup>) LDL, LDL:HDL (no unit), non-HDL, direct LDL, and Apolipoprotein B at W1 (77±20, 3.2±0.5, 106±24, 96±25, and 71±17) than at PS (87±22, 2.8±0.5, 93±22, 81±22, and 64±15, all  $p < 0.017$ ). HDL (mg·dL<sup>-1</sup>) was significantly greater at W4 (56±10), W8 (55±10), and W12 (58±11) than at PS (50±8, all  $p < 0.05$ ). Total cholesterol (mg·dL<sup>-1</sup>) was significantly elevated at W8 (163±28,  $p = 0.012$ ) and W12 (168±31,  $p = 0.007$ ) vs. W1 (145±26).

**CONCLUSIONS:** Our panel detected a decrease in HCT beginning at W1, but improved cardiovascular/metabolic health throughout the season. Ongoing analysis aims to optimize this general health panel for practical use by correlational analysis to performance data.

2923 June 2 2:15 PM - 2:30 PM

### Stretching Combined With Tens Or Self-massage Has Differential Effects On Ankle Flexibility

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(No relationships reported)

Many studies evaluating the effect of stretching conclude that gains in flexibility are primarily due to improved stretch tolerance (discomfort). Under this rationale, use of pain reduction therapies while stretching should provide greater improvements in flexibility than stretching alone. Transcutaneous electrical nerve stimulation (TENS) is a modality commonly used to mitigate pain. Self-massage with a foam roller, which may modulate the mechanical properties of connective tissues, has been shown to improve flexibility.

**Purpose:** To compare the influence of TENS and self-massage on ankle joint flexibility and force capacity of the plantar flexor muscles after a stretching intervention.

**Methods:** 20 healthy young adults (10M, 10F, mean (SD) age 25 (3) y) underwent 3 sessions of ankle plantar flexor stretching: stretching alone (SS), stretching with concurrent application of TENS (TS), and stretching after self-massage using yoga therapy balls (BS). Each visit was separated by one week. All subjects performed SS at the first visit; the remaining 2 visits were counterbalanced. At every visit, subjects performed isometric maximum voluntary contractions (MVCs) for the plantar flexors before and after the intervention. Stretching involved three 30-s standing calf stretches, separated by 30-s rest. TENS was applied at a comfortable current without muscle contraction for 1-min prior to, and for the duration of stretching. Massage with yoga balls was performed for 60-s immediately prior to each of the 3 stretches. Ankle dorsiflexion range of motion (ROM) was assessed before, immediately after, and at 1, 5, 10, and 15 min after the intervention.

**Results:** All 3 interventions significantly increased ankle dorsiflexion ROM (all  $p = 0.00$ ). The mean (SD) change in ROM was 13 (9)%, 9 (7)%, and 25 (17)% for SS, TS, and BS, respectively. The mean (SD) change in ankle torque was -1(13)%, -3 (10)%, and 16 (11)% for SS, TS, and BS, respectively. In contrast to TENS (TS), the use of yoga therapy balls significantly increased ROM and MVC torque (both  $p = 0.00$ , effect size 0.40, 0.58 for ROM, torque).

**Conclusion:** The addition of TENS to a stretch intervention did not improve ankle joint range of motion or alter MVC force. In contrast, self-massage with yoga therapy balls prior to stretching significantly improved range of motion and MVC force.

2924 June 2 2:30 PM - 2:45 PM

### Lower Limb POWER Training to Enhance Locomotor and Muscular Function Poststroke

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(No relationships reported)

Training to improve muscle power generation has functional benefits beyond strength training in an aging population. Individuals following stroke show pronounced deficits in muscle power generation as well as function (i.e. gait speed), though data on specific adaptations following muscle power training are not available. **PURPOSE:** The purpose of this analysis was to determine the effects of the Poststroke Optimization of Walking Using Explosive Resistance (POWER) training on the paretic limb's contribution to walking. **METHODS:** Twenty individuals (13 male; 51 yrs; 36 mos poststroke) with chronic poststroke hemiparesis participated in this study. Subjects completed 24 training sessions that included a series of progressive, intensive leg press and jump training exercises, sit-to-stands, step-ups, and calf raises. Subjects also performed progressive overground fast walking to emphasize task-specific lower extremity power generation. Kinetic data was collected via a split-belt instrumented treadmill during three walking trials at self-selected (SSWS) and fastest comfortable walking speeds (FCWS). Using the anterior-posterior ground reaction forces (A-P

GRFs), the percentage of total propulsion generated by the paretic limb was calculated by dividing the propulsive impulse of the paretic leg by the sum of the paretic and nonparetic propulsive impulses. Other outcomes included overground SSWS and FCWS, maximum voluntary isometric contractions (MVIC), and peak isotonic power of the knee extensors. Subjects underwent pre-testing, post-testing, and 12-week follow-up testing. One-way repeated measures ANOVAs were used to determine main effects of time. **RESULTS:** Significant effects for time were observed for SSWS ( $p<0.01$ ), FCWS ( $p=0.01$ ), and nonparetic knee extensor MVIC ( $p=0.05$ ) and power ( $p<0.01$ ). Although peak A-P GRFs of the paretic limb significantly increased following training ( $p=0.01$ ), no changes were observed in paretic propulsion. **CONCLUSION:** Subjects improved gait speed, but those improvements were not accompanied by enhanced symmetry following POWER training. Future data will look into other potential underlying kinetic and kinematic mechanisms contributing to the significant and clinically meaningful improvements in gait speed ( $>0.16$  m/s) observed in this cohort.

2925 June 2 2:45 PM - 3:00 PM

**Acute Effects of Speed-Dependent Interval Training Versus Continuous Training on Post-Stroke Locomotor Function**

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(No relationships reported)

The benefits of interval training (IT) compared to continuous training (CT) have been shown on a variety of functional and health-related outcomes. To date, the feasibility of IT has been demonstrated in individuals following stroke, though investigations of its effectiveness are still lacking. **Purpose:** To compare acute changes in locomotor function following single bouts of continuous (CT) and interval (IT) treadmill training, matched for total work, in ambulatory individuals with chronic stroke. **Methods:** Participants completed 20 minute sessions of CT and IT treadmill exercise separated by a minimum of 48 hours. Overground self-selected walking speed (SSWS) was used for CT while IT involved a 1:1 ratio (1 min slow : 1 min fast walking) with the goal of fast walking at 150% of SSWS and slow walking at 50% of SSWS. If subjects could not achieve 150% SSWS then speed was reduced and slow walking speed was adjusted to ensure matched-work between conditions. Overground SSWS was assessed prior to, immediately following as well as 20, 40 and 60min post-training. Subjects also walked at self-selected speed on a split-belt, instrumented treadmill to collect ground-reaction force data at the same time points. **Results:** Six subjects completed both sessions. Average CT treadmill speed was 0.92 m/s; average IT speeds were 0.57 m/s (slow) and 1.26 m/s (fast). Immediate post-training increases in SSWS were realized following CT (+6%) but not IT (-2%). SSWS following CT remained 6% faster than pre-training SSWS over time. In contrast, IT showed a delayed increase in speed with 7% improvement in SSWS at 20min, 11% at 40min, and 6% at 60min. Improvements in peak paretic propulsive (Pp) force were realized immediately post-training for the CT condition (+10.3 N; +21%) and persisted over time (20min +24%, 40m +23%, 60m +19%). IT improved peak Pp force immediately post-training (+6.9 N; +14%) and remained elevated post-training (20m +18%, 40m +16%, 60m +11%). **Conclusion:** These preliminary results suggest single bouts of IT and CT treadmill walking appear to elicit acute increases in SSWS as well as propulsive forces in individuals following stroke. The potentially greater relative improvements following IT suggest its potential effectiveness over CT if changing walking function is the goal. Funding source NIH COBRE Stroke Study P20-GM109040

**F-14 Free Communication/Slide - Exercise and Chronic Disease**

Friday, June 2, 2017, 1:00 PM - 3:00 PM

Room: 401

2926 **Chair:** Matthew Harber, FACSM. *Ball State University, Muncie, IN.*

(No relationships reported)

2927 June 2 1:00 PM - 1:15 PM

**Exercise Training Improves Ventilatory Efficiency in Patients With Small Abdominal Aortic Aneurysm: A Randomized Controlled Study**

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(No relationships reported)

**PURPOSE:** To investigate the effects of exercise training on ventilatory efficiency and other physiological responses to submaximal exercise in subjects with small abdominal aortic aneurysm (AAA).

**METHODS:** Sixty five patients (72.3±7.0 yr) were randomized to exercise training (n=33) or usual care groups (n=32). Exercise subjects participated in a training program for 3 months. Cardiopulmonary exercise testing was performed before and after the study period and peak  $\dot{V}O_2$ , the ventilatory threshold (VT), the oxygen uptake efficiency slope (OUES) and the  $\dot{V}_E/\dot{V}O_2$  slope were identified. Baseline work rates at VT were matched to examine cardiopulmonary responses before and after training. ANOVA was used to assess time by group interactions.

**RESULTS:** Significant interactions indicating improvements in the exercise group were observed for time ( $p<0.01$ ),  $\dot{V}O_2$  ( $p<0.01$ ), and work rate ( $p<0.01$ ) at the VT. At peak effort, significant interactions were noted for time ( $p<0.01$ ) and work rate ( $p<0.01$ ), while borderline significance was noted for absolute ( $p=0.07$ ) and relative ( $p=0.04$ )  $\dot{V}O_2$ . Significant interactions were observed for the OUES both when using all exercise test data (Exercise: 2.03 to 2.16, and Usual care: 2.10 to 1.98;  $p$  for interaction =0.04) and when calculated up to the VT (Exercise: 2.07 to 2.23, and Usual care: 2.13 to 1.95;  $p$  for interaction <0.01). For the  $\dot{V}_E/\dot{V}O_2$  slope, significance was only noted when calculated up to the VT (Exercise: 30.4 to 29.5, and Usual care: 29.2 to 30.3;  $p$  for interaction=0.04). After training, heart rate (104.5 to 97.3 bpm),  $\dot{V}_E$  (34.2 to 32.0 L/min),  $\dot{V}CO_2$  (1013.6 to 910.6 ml/min) and respiratory exchange ratio (0.85 to 0.82) were significantly attenuated for the same baseline workrate in the exercise group (all  $p<0.01$ ), but no changes were observed in the usual care group.

**CONCLUSIONS:** Exercise training improves ventilatory efficiency in patients with small AAA. In addition, exercised patients exhibited less demanding cardiorespiratory responses to submaximal effort, with potential clinical significance for activities of daily living.

2928 June 2 1:15 PM - 1:30 PM

**Associations Between Perceptual and Ventilatory Responses to Exercise: Effect of Sympathetic Blockade**

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(No relationships reported)

Previous studies have shown that the first and second lactate threshold are associated with a rating of perceived exertion (RPE) of 11 and 14 on the Borg 6-20 RPE scale. However, it remains unclear how the RPE is associated with the ventilatory breakpoints and whether this relationship is altered by sympathetic blockade.

**Purpose:** To determine the association between the RPE and ventilatory breakpoints, and whether the relationship is altered by acute sympathetic blockade. **Methods:** The oxygen uptake ( $\dot{V}O_2$ ) at the ventilatory threshold (VT) and respiratory compensation point (RCP) were determined from a graded exercise test in eleven healthy participants (6 male, 26±5 y) under a  $\beta_2$  receptor antagonist and placebo. Treadmill speed increased by 2 km·h<sup>-1</sup> every two minutes until exhaustion. The  $\dot{V}O_2$  was measured continuously and RPE recorded in the final 10s of each min. Linear regression modelled the RPE: $\dot{V}O_2$  relationship and predicted the RPE associated with VT and RCP. The  $\dot{V}O_2$  associated with RPE 13 and 15 were also predicted and expressed relative to the VT and  $\dot{V}O_2$  peak. Paired samples t-tests assessed differences between conditions.

**Results:** The  $\dot{V}O_2$  at VT and peak exercise were significantly lower under  $\beta$ -blockade (32±3 vs 30±3 and 52±5 vs 49±7 mL·kg<sup>-1</sup>·min<sup>-1</sup>,  $p<0.05$ ), while the  $\dot{V}O_2$  at RCP

remained unchanged. The RPE associated with VT and RCP were  $13\pm 1$  and  $17\pm 1$ , respectively, and not significantly different during  $\beta$ -blockade ( $13\pm 1$  and  $18\pm 0.6$  respectively;  $p>0.05$ ). The  $\text{VO}_2$  associated with RPE 13 was significantly lower under  $\beta$ -blockade compared to control ( $28\pm 6$  vs  $32\pm 6$  mL·kg<sup>-1</sup>·min<sup>-1</sup>;  $p<0.05$ ). However, when expressed relative to VT ( $94\pm 15$  and  $99\pm 14\%$ ) and  $\text{VO}_{2\text{peak}}$  ( $58\pm 8$  and  $62\pm 10\%$ ) differences were no longer significant (all  $p>0.05$ ). For RPE 15, associated  $\text{VO}_2$  was significantly lower during  $\beta$ -blockade ( $35\pm 6$  vs  $39\pm 6$  mL·kg<sup>-1</sup>·min<sup>-1</sup>;  $p<0.05$ ), but no longer significant when expressed relative to VT ( $116\pm 13$  and  $120\pm 13\%$ ;  $p>0.05$ ) and  $\text{VO}_{2\text{peak}}$  ( $72\pm 6$  and  $75\pm 8\%$ ;  $p>0.05$ ). **Conclusion:** Despite changes in the VT and  $\text{VO}_{2\text{peak}}$  with  $\beta$ -blockade, the RPE associated with VT and RCP remain constant. Further, the exercise intensity associated with RPE 13 and 15 appear to scale in accordance with changes in VT and  $\text{VO}_{2\text{peak}}$ .

2929 June 2 1:30 PM - 1:45 PM

### Cardiorespiratory Fitness Versus Physical Activity as Predictors of All-Cause Mortality in Men

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(No relationships reported)

A limited number of studies have examined the interaction between cardiorespiratory fitness (CRF), physical activity (PA) and all cause-mortality.

**PURPOSE:** To assess the independent and combined associations of PA, CRF and all-cause mortality in 11,610 male veterans aged 20 to 89 (mean  $\pm$  SD,  $58.5 \pm 11.2$  years) who were referred for exercise testing at the Veterans Affairs Medical Center in Washington, DC, or Palo Alto, CA.

**METHODS:** CRF was assessed by a maximal exercise treadmill test and PA was measured by self-reported questionnaire obtained at the time of the exercise test. There were 2876 deaths during a mean ( $\pm$  SD) follow-up of 9.8 (5.9) years. Cox proportional hazard models were used to assess the independent associations between CRF, PA and mortality. To further explore the interaction between PA and CRF with mortality, we dichotomized the cohort into fit and unfit groups, defined by a CRF threshold of 7 METS. Within the fit and unfit groups, active individuals (meeting 150 minutes of moderate or higher intensity PA per week) and inactive individuals (not meeting 150 minutes of moderate or higher intensity PA per week) were matched, 1:1, for CRF, age and BMI. Hazard ratios [HRs] compared inactive subjects (reference) with active subjects. All analyses were adjusted for age, BMI, smoking status, family history of risk factors, medication use, history of stroke, and presence or absence of hypertension, diabetes, hypercholesterolemia, or cardiovascular disease.

**RESULTS:** CRF was inversely associated with mortality after adjusting for clinical variables (HR: 0.88; 95% confidence interval [CI]: 0.87 – 0.89), and remained a strong predictor of mortality after further adjusting for PA; the risk reduction per 1-MET increase in CRF was 15% (HR: 0.85; CI: 0.83 – 0.87). PA was a significant predictor of mortality after controlling for clinical variables (HR: 0.83; CI: 0.75 – 0.93), however the association was eliminated after further adjusting for CRF (HR: 0.98; CI: 0.88 – 1.10). Further, within both the fit (HR: 0.91; CI: 0.74 – 1.11) and unfit groups (HR: 0.98; CI: 0.83 – 1.15), meeting the PA guidelines (Active) was not significantly associated with mortality compared to the reference group (Inactive).

**CONCLUSION:** In adult male, US veterans, CRF is associated with mortality risk independent of PA, whereas the reverse is not true.

2930 June 2 1:45 PM - 2:00 PM

### Can A Prediction Formula Accurately Predict Cardiorespiratory Fitness In Fibromyalgia Patients?

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(No relationships reported)

Cardiorespiratory fitness (CRF) is often estimated using prediction formulas when clinicians do not have access to a metabolic cart. Unfortunately, using prediction formulas could potentially over or under estimate the CRF of patients with a chronic disease. Improving the accuracy of CRF in fibromyalgia (FM) patients is important considering that it has been reported that they have a lower CRF when compared to match controlled healthy participants. **PURPOSE:** To assess if a commonly used formula is accurate to predict CRF ( $\text{VO}_{2\text{peak}}$  or METs) in women living with FM. **METHODS:** Twelve FM women (age:  $50.5\pm 7.9$  years; weight:  $69.3\pm 16.0$  kg; BMI:  $26.4\pm 7.1$ ) were submitted twice to a maximal exercise test (BSU/Bruce ramp), with a 24 hours' interval, until participants achieved volitional exhaustion. Gas exchange (Ergogard, Medisoft) and ECG (Quinton) was continuously monitored throughout

the test.  $\text{VO}_{2\text{peak}}$  was considered as the highest  $\text{O}_2$  uptake averaged over a 30 second period during the test and the highest value obtained between the first test (T1) and second (T2). Predicted  $\text{VO}_{2\text{peak}}$  was determined by the formula integrated in the Quinton ECG system and the highest value between T1 and T2. The Metabolic equivalent of task (METs) was determined by using  $\text{VO}_{2\text{peak}}$  values divided by 3.5 ml  $\text{O}_2$ ·kg<sup>-1</sup>·min<sup>-1</sup>. **RESULTS:** No significant differences were found between both  $\text{VO}_{2\text{peak}}$  (T1;  $25.5\pm 5.3$  vs. T2;  $26.5\pm 5.3$  ml  $\text{O}_2$ ·kg<sup>-1</sup>·min<sup>-1</sup>,  $p>0.05$ ) tests. However, measured  $\text{VO}_{2\text{peak}}$  ( $27.2\pm 5.6$  ml  $\text{O}_2$ ·kg<sup>-1</sup>·min<sup>-1</sup>) was significantly lower than predicted  $\text{VO}_{2\text{peak}}$  ( $32.4\pm 5.6$  ml  $\text{O}_2$ ·kg<sup>-1</sup>·min<sup>-1</sup>,  $p<0.05$ ). In fact, the prediction formula overestimated the CRF by  $1.5\pm 1.1$  METs or 19.1%. When participants were divided by the severity of their disease, CRF was overestimated by  $1.2\pm 0.8$  METs in the mild ( $n=5$ ) and by  $1.6\pm 1.3$  METs in the moderately-to-severely ( $n=7$ ) affected FM participants, but did not attain statistical difference between groups. **CONCLUSION:** Our results show that system based prediction formula commonly used in the clinical setting overestimate cardiorespiratory fitness in women with fibromyalgia and should be used with precaution.

2931 June 2 2:00 PM - 2:15 PM

### The Immediate Antihypertensive Effects of Aerobic Exercise: A Meta-Analysis

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Acute aerobic exercise (AE) produces immediate but transient blood pressure (BP) reductions that persist for up to 24 hr, termed *postexercise hypotension* (PEH). PEH is strongly correlated with the BP response to AE training. Surprisingly, 33 meta-analyses exist on the BP response to AE training, but none on PEH. **PURPOSE:** To perform a meta-analysis to determine the effectiveness of PEH as antihypertensive lifestyle therapy among adults with hypertension. **METHODS:** Databases were searched for controlled PEH trials that included: adults ( $>19$  yr) with hypertension (systolic BP [SBP]/diastolic BP [DBP]  $\geq 140$  and/or  $\geq 90$  mmHg and/or on BP medication), and BP measured pre- and post-acute AE and control. Study quality was determined using a modified Downs and Black checklist. Analyses incorporated random-effects assumptions. **RESULTS:** Ten studies and 17 interventions qualified. Subjects ( $N=260$ ) were middle-aged ( $41.8\pm 4.2$  yr), overweight ( $28.9\pm 2.3$  kg·m<sup>-2</sup>) adults (24% women, 76% men) with hypertension (SBP/DBP= $140.6\pm 9.2/89.2\pm 4.4$  mmHg). The AE bout was performed at moderate intensity ( $5.4\pm 1.3$  metabolic equivalents [METs],  $\sim 55\%$  maximal oxygen consumption) for  $38.0\pm 8.7$  minutes, typically on a cycle ergometer (61.9%;  $k=13$ ). Awake ambulatory BP consisted of  $3.1\pm 0.6$  measurements/hr at  $18.2\pm 4.9$  minute intervals over  $11.7\pm 4.7$  hr. Overall, PEH occurred over the awake hr (SBP/DBP:  $d$ , [95% CI] =  $-0.76$  [ $-1.03, -0.49$ ]/ $-0.33$  [ $-0.50, -0.17$ ];  $-5.42/-2.12$  mmHg), but effect sizes lacked homogeneity ( $P$  [95% CI] =  $85.0\%$  [77.4%, 90.1%]/67.9% [46.9%, 80.6%]). PEH was of greater magnitude following higher than lower intensity ( $>6$ - $<9$  METs,  $-11.4/-5.6$  versus  $4$  METs,  $-1.6/-0.5$  mmHg,  $p=0.04$ , respectively), independent of resting BP. For DBP only, PEH was of greater magnitude among trials of lower than higher study quality ( $-4.0$  versus  $-0.4$  mmHg,  $p=0.03$ ). **CONCLUSIONS:** On average, the magnitude of PEH was equal to the magnitude of the BP reductions that are reported after AE training ( $\sim 5$ - $7$  mmHg). Furthermore, PEH was of greater magnitude among trials of higher intensity (SBP,  $\sim 11$  mmHg) and lower quality (DBP,  $\sim 4$  mmHg). Of note, the antihypertensive benefits of PEH occurred during the awake hr when BP is typically at its highest levels. Future trials are warranted to confirm the effectiveness of PEH as antihypertensive therapy.

2932 June 2 2:15 PM - 2:30 PM

### Effect of Differential Exercise Intensities on Interleukin-22 in Metabolic Syndrome

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Elevated serum interleukin-22 (IL-22) concentration is independently associated with the incidence of type 2 diabetes and coronary artery disease. Individuals with metabolic syndrome (MetS) are at increased risk of developing both conditions. Paradoxically, evidence also exists demonstrating that IL-22 may have a role in the alleviation of MetS.

**PURPOSE:** We investigated the impact of moderate-intensity continuous training (MICT) and different volumes of high-intensity interval training (HIIT) on IL-22.

**METHODS:** This was a sub-study of the 'Exercise in prevention of Metabolic Syndrome' (EX-MET) multi-center randomized trial, based on data collected at the Brisbane site. Thirty-nine MetS individuals were randomized to one of three 16-wk interventions: i) MICT (n=10, 30min at 60-70%HRpeak, 5x/wk); ii) 4HIIT (n=13, 4x4min at 85-95%HRpeak, interspersed with 3min of recovery at 50-70%HRpeak, 3x/wk); or iii) 1HIIT (n=16, 1x4min at 85-95%HRpeak, 3x/wk). Serum IL-22 concentration was measured following a 12-hr fast via enzyme linked immunosorbent assays, before/after the intervention. MetS severity, cardiorespiratory fitness (CRF), insulin resistance (IR), and visceral adipose tissue (VAT) were also measured via MetS z-score, HOMA-IR, dual-energy x-ray absorptiometry, and indirect calorimetry, respectively.

**RESULTS:** The median (IQR) IL-22 percent changes from pre- to post-intervention in the MICT, 4HIIT, and 1HIIT groups were -17% (-43.0%; 31.3%), +16.5% (-18.9%; 154.9%), and +15.9% (-28.7%; 46.1%) respectively. Although there was no significant between-group difference in IL-22 change, there was a medium-to-large group x time interaction effect on this cytokine [ $F(2,35)=2.08$ ,  $p=0.14$ ,  $\eta^2=0.14$ ]. There were similar reductions in MetS severity (MICT,  $-0.5\pm 1.8$ ; 4HIIT,  $-0.5\pm 0.9$ ; 1HIIT,  $-1.3\pm 1.8$ ), IR (MICT,  $-2.1\pm 2.7$ ; 4HIIT,  $-0.8\pm 1.4$ ; 1HIIT,  $-1.0\pm 2.0$ ), and VAT (MICT,  $-47.2\pm 152.6$ g; 4HIIT,  $-68.2\pm 106.0$ g; 1HIIT,  $-44.9\pm 102.7$ g) following all interventions. 4HIIT ( $+5.7\pm 4.7$ ml/kg/min) significantly improved CRF more than MICT ( $+2.7\pm 1.9$ ml/kg/min) and 1HIIT ( $+2.9\pm 2.2$ ml/kg/min).

**CONCLUSION:** Although there was no significant between-group difference in IL-22 change, the study suggests that different exercise intensities may have different effects on IL-22 in MetS individuals.

2933 June 2 2:30 PM - 2:45 PM

### Effects Of Aerobic & Resistance Training On Cardiorespiratory Fitness In People Living with HIV. A Meta-analysis

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The life expectancy of people living with HIV (PLWH) is increasing due to advancements in anti-retroviral drug therapy. For this reason, PLWH are increasingly facing age-related comorbidities. Higher cardiorespiratory fitness is associated with lower risks for cardiovascular and metabolic diseases. Prior meta-analyses have focused on the effect of exercise in PLWH investigating  $VO_{2max}$  in a small amount of available studies. This meta-analysis represents a large number of included studies and will be the first investigating the 6-Minute Walk Distance additionally.

#### PURPOSE

To assess the effects of aerobic exercise alone or in combination with resistance training on cardiorespiratory fitness (Maximal Oxygen Consumption ( $VO_{2max}$ ) and performance in the 6-minute walk test (6MWT) in PLWH.

#### METHODS

Two authors (CPC and PAZ) independently performed a systematic literature search for relevant articles in six web-based databases. Only randomized controlled trials (RCTs) were included. The Physiotherapy Evidence Database-Scale (PEDro-scale) was used to rate the quality level of the studies and to assess the risk of bias. A meta-analysis was performed and standardized mean differences (SMDs) were calculated for each outcome and assessed for heterogeneity.

#### RESULTS

A total of 335 articles were found. After screening, a total of 14 articles were selected with three more articles added after cross referencing, leading to a total of 17 included studies (n= 617 subjects after intervention). Only 8 of the selected studies had a PEDro-

Score  $\geq 6$  after quality assessment. 13 studies assessed  $VO_{2max}$  and 4 studies 6MWT. The random-effect model was used. Exercise significantly improved  $VO_{2max}$  (SMD =  $0.61$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, 95% CI:  $0.35$ - $0.88$ ,  $z = 4.47$ ,  $p < 0.001$ ). After exercise intervention, 6MWT distance also increased significantly (SMD =  $0.59$  meters, 95% CI:  $0.08$ - $1.11$ ,  $z = 2.25$  ( $p = 0.02$ ). Heterogeneity of  $VO_{2max}$  and 6MWT between included studies was  $I^2 = 50\%$  and  $I^2 = 63\%$ , respectively.

#### CONCLUSION:

Performing aerobic exercise alone or in combination with resistance training can lead to significant improvements in outcomes of cardiorespiratory fitness ( $VO_{2max}$  and 6MWT) in PLWH and could therefore be a protective factor for PLWH dealing with multiple comorbidities.

2934 June 2 2:45 PM - 3:00 PM

### Role Of Physical Activity In Closing The Life Expectancy Gap of People With Mental Illness

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**PURPOSE:** People experiencing mental illness are at high risk of poor lifestyle factors such as physical inactivity, which contributes to a 15 to 25-year gap in life expectancy. To develop an international consensus statement on behalf of Exercise & Sports Science Australia (ESSA), the American College of Sports Medicine (ACSM) and Sport and Exercise Science New Zealand (SESNZ) on the role of exercise interventions as a key component of a global strategy towards achieving a 50% reduction in the life expectancy gap of people experiencing mental illness by 2032.

**METHODS:** The statement was sent to all signatory organizations for review and endorsement. **RESULTS:** Three factors were identified including i) culture change with psychiatric facilities to allow for the integration of exercise practitioners within routine care, ii) advocating for appropriate infrastructure for the provision of exercise interventions regardless of treatment setting, age, diagnosis or physical health status, and iii) prioritizing training of exercise practitioners to ensure adequate mental health literacy and competency to work within psychiatric facilities. Similarly, training of mental health professionals regarding the role of exercise practitioners within mental health must be addressed. **CONCLUSIONS:** The organisations that endorse this consensus statement commit to promoting the role of exercise interventions as a key component of a global strategy towards achieving a 50% reduction in the life expectancy gap of people experiencing mental illness by 2032. We believe that enhanced training of our members, working with our medical, other allied health and health policy partners to facilitate culture change within mental health services and advocating for the provision of required infrastructure are the cornerstones of achieving this goal.

### F-15 Free Communication/Slide - Perception of Effort, Pain and Fatigue

Friday, June 2, 2017, 1:00 PM - 3:00 PM  
Room: 103

2935 **Chair:** Dane B. Cook, FACSM. University of Wisconsin-Madison, Madison, WI.

(No relationships reported)

2936 June 2 1:00 PM - 1:15 PM

### Resistance Exercise Performed With The Same Load In Self-selected And Imposed Intensities Promote Different Affective And Perceptual Responses

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**PURPOSE:** to compare the perceptual and affective responses to self-selected and imposed load resistance exercise performed with the same load. **METHODS:** 15 young male college students with at least 6 months experience in resistance training (age:  $24.5 \pm 3.4$  yrs; height:  $176.3 \pm 5.8$  cm; body mass:  $79.0 \pm 10.3$  kg) participated in the study. All subjects completed three exercise sessions: 1. familiarization and 1RM test; 2. self-selected exercise intensity, & 3. imposed exercise intensity. All exercises (chest press, leg extension, lat pulldown, & leg curl) were performed using machines. Each experimental exercise session consisted of 3 sets of 10 repetitions for each of the 4 exercises with 1 min of rest between sets and 2 min of rest between exercises. In the self-selected exercise session, participants were instructed to choose a load in which they could perform three sets. The participants were able to adjust the load at the end of each set. In the second exercise session, the same load was used, but without the individuals' knowledge. Subjects were informed that the investigators selected the load. Affect (Feeling Scale) and Ratings of Perceived Exertion (RPE) - OMNI-RES were assessed after each exercise. **RESULTS:** RPE was similar in 3 of the 4 exercises, but Affect was lower ( $p < 0.05$ ) in all of the exercises in the imposed intensity exercise

sessions. **CONCLUSION:** Self-selected intensity results in a more favorable affective response to resistance exercise than imposed intensity in college men with at least 6 months of resistance training experience.

2937 June 2 1:15 PM - 1:30 PM

### Influence Of Physical Activity And Sedentary Behavior On Anticipation-related Pain Sensitivity In Gulf War Veterans With Chronic Muscle Pain

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Exercise can alter pain sensitivity among Gulf War Veterans with chronic muscle pain (CMP). Anticipation of a painful experience can influence perceptual and neural responses to non-painful thermal stimuli among Fibromyalgia patients and this may extend to other patient groups with CMP. However, the association between physical activity or sedentary behavior and anticipation-related pain sensitivity has not been adequately studied. **PURPOSE:** To determine if (i) anticipation of pain influenced perceptual and neural responses to thermal stimuli among Veterans with CMP and (ii) anticipation-related pain sensitivity was associated with physical activity or sedentary behavior. **METHODS:** Gulf War Veterans with ( $n=29$ ;  $46\pm 6.5$  years) and without ( $n=29$ ;  $45\pm 6.7$  years) CMP were randomly assigned to conditions in which they were told that they would receive a painful or non-painful heat stimulus. Following one week of physical activity monitoring (ActiGraph GT3X), functional MRI responses to a 20-second warm stimulus (40C) applied to the left palm were measured on a 3T MRI scanner (GE MR750). Participants were then asked to provide ratings of pain intensity and unpleasantness following thermal stimulus administration. **RESULTS:** Factorial ANOVA with group and condition as between-subjects factors revealed significantly higher pain intensity ( $p=.003$ ;  $d=.85$ ) and unpleasantness ( $p=.006$ ;  $d=0.76$ ) ratings in the pain anticipation condition. A main effect for group and condition by group interaction was not found. Analyses of fMRI responses showed significantly different lateral postcentral gyrus activation in the pain anticipation condition. Linear regression analyses on Veterans in the pain anticipation condition showed that physical activity (e.g., moderate-vigorous physical activity) and sedentary behavior (e.g., average sedentary bouts of 30 or 60 minutes) did not significantly predict perception of pain intensity or unpleasantness. **CONCLUSION:** Pain anticipation influences perceptual and neural responses to non-painful stimuli among Gulf War Veterans with or without CMP; however, physical activity or sedentary behavior may not be related to anticipation-related pain sensitivity in this population. Supported by Dept. of Veterans Affairs grant: 561-00436

2938 June 2 1:30 PM - 1:45 PM

### Playing With A Friend Or Parent, Versus Playing Alone, Moderates Associations Between Hr And Rpe.

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Previously, our group have shown that interacting with peers and/or parents, relative to playing alone, increases physical activity behavior in children without altering perceived exertion. It is possible that the enriching nature of interacting with peers and parents distracts children from how intense their physical activity is thus disrupting their ability to accurately perceive exertion. **PURPOSE:** To determine if, relative to a condition where a child plays alone, playing with a friend or parent moderates the association between an objective, physiologic measure of intensity (i.e., heart rate) and ratings of perceived exertion (RPE) in children. We hypothesized that the association between heart rate and RPE will weaken from the alone condition to both the parent and friend conditions. **METHODS:** Twenty children ( $8.3 \pm 1.3$  years old,  $n = 10$  girls) participated in three simulated recess conditions (alone, friend, parent) on separate days. During each of the conditions, children had 30 minutes of free access to an outdoor playground (e.g., slides, crawl tubes, etc.) and a chair with a table of sedentary activity options (e.g., books, toys, coloring sheets, etc.) situated within the playground property. Only a single participant and their friend or parent (during the friend and parent conditions) were present during each condition. Average heart rate was recorded during each condition via a telemetry monitor and self-reported RPE was obtained via the children's OMNI walk/run scale. **RESULTS:** Pearson's correlation analyses revealed that the association between heart rate and RPE was strongest when children were playing alone ( $r = 0.34$ ). This association was 10% and 62% greater than when children were playing with their friend ( $r = 0.31$ ) and parent ( $r = 0.21$ ), respectively. **CONCLUSION:** Playing with a parent and, to a lesser extent, with a friend present moderates the association between heart rate and RPE relative to a condition when

children were playing alone. It is possible that when children played with a parent or friend it was more difficult to perceive effort because they were distracted by their exercise partner. That distraction may come in the form of greater enjoyment of or motivation for participating in physical activity.

2939 June 2 1:45 PM - 2:00 PM

### Altered Breathing Pattern Responses to Exercise in Veterans with Fatiguing Illness

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Gulf War Veterans with fatiguing illness often perceive exercise as more effortful in comparison to controls despite similar exercise capacity. Breathing pattern responses may contribute to this perception, but have not been thoroughly examined in this group of Veterans. **PURPOSE:** To evaluate breathing patterns during a maximal cardiopulmonary exercise test (CPX) between deployed Veterans with fatiguing illness and controls. **METHODS:** CPX was performed on a cycle ergometer in 17 deployed Veterans (mean  $\pm$  SD;  $49.6\pm 6.2$  years) with clinical fatigue (Fatigue Severity Scale [FSS]:  $54.7\pm 6.1$ ) and 14 non-fatigued controls ( $53.5\pm 5.8$  years; FSS:  $18.2\pm 7.9$ ). Ventilatory parameters were obtained breath-by-breath throughout exercise and compared at relative intensities (20, 40, 60, 80 and 100% of peak oxygen consumption [ $\dot{V}O_{2\max}$ ]). Primary variables of interest included both tidal volume (VT) and respiratory frequency (RF) at increasing exercise intensities and were compared between- and within-groups using repeated measures ANOVA. **RESULTS:** Demographics (Veterans vs. controls:  $30.3\pm 4.4$  kg/m<sup>2</sup> vs.  $30.7\pm 4.7$  kg/m<sup>2</sup>), baseline physical activity levels ( $108.3\pm 45.9$  vs.  $154\pm 52.6$  min-wk<sup>-1</sup>), and peak  $\dot{V}O_2$  ( $22.5\pm 4.7$  vs.  $20.9\pm 5.9$  ml/kg/min) were similar between groups. A significant main effect for exercise intensity was observed for both VT and RF ( $p < 0.05$ ), but only VT demonstrated a significant group-by-time interaction ( $p < 0.05$ ). Veterans with fatiguing illness had significantly higher VT at each exercise intensity level ( $p < 0.01$ ) in comparison to controls, but RF was similar across all intensities. Bivariate associations were observed between VT at each exercise intensity with FSS ( $r = 0.39$ ,  $p < 0.01$ ) and a measure of physical health-related functioning (physical composite score;  $r = -0.35$  to  $-0.45$ ,  $p < 0.01$ ), but not for RF ( $p > 0.05$ ). **CONCLUSIONS:** Despite similar peak exercise capacity, Veterans with fatiguing illness adopt a unique breathing pattern characterized by high tidal volumes throughout exercise. Higher exercise tidal volumes may encroach on vital capacity and contribute to perceptions of fatigue and effort. Additional studies are needed to confirm a neurophysiological basis of exercise discomfort in this group of Veterans, but evaluating breathing patterns during exercise may afford unique insight.

2940 June 2 2:00 PM - 2:15 PM

### The Influence Of A Sit-stand Desk On Sleepiness, Physical Discomfort, Physical Fatigue And Mental Fatigue

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Sleepiness, pain and fatigue significantly impact the productivity of office workers, and prolonged sitting may negatively impact these feelings during deskwork. Using a sit-stand desk could benefit these measures, but it is not clear. **PURPOSE:** To examine whether using a sit-stand desk to alternate posture could improve ratings of sleepiness, mental fatigue, physical fatigue and physical discomfort. **METHODS:** 25 inactive adults (age:  $42 \pm 12$  yr; BMI:  $31.9 \pm 5.0$  kg/m<sup>2</sup>) participated in a randomized cross-over study of two simulated 8-hr workdays (with a lunchbreak) while performing continuous sitting (SIT) or alternating sit-stand postures every 30 min (SIT-STAND). Ratings of sleepiness were measured by the 9-pt Karolinska Sleepiness Scale each hr while at the desk. A validated questionnaire measured the overall presence of physical discomfort, degree of physical discomfort (averaged across 10 body locations) and degree of physical and mental fatigue every 2 hr by 100-pt visual analog scales. Outcomes were checked for skewness and log transformed. Generalized linear mixed models, controlling for baseline values, evaluated differences across condition and time. **RESULTS:** Sleepiness increased across the day ( $p < 0.001$ ) and was lower in SIT-STAND vs. SIT ( $p = 0.036$ ). Mental fatigue was similar across time ( $p = 0.095$ ) and conditions ( $p = 0.068$ ). Comparing SIT-STAND to SIT, the presence of any physical discomfort was less frequently reported ( $p = 0.006$ ) and degree of physical discomfort was lower ( $p < 0.001$ ). The presence or degree of physical discomfort did not differ over time ( $p = 0.378$  and  $p = 0.089$ , respectively). Physical fatigue was similar across the day ( $p = 0.050$ ) and conditions ( $p = 0.712$ ). (See table 1)

**CONCLUSION:** Using a sit-stand desk during daily work activity resulted in better ratings of sleepiness and physical discomfort compared to sitting all workday. These measures are important for presenteeism of office workers and should be explored over a longer duration.

2941 June 2 2:15 PM - 2:30 PM

### Perceptions At Moderate Work Intensity In Temperate And Hot Conditions In Trained And Untrained Individuals

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Ratings of perceived exertion (RPE) and thermal comfort (TC) scales are used to assess exercise intensity, subjects' exertion and heat perception. For the safety of workers in the heat, it has been proposed that increased fitness levels may have a protective effect and could be associated with benefits to work in the heat, but it remains unclear if trained individuals perceive exertion and heat differently than untrained individuals at moderate work intensities. **PURPOSE:** This study compares RPE and TC in trained (TR) versus untrained (UT) individuals at a cycling intensity of 75%VO<sub>2max</sub> in the heat.

**METHODS:** Twelve young healthy males were categorized into two groups, TR (n=6, age=26.3±5.9 years, BMI=23.6±2.0kg/m<sup>2</sup>, aerobic exercise minutes=265±114.5minutes/week) and UT (n=6, age=23.0±2.7 years, BMI=25.6±1.1kg/m<sup>2</sup>, aerobic exercise minutes=55±72.0 minutes/week) based on their self-reported exercise behaviors. Each individual completed a graded exercise test on a cycle ergometer to maximal exertion in a neutral (NORM; 25°C, 50% relative humidity) or hot (HYPER; 40°C, 50% relative humidity) environment. During the HYPER condition, participants also wore a heating garment with 45°C circulating water until their rectal temperature (Tre) increased by 0.5°C from baseline.

**RESULTS:** At the start of exercise or at 75% VO<sub>2max</sub>, neither HR nor Tre showed significant differences between TR and UT in either condition. RPE and TC did not differ between TR and UT in either condition at 75% VO<sub>2max</sub> - NORM: TR: RPE: 14.1±1.8, UT: 15.0±2.2, p=0.458; TC: 0.8±0.7, UT: 1.6±1.1, p=0.141; HYPER: TR: RPE: 13.6±0.5, UT: 12.6±2.3, p=0.369; TC: 1.8±0.4, UT: 1.6±0.5, p=0.649. RPE did not show differences between NORM and HYPER at 75% VO<sub>2max</sub> in TR (p=0.557) nor UT (p=0.152).

**CONCLUSIONS:** Trained individuals perceive exertion and heat similarly to untrained individuals at 75% VO<sub>2max</sub> in normal or hot conditions. This conclusion has implications for workers safety and the risk for heat injuries in hyperthermia across individuals of varying fitness levels.

2942 June 2 2:30 PM - 2:45 PM

### Comparison of Mood Response Through Five Weeks of a High Intensity Functional Training Competition

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(No relationships reported)

Mood is known to be affected by exercise, as well as the predictability of an event. By design, high-intensity functional training (HIFT) incorporates a wide variety of exercise modalities. Further, competitive HIFT events generally incorporate a unique and unpredictable combination of fitness challenges that may elicit varying mood responses. **Purpose:** Examine mood prior to and following 5 unique, competitive HIFT events during a worldwide fitness competition. **Methods:** Physically active adults (N=11; 34.9 ± 5.1 years, 77.9 ± 15.1 kg, 166.1 ± 10.6 cm) with HIFT experience (≥6 months) completed a baseline (BL) Profile of Mood States (POMS) questionnaire the week prior to the HIFT competition. During each week of the 5-wk competition, the competitors completed a unique HIFT fitness challenge. For each challenge, the POMS was completed prior to (PRE), immediately post (IP), 30-min post- (30P), and 60-min post-exercise (60P). The POMS yields measures of tension, depression, anger, confusion, fatigue (FAT), and vigor (VIG). Additionally, Total Mood Disturbance (TMD; sum of other 5 subscales minus VIG) and Energy Index (EI; VIG - FAT) were also calculated and analyzed. **Results:** Repeated measures analysis of variance revealed no differences between BL and PRE values across weeks. Week (1-5) x Time (PRE, IP, 30P, 60P) interactions were observed for EI (P=0.025) and FAT (P=0.002). Compared to Week 5, EI was higher (increased VIG and/or decreased FAT) in Week 3 at 30P (Wk3: 12.3 ± 3.6; Wk5: 4.0 ± 5.4, P=0.003), and higher than Wk1 (P=0.005) and Wk3 (P=0.005) at 60P (Wk1: 14.8 ± 8.7; Wk3: 11.6 ± 4.0; Wk5: 6.0 ± 5.4). Compared to Wk3, FAT was significantly greater at Wk1 (P=0.005), Wk4 (P=0.001), and Wk5 (P=0.008) at IP (Wk1: 10.3 ± 4.0; Wk3: 4.4 ± 5.2; Wk4: 9.1 ± 5.9; Wk5: 10.4 ± 7.3). No other significant interactions were observed between weeks. **Conclusion:**

The unique design of the HIFT competition did not seem to impact pre-exercise mood, but the different workouts resulted in differing mood responses, particularly for vigor and fatigue.

2943 June 2 2:45 PM - 3:00 PM

### Establishing Thresholds for Visual Discrimination of Intrinsic and Novel Coordination Patterns

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Human movements are characterized with different coordination patterns. The ability to visually discriminate the coordination pattern is important for people to recognize the other's movement and plan for the response. Two coordination patterns are known to be intrinsic for humans: in-phase (0°) and anti-phase (180°). They can be perceived and produced easily without practice. Any coordination pattern between 0° and 180° has to be learned through significant amount of practice. Neurological diseases or traumatic brain injury may result in decreased ability to perceive and produce the intrinsic coordination patterns, as well as to learn novel coordination patterns.

**PURPOSE:** To establish threshold for healthy controls to visually discriminate the intrinsic and novel coordination patterns. **METHODS:** A total of 15 healthy adults aged from 20-40s were recruited (23.47 ± 3.87). They were tested on the ability to visually discriminate three coordination patterns: 0°, 90°, and 180°. A computer display of a target pattern was shown, followed by displays of a pair of patterns, in which one was the target pattern and the other was the distracting pattern. Participants had to press a key to indicate whether the first or second of the pair was the target pattern. Logistic curve fitting was performed to calculate the individual threshold for discriminating each target coordination pattern. **RESULTS:** A one-way repeated measure ANOVA was performed to examine the difference of mean thresholds among three coordination patterns. A significant difference was shown (F<sub>2,28</sub> = 54.88, p<.001). The threshold for discriminating 90° was the greatest with the largest variability (25.64° ± 12.39°). Although thresholds for discriminating the two intrinsic coordination patterns were smaller, discriminating 180° (4.97° ± 3.79°) was more challenged and variable than discriminating 0° (0.56° ± 1.00°). **CONCLUSION:** For health controls, visually discriminating intrinsic coordination patterns is easier and more consistent than discriminating novel coordination patterns. Establishing the normal thresholds for visual discrimination of intrinsic and novel coordination patterns helped to develop visual-motor coordination tests to screen the neurological diseases or traumatic brain injury.

## F-16 Free Communication/Slide - Prospective Studies of Physical Activity and Health

Friday, June 2, 2017, 1:00 PM - 3:00 PM

Room: 507

2944 **Chair:** Sarah Keadle. *California Polytechnic State University, San Luis Obispo, CA.*

(No relationships reported)

2945 June 2 1:00 PM - 1:15 PM

### The Level Of Physical Activity Post-myocardial Infarction Predicts Future Mortality

Mats Börjesson<sup>1</sup>, Amanda Ek<sup>2</sup>, Kristina Hambraeus<sup>3</sup>, Lena Kallings<sup>2</sup>, Örjan Ekblom<sup>2</sup>. <sup>1</sup>Sahlgrenska University Hospital, GOTHENBURG, Sweden. <sup>2</sup>Swedish School of Sport and Exercise, STOCKHOLM, Sweden. <sup>3</sup>Falu Hospital, FALUN, Sweden.

**Reported Relationships:** M. Börjesson: Consulting Fee; NovoNordisk, AstraZeneca.

There is little knowledge of the association between physical activity (PA) level and the mortality risk post myocardial infarction (MI). Smaller studies have indicated, that individuals who remain active or increase their level of PA after MI have a lower risk of death. However, in order to confirm this and adjust for confounders larger studies are needed. **PURPOSE:** Explore any association between PA level after MI and all-cause mortality during follow-up in a large MI-cohort.

**METHODS:** A national cohort study including all patients <75 years of age, with a diagnosis of MI between 1991-2014 (Swedish MI register SWEDEHEART). From the register self-reported PA, 6-10 weeks post MI, (i.e. number of sessions during the past seven days with moderate and/or vigorous PA lasting ≥30 minutes) was obtained. The answers were grouped into 0-1 sessions (inactive), 2-4 sessions (moderately active) and 5-7 sessions (highly active). Associations were first assessed unadjusted, stratified by potential confounders (sex, age, smoking status, ejection fraction, ST-

elevation and quality of life). Thereafter, a multiple logistic regression was performed to control for possible confounders. **RESULTS:** Complete data was obtained from 37 655 individuals (median 63 years, 74 % men). A total of 2512 deaths occurred during a mean of 4.1 years of follow-up. The mortality rate was 17.0 cases/1000 person-years. Moderate activity (n= 10 601) and high activity (n=18 545), was associated with a lower risk of all-cause mortality at follow-up (OR 0.356 95 % CI 0.320-0.396 and OR 0.334, 95 % CI 0.305-0.366), compared to being physically inactive (n=8519). The OR's remained largely unchanged when stratifying for age, sex, non-ST elevation MI/ST-elevation MI and ejection fraction. However, active smokers had a lower OR, for subsequent death, as had patients with a low EQ5D. The associations persisted in the multiple logistic regression, after adjustment for the possible confounders above. **CONCLUSIONS:** A higher level of physical activity 6 -10 weeks after myocardial infarction, is associated with a lower risk of all-cause mortality at follow-up. These results suggest that physical activity assessment is important post-MI, not least as an important predictor of subsequent mortality.

2946 June 2 1:15 PM - 1:30 PM

### Effect Of Cardiorespiratory Fitness On Blood Glucose Trajectory With Aging: A Cohort Study Of Japanese Men

Haruki Momma<sup>1</sup>, Susumu S. Sawada, FACSM<sup>2</sup>, Kazunori Shimada<sup>3</sup>, Yuko Gando<sup>2</sup>, Motohiko Miyachi<sup>2</sup>, Chihiro Kinugawa<sup>4</sup>, Takashi Okamoto<sup>4</sup>, Koji Tsukamoto<sup>4</sup>, Cong Huang<sup>1</sup>, Ryoichi Nagatomi<sup>1</sup>. <sup>1</sup>Tohoku University, Sendai, Japan. <sup>2</sup>National Institutes of Biomedical Innovation, health and Nutrition, Tokyo, Japan. <sup>3</sup>Juntendo University Graduate School of Medicine, Tokyo, Japan. <sup>4</sup>Tokyo Gas Health Promotion Center, Tokyo, Japan.

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(No relationships reported)

There has only been one study examining the effect of cardiorespiratory fitness (CRF) on blood glucose with aging among Americans. Whether CRF also has a similar effect on aging-associated change in blood glucose among Japanese with lower prevalence of obesity as compared with Americans. **PURPOSE:** To investigate whether the aging-related increase of glucose in Japanese men with higher CRF is smaller than that of those with lower CRF. **METHODS:** We studied 6,153 Japanese men (age: 20-60 y) free of diabetes, cardiovascular disease and stroke in 1986. The participants completed annual health examinations including fasting blood glucose until 2009. CRF was measured by a submaximal exercise test between 1979 and 1986. Participants were divided into quartiles (Q1, Q2, Q3, and Q4) for CRF based on the cumulative mean of CRF during the period. Time-invariant covariates included BMI, smoking status, drinking habit, desk work, family history of diabetes, and frequency of measurements of blood glucose, and time-variant covariates included systolic blood pressure and fasting blood triglyceride. The trajectories of glucose with aging were analyzed using linear mixed models. **RESULTS:** Fasting glucose increased at a linear rate with aging. Glucose increased at a yearly rate of 0.49 mg/dL (95% confidence interval: 0.48-0.50). After adjustment for covariates, the aging-related glucose increase in men with Q4 of CRF (0.42 [0.40-0.44] mg/dL per year) was smaller than that in men with Q1 (0.55 mg/dL [0.50-0.60] per year), Q2 (0.51 mg/dL [0.46-0.56] per year), Q3 (0.48 mg/dL [0.42-0.53] per year), respectively. **CONCLUSIONS:** Higher levels of CRF is inversely associated with the increase in blood glucose with aging among Japanese healthy men.

2947 June 2 1:30 PM - 1:45 PM

### Associations Of Sarcopenia And Low Muscular Strength With All-cause Mortality Among Us Older Adults

Ran Li<sup>1</sup>, Jin Xia<sup>2</sup>, Xi Zhang<sup>2</sup>, Jianjun Guo<sup>1</sup>, Yiqing Song<sup>2</sup>. <sup>1</sup>China Institute of Sport Science, Beijing, China. <sup>2</sup>Richard M. Fairbanks School of Public Health, Indiana University, Indianapolis, IN.

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(No relationships reported)

Sarcopenia is defined as aging-related loss of muscle mass and knee extension strength serves as a marker of lower extremity muscular strength in populations. Sarcopenia and low muscular strength (LMS) may be important but understudied risk factors for aging-related morbidity and mortality in the older and elderly populations. **PURPOSE:** We aimed to prospectively examine individual or joint associations of sarcopenia and LMS with all-cause mortality in a nationally representative sample of US older adults in the National Health and Nutrition Examination Survey (NHANES). **METHODS:** Data sources included the NHANES 1999-2002 with public-use 2011 linked mortality files, which comprised 4,449 participants aged 50 years and older with complete data on body composition by dual-energy x-ray absorptiometry and isokinetic knee extensor strength measurement. Sarcopenia was defined by two definitions proposed by the National Institutes of Health Sarcopenia Project according to appendicular lean mass

(ALM) and ALM divided by BMI (ALM/BMI). LMS was defined as the lowest 25% of measurements of knee extensor strength. Weighted multivariable logistic regression models were adjusted for age, sex, race, BMI, smoking, alcohol use, education, leisure time physical activity, sedentary time, and comorbidities. **RESULTS:** The weighted prevalence of sarcopenia was 23.1% defined by ALM and 17.0% defined by ALM/BMI; the weighted prevalence of low muscular strength was 19.4%. In the multivariate-adjusted models, sarcopenia was significantly associated with increased risk of all-cause mortality for ALM/BMI definition (OR: 1.44; 95% confidence interval [CI], 1.06-1.97) but not for ALM definition (OR: 1.37; 95% CI, 0.90-2.09) while LMS was strongly associated with all-cause mortality (OR: 2.32; 95% CI, 1.70-3.18). In the joint analyses, a significantly increased all-cause mortality was observed only among participants with LMS and non-sarcopenia (OR range: 2.03-2.50) and those with LMS and sarcopenia (OR range: 2.15-2.56) while those without sarcopenia and LMS were the reference group. **CONCLUSIONS:** Low knee extensor strength indicative of low muscular strength was independently and significantly associated with an increased risk of all-cause mortality among US older adults regardless of the presence or absence of sarcopenia.

2948 June 2 1:45 PM - 2:00 PM

### Muscle Weakness Increases the Risk of Incident Diabetes in Older Mexican Americans

Brenda M. Vincent<sup>1</sup>, Ryan P. McGrath<sup>2</sup>, Soham Al Snih<sup>3</sup>, Kyriakos S. Markides<sup>3</sup>, Mark D. Peterson, FACSM<sup>2</sup>. <sup>1</sup>VA Ann Arbor Health System, Ann Arbor, MI. <sup>2</sup>University of Michigan Medical School, Ann Arbor, MI. <sup>3</sup>University of Texas Medical Branch, Galveston, TX.

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(No relationships reported)

A natural decline of muscle strength occurs during the aging process; however, preserving muscle strength may reduce the risk of many preventable diseases such as diabetes, especially in higher risk populations. **PURPOSE:** The purpose of this study was to examine the sex-specific association between muscle weakness and incident diabetes in older Mexican Americans. **METHODS:** A subsample of 1,903 Mexican Americans aged at least 65 years at baseline was followed for 13 years. Muscle strength was assessed with a hand-held dynamometer and was normalized to body weight (normalized grip strength (NGS)). Male and female participants were categorized as weak if their NGS was  $\leq 0.46$  and  $\leq 0.30$ , respectively. Diabetes status and age of diabetes diagnosis was self-reported by participants. Sex-stratified Cox proportional hazard regression models were used to determine the association between muscle weakness and incident diabetes when using age as an entry variable and after adjusting for marital status, employment status, and education. A sensitivity analysis was performed to account for influential outliers in the outcome variable (time to incident diabetes) and the model was re-run. If a >10% change in the hazard ratios was identified, the results of the model that underwent the sensitivity analysis would be presented. **RESULTS:** The hazard ratio for incident diabetes was 1.16 (95% confidence intervals (CI): 1.12-1.20;  $p < 0.001$ ) in weak vs. strong males and 1.24 (CI: 1.21-1.27;  $p < 0.001$ ) in weak vs. strong females, after adjusting for marital status, employment status and education. **CONCLUSIONS:** Muscle weakness was robustly associated with an increased risk of incident diabetes in older Mexican American males and females. Health professionals should encourage physical activities and healthy behaviors that preserve or improve muscle strength, thereby reducing the risk of incident diabetes in older Mexican Americans. NGS may also be used to assess and monitor muscle weakness in older populations, especially because it is inexpensive and non-invasive.

2949 June 2 2:00 PM - 2:15 PM

### Examining The "Weekend Warrior" And Mortality Using Accelerometer-assessed Physical Activity In NHANES

Eric J. Shiroma<sup>1</sup>, I-Min Lee, FACSM<sup>2</sup>, Mitchell A. Schepps<sup>1</sup>, Masamitsu Kamada<sup>2</sup>, Osorio Meirelles<sup>1</sup>, Tamara B. Harris<sup>1</sup>.

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**PURPOSE:** It remains unclear if those who participate in physical activity on only a few days a week, "weekend warriors", have similar health benefits to those who perform activity more often over the week. Accelerometers provide a real time, objective measure of physical activity that may allow for further exploration of activity and health through pattern analysis, such as examining activity frequency. The aim of this study is to use accelerometer-assessed physical activity to compare the mortality risk among "weekend warriors" to more regularly active adults, in a large population-based study. **METHODS:** Study participants were from the National Health and Nutrition Examination Survey (NHANES), a population-based study with mortality follow-up through 2011. Participants were required to be at least 20 years

old and have worn the accelerometer for 6 or 7 days ( $n = 4206$ ). Weekly moderate-to-vigorous physical activity (MVPA) was categorized based on the US Federal Physical Activity Guidelines: 1)  $<75$  minutes; 2) 75-150 minutes; 3)  $\geq 150$  minutes per week (recommended). Of those in the  $\geq 150$  minutes group, participants who performed  $\geq 50\%$  of their weekly activity on only 1 or 2 days were classified as "weekend warriors", and the rest as "regularly active". To compare mortality rates based on physical activity category, we calculated hazard ratios (95% confidence intervals) using Cox survival analysis and adjusting for relevant covariates. **RESULTS:** Over an average of 79.4 (SD = 18.6) months of follow-up, there were 419 deaths. Participants with some activity, but insufficient to meet the guidelines (75-150 minutes per week MVPA), had a 61% reduction (HR = 0.39 (95% CI: 0.26, 0.58)) in mortality risk compared to those with  $<75$  minutes per week. Participants meeting the guidelines had a similar mortality risk reduction,  $\sim 50\%$ , compared to those with the least activity, whether "weekend warriors" (HR = 0.50 (0.32, 0.81)) or regularly active participants (HR = 0.48 (0.28, 0.81)). **CONCLUSIONS:** Active participants and those with some activity, but insufficient to meet the guidelines, both had reduced mortality risk during follow-up compared to the least active participants. "Weekend warriors" were observed to have comparable magnitude of risk reduction as regularly active participants.

2950 June 2 2:15 PM - 2:30 PM

### The Epidemiology of Health and Morbidity Amongst Former Rugby Union Players

Madeleine A.M. Davies<sup>1</sup>, Andrew Judge<sup>1</sup>, Antonella Delmestri<sup>1</sup>, Simon Kemp<sup>2</sup>, Keith A. Stokes<sup>3</sup>, Julia L. Newton<sup>1</sup>, Nigel K. Arden<sup>1</sup>. <sup>1</sup>University of Oxford, Oxford, United Kingdom. <sup>2</sup>Rugby Football Union, Twickenham, United Kingdom. <sup>3</sup>University of Bath, Bath, United Kingdom.  
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(No relationships reported)

Despite over 7 million participants in rugby union ('rugby') globally, the effect of rugby on health, in terms of increasing or decreasing the prevalence of long-term morbidity amongst players, has not yet been established. Where sport may be associated with decreased morbidity, participation can be recommended as improving specific health outcomes. Where former players are seen to demonstrate health deficits, potential targets for population interventions may become evident. **PURPOSE:** To determine the prevalence of self-reported physician-diagnosed morbidity amongst former elite rugby players, and compare this with an age and gender-standardised representative national population comparison. **METHODS:** A cross-sectional questionnaire study was used. The English Longitudinal Study of Ageing (ELSA), a nationally representative study of English adults, was used as a control population. Age and gender matched standardised morbidity ratios (SMR) were calculated against the ELSA reference population. A post-hoc sensitivity analysis examined morbidity differences between the complete cohort of former players and ELSA participants. **RESULTS:** Amongst gender-matched rugby ( $n=259$ ) and ELSA ( $n=5186$ ) participants aged 50 and over, diabetes was significantly lower amongst former players (SMR 0.28, CI 0.11 to 0.66), whereas osteoporosis (SMR 2.69, CI 1.35 to 5.38) and osteoarthritis (SMR 4.00) were significantly increased amongst former players. In unadjusted, complete cohort sensitivity analyses, hypertension and heart problems were also decreased compared with ELSA. **CONCLUSIONS:** Morbidity differs amongst former elite rugby players and the general population. The magnitude of musculoskeletal morbidity in this population may warrant proactive osteoarthritis education and management in this at-risk population.

2951 June 2 2:30 PM - 2:45 PM

### Longitudinal Associations Of Adiposity And Grip Strength With Physical Activity Assessed With Wrist-worn Accelerometers In 84,779 Adults: The Uk Biobank Study

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(No relationships reported)

**PURPOSE:** To determine the longitudinal associations of body mass index (BMI), waist circumference (WC) and grip strength (GS) with objectively measured physical activity (PA) in adults. **METHODS:** This study utilized data from the UK Biobank study, an ongoing prospective cohort of over half a million UK adults aged 40-69yrs at recruitment (2006 to 2010). Each participant underwent baseline measurements of BMI (kg/m<sup>2</sup>), WC (cm) and GS (kg). GS was measured using a hand dynamometer. Values from the two hands were averaged. Between 2013 and 2015, a sub-sample of over 100,000 participants each wore a tri-axial accelerometer on the dominant wrist for 7 days. Measurements taken at baseline were not repeated during the follow-up accelerometer protocol. Mean acceleration levels were calculated, and moderate-to-vigorous PA

(MVPA) was estimated as time when acceleration was above 125mg. BMI, WC and GS were standardized, and PA outcomes were log-transformed. **RESULTS:** A total of 84,812 participants (46,947 women) with  $\geq 72$  hours of wear and no missing covariates were included in the analysis. The median follow-up was 5.7 years (interquartile range: 4.9-6.5). Using multiple linear regression adjusted for GS and various potential confounders (demographic, lifestyle, disease status, seasonality), every 1 standard deviation increase in BMI and WC was associated with 0.071 (95% confidence interval [CI]: -0.073, -0.069) and 0.070 (95% CI: -0.073, -0.068) lower log of mean acceleration at follow-up, respectively, in women: in men, BMI (b: -0.066; CI: -0.069, -0.063) and WC (b: -0.076; CI: -0.079, -0.073). Positive associations were found between baseline GS and follow-up acceleration levels after adjusting for confounders and BMI, in women (b: 0.013; CI: 0.010, 0.01) and men (b: 0.004; CI: 0.001, 0.007). Marginal means (adjusted for confounders) of follow-up acceleration were lower in individuals with higher adiposity levels and/or lower GS at baseline. Similar results were observed with MVPA as an outcome.

**CONCLUSIONS:** BMI, WC and GS at baseline predicted objectively measured PA at follow-up. Findings of our study provide compelling justification for interventions and policies to focus on improving body composition and muscle strength to increase or prevent decline in PA at the population level.

2952 June 2 2:45 PM - 3:00 PM

### Energy Expenditure From Light And Moderate-Vigorous Intensity Physical Activity And All-cause Mortality

Pedro F. Saint-Maurice<sup>1</sup>, Steven C. Moore<sup>1</sup>, Sarah Keadle<sup>2</sup>, Charles E. Matthews, FACSM<sup>1</sup>. <sup>1</sup>National Cancer Institute, Rockville, MD. <sup>2</sup>California Polytechnic State University, San Luis Obispo, CA. (Sponsor: Charles E. Matthews, FACSM)  
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(No relationships reported)

**PURPOSE:** It has been suggested that light intensity activity may have health benefits however, it is still uncertain whether 1 MET-hr of light intensity activity confers similar benefit as 1 MET-hr of moderate-to-vigorous (MV) activity. This study examined the mortality benefits of light and MV intensity activity, while accounting for the volume of activity. **METHODS:** Accelerometer (ActiGraph 7164) records were extracted from the NHANES 2003-2006 adult database ( $n=6355$ ). Participants were followed prospectively for mortality through 2011 via the National Death Index. Volume of light and MV activity was determined by classifying monitored time into light (100-759 cts/m) and MV (760+ cts/m) intensity activity and by estimating energy expenditure (MET-hrs/d) within each intensity category. Cox proportional hazard models were used to estimate hazard ratios and 95% confidence intervals (HR [95% CI]) for mortality associated with 1 MET-hr/d increase in light or MV activity adjusted for age, sex, ethnicity, education, smoking, alcohol, health status (diabetes, cancer, heart disease, stroke, mobility), BMI, with and without mutual adjustment for light and MV activity. To account for non-linear mortality associations we examined both exposures among low- ( $n=2588$ ) and highly-active adults ( $n=2251$ ). **RESULTS:** There was complete data on 4839 adults ( $\geq 40$  yrs) followed over a period of 6.5 yrs. There were 572 deaths registered among the low-active group and 128 deaths in the highly-active group. Initial models in the low-active group without mutual adjustment revealed significant associations for light (HR=0.85 [0.80, 0.90]) and MV activity (HR=0.70 [0.64, 0.77]). After mutual adjustment for each activity intensity, among low-active adults, a 1 MET-hr/d increase in light activity was associated with 9% lower mortality (HR=0.91 [0.86, 0.97];  $p = 0.002$ ), while a 1 MET-hr/d increase in MV activity was associated with 26% lower mortality (HR=0.74 [0.67, 0.81];  $p < 0.001$ ). There were no significant reductions in mortality risk among the high-active group ( $p > 0.05$ ).

**CONCLUSIONS:** The findings support the idea that greater amounts of light activity are associated with lower mortality among less active individuals after considering MV energy expenditure. However, for a given MET-hr of activity, MV may provide more benefit.

**F-30 Thematic Poster - Altitude/Hypoxia/Supplementation**Friday, June 2, 2017, 3:15 PM - 5:15 PM  
Room: 404**2996 Chair:** Roy Salgado. *US Army Research Institute of Environmental Medicine, Natick, MA.*  
(No relationships reported)**2997 Board #1** June 2 3:15 PM - 5:15 PM  
**Co-ingestion Of Glucose And Fructose During Exercise On Acute Exposure To Altitude**  
Nicola C. Arjomandkhab<sup>1</sup>, John P. O'Hara<sup>2</sup>, Roderick F. G. J. King<sup>2</sup>. <sup>1</sup>Leeds Trinity University, Leeds, United Kingdom. <sup>2</sup>Leeds Beckett University, Leeds, United Kingdom.  
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(No relationships reported)

The reduction in partial pressure of oxygen ( $O_2$ ) leading to reduced  $O_2$  delivery to tissues at altitude has the potential to alter substrate utilization during exercise. Experiments at sea level suggest performance benefits from consuming multiple transportable carbohydrates, the impact of this at altitude is not known. **PURPOSE:** To investigate how carbohydrate (CHO) (glucose and fructose) ingestion effects fuel utilization during exercise at 2500m and the impact of this on performance. **METHODS:** Ingestion of 1.2 g·min<sup>-1</sup> glucose plus 0.8 g·min<sup>-1</sup> fructose was compared to 1.2 g·min<sup>-1</sup> glucose and a placebo during 120 minutes running at 70%  $\dot{V}O_{2max}$  performed by eight males in a normobaric hypoxic chamber set at 2500m altitude. Exogenous and endogenous oxidation was quantified using <sup>13</sup>C stable mass isotope tracing techniques. Performance was measured in a 5 km TT. **RESULTS:** CHO ingestion shifted fuel use to predominantly CHO (79.51 ± 7.11, 79.45 ± 1.88 and 56.66 ± 20.18% in glucose plus fructose, glucose alone and placebo, respectively) compared with placebo where fat (20.49 ± 7.11, 20.55 ± 11.88 and 43.34 ± 20.18% in glucose plus fructose, glucose alone and placebo, respectively) was the dominant fuel. Co-ingestion of glucose and fructose led to significantly ( $p < 0.001$ ; ES= 3.82) greater peak exogenous CHO oxidation rates compared to glucose alone (1.51 ± 0.14 g·min<sup>-1</sup> and 0.96 ± 0.07 g·min<sup>-1</sup>, respectively) and this resulted in a significantly ( $p = 0.007$ ; ES= 1.01) lower contribution from endogenous CHO oxidation (49.15 ± 8.85% and 59.65 ± 1.80%, respectively). Co-ingestion of glucose and fructose did not improve performance in the 5 km TT (25:37 ± 03:01 minutes) compared to glucose alone (25:13 ± 02:53 minutes). However, time to complete the 5 km TT was significantly ( $p = 0.002$ ; ES= 0.47) faster in the glucose only trial compared to placebo (26:33 ± 2:59 minutes). **CONCLUSION:** CHO ingestion reduced the reliance on fat oxidation compared to placebo and the co-ingestion of glucose and fructose increased exogenous and spared endogenous CHO oxidation over glucose alone. However, the co-ingestion of glucose and fructose did not provide an ergogenic benefit at 2500m.

**2998 Board #2** June 2 3:15 PM - 5:15 PM  
**No Impact of Carbohydrate Supplementation and Altitude Acclimatization on Aerobic Exercise Performance**  
Robert W. Kenefick, FACSM, Adam J. Luippold, Karleigh E. Bradbury, Andrew J. Young, FACSM, Allyson N. Derosier, Marques A. Wilson, Claire E. Berryman, Stefan M. Pasiakos, FACSM. *U.S. Army Research Institute of Environmental Medicine, Natick, MA.*  
Email: Robert.W.Kenefick.civ@mail.mil  
(No relationships reported)

Ergogenic benefits of carbohydrate (CHO) supplementation during exercise at high altitude (HA) appear to vary depending on acclimatization status. However, longitudinal evaluation of potential performance benefits of CHO in the same volunteers, prior to- and following acclimatization to HA have not been reported. **PURPOSE:** To determine the impact of a CHO beverage consumed during steady-state exercise, on subsequent time trial (TT) performance (2 mi. run), of lowlanders immediately after they arrived at high altitude (A-HA) and after 22 days (C-HA) of acclimatization at 4,300 m. **METHODS:** Seventeen unacclimatized men (mean ± SD; age, 23.4 ± 5.6 y; body mass, 81.9 ± 13.9 kg; SL  $\dot{V}O_{2peak}$  4.2 ± 0.7 L/min, HA  $\dot{V}O_{2peak}$  2.8 ± 0.5 L/min) performed 80-min of treadmill walking (~55% of HA  $\dot{V}O_{2peak}$ ) at sea level (SL), A-HA and C-HA. Before, and every 20 min during exercise they consumed either a CHO beverage (n = 9; 45 g fructose/L + 55 g glucose/L, 1.8 g CHO/min) or a flavor-matched placebo (PLA, n = 8). Immediately following walking/supplementation, a 2 mi., self-paced TT was performed. **RESULTS:** There were no differences ( $P > 0.05$ ) in TT duration between CHO and PLA at SL (17.1 ± 2.8 vs. 18.8 ± 4.2 min), A-HA (27.9 ± 5.0 vs. 27.3 ± 7.0 min) or C-HA (23.9 ± 4.0 vs. 24.2 ± 4.7 min), respectively. Acute and chronic HA exposure did significantly alter TT

performance such that A-HA duration > SL and C-HA, and C-HA duration was > SL ( $P < 0.05$ ). There were also no differences ( $P > 0.05$ ) at SL, A-HA and C-HA between CHO and PLA in exercise intensity (% SL  $\dot{V}O_{2peak}$ ) and pacing at 0.5 mi. increments during the TTs. **CONCLUSIONS:** CHO supplementation did not provide any benefit to TT performance when volunteers were unacclimatized or acclimatized to HA. Chronic HA exposure/acclimatization did improve performance compared to that after acute HA exposure, but performance remained worse than at SL. Authors' views not official U.S. Army or DoD policy.

**2999 Board #3** June 2 3:15 PM - 5:15 PM  
**Effect Of Sodium Bicarbonate Ingestion During 6-, 8-, 12-hour Hypobaric Hypoxic Acclimatization on Cycling Performance**  
Nazareth Khodiguan<sup>1</sup>, Jens Johansson<sup>2</sup>, Andrew Cornwell<sup>1</sup>, Svenja Wassmann<sup>1</sup>, Jacob D. Jelmini<sup>1</sup>, Eddie Leon<sup>1</sup>. <sup>1</sup>California State University, Los Angeles, Los Angeles, CA. <sup>2</sup>Mercy Medical Center, Roseburg, OR.  
(No relationships reported)

Numerous studies investigate the ergogenic effects of normobaric and hypobaric hypoxic acclimatization on endurance performance in normobaria. Likewise, numerous studies assessed the ergogenic effect of sodium bicarbonate ingestion on performance. Diuresis of bicarbonate ions induced by altitude exposure may reduce the extracellular buffering of  $H^+$ , compromising the performance at high altitude. Purpose of this study was to investigate the effect of Sodium Bicarbonate ingestion during hypobaric hypoxic acclimatization on cycling performance in hypobaria. Eight, eight, and twelve subjects were exposed to hypobaric hypoxia (525mmHg) for 6, 8, and 12 hours, respectively. Sodium bicarbonate supplementation took place at 4.5 and 1.5 hours (200 mg·kg<sup>-1</sup> and 250 mg·kg<sup>-1</sup> of body mass, respectively) before performance test (525 mmHg). Subjects were tested in 4 conditions: Normobaric placebo (NBPbo); Normobaric Bicarbonate (NBBC); Hypobaric Placebo (HBPbo); and Hypobaric Bicarbonate (HBBC). Time trials consisted of performing 360 revolutions of pedals as fast as possible against a resistance equal to 5% of body weight. Blood samples were collected from a venous catheter before the exposure, 15 min before the exercise, and 3-5 minutes after the exercise. Urinary bicarbonate excretion was measured during the exposure. There were no differences in performance time, serum bicarbonate and lactate concentrations, as well as total urinary bicarbonate excretion between the 6-, 8-, and 12-hour acclimatization. Therefore the data were pooled and analyzed together. Serum bicarbonate concentration was significantly lower (26.4±2.8 vs 24.1±2.5 P=0.000) and urinary bicarbonate excretion was significantly higher (613±460.1 vs 322±264.9,  $p = .003$ ) in HBPbo than in NBPbo at the end of acclimatization. Bicarbonate supplementation significantly improved cycling performance (2.0±4.21%) in hypobaric hypoxia, while the improvement was not significant in normobaria. It was concluded that sodium bicarbonate supplementation during short-duration acclimatization improves high intensity cycling performance.

**3000 Board #4** June 2 3:15 PM - 5:15 PM  
**Effect Of Dietary Nitrate Supplementation On Step Test Performance At Sea Level And Altitude**  
Devon Dobrosielski, Chris Goss, Adam Farley, Kyle Moran. *Towson University, Towson, MD.*  
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(No relationships reported)

Nitrate-rich beetroot juice improves exercise performance in untrained and moderately trained individuals at sea level through increased production of nitric oxide (NO). Beetroot supplementation may be more effective during exercise in a hypoxic environment, where NO production is reduced, due to low  $O_2$  tensions and muscle pH. However, results from studies that have examined the effects of nitrate supplementation on exercise performance at altitude have been equivocal. **PURPOSE:** To examine the effect of beetroot-juice ingestion on step test performance at sea level and altitude. **METHODS:** Undergraduate students enrolled in a 10-day study abroad to Peru that included a two-day hike on the Inca trail. Prior to traveling, all students performed a Queens College step test at sea level. Students stepped at a predetermined cadence for 3 minutes, after which recovery heart rate was recorded and entered into a standardized regression equation to estimate  $\dot{V}O_{2max}$ . The test was repeated at sea level, 90 minutes after ingesting a 70 mL shot of beetroot juice (6.45 mmol nitrate concentration). The step test was completed twice more at an altitude of 3500 meters; both with and without beetroot juice ingestion. All tests were separated by at least 24 hours. **RESULTS:** Twelve students (age 21 ± 1.7 years; M:6, F:6) completed all aspects of the study. The estimated  $\dot{V}O_{2max}$  at sea level without and following nitrate supplementation was 45.2 ± 9.3 ml/kg/min and 46.8 ± 9.1 ml/kg/min, respectively. The estimated  $\dot{V}O_{2max}$  at 3500 meters increased from 45.2 ± 9.8 ml/kg/min to 47.7 ± 12.3 ml/kg/min following nitrate ingestion. However, one-way repeated measures ANOVA revealed no differences in mean estimated  $\dot{V}O_{2max}$  across conditions,  $F(3,33) = 1.31, p = 0.29$ . **CONCLUSION:** We found no apparent effect of altitude or nitrate

supplementation on step test performance in a group of college students. The duration of the exercise bout, as well as the dosage and timing of nitrate supplementation may explain our inability to observe an ergogenic effect.

3001 Board #5 June 2 3:15 PM - 5:15 PM

**"Beet On Alps": Effect of Dietary Nitrate Supplementation on Skeletal Muscle Oxidative Capacity during Prolonged Exposure to Hypobaric Hypoxia**

Desy Salvadego<sup>1</sup>, Mauro Marzorati<sup>2</sup>, Letizia Rasica<sup>3</sup>, Simone Porcelli<sup>2</sup>. <sup>1</sup>University of Udine, Udine, Italy. <sup>2</sup>National Research Council, Milano, Italy. <sup>3</sup>Università degli Studi di Milano, Milano, Italy.

(No relationships reported)

**PURPOSE:** Skeletal muscle oxidative function is influenced by inspired O<sub>2</sub> fraction. Previous studies in acute hypoxia have shown that dietary nitrate supplementation is able to attenuate or prevent the hypoxia-induced decrement of performance. No data have been provided during prolonged exposure to hypobaric hypoxia, a condition that affects both skeletal muscle oxidative metabolism and nitric oxide bioavailability. Aim of this study was to investigate the effects of a dietary nitrate supplementation on *gastrocnemius* muscle oxidative capacity during a prolonged exposure to high altitude. **METHODS:** At altitude (3,269m a.s.l., Casati Refuge, Italy), fourteen healthy young (29±4 yr) subjects were supplemented for three days with beetroot juice (2x70mL/day, 8.4 mmol nitrate/day [BEET-IT]) or nitrate-depleted juice (PLA) following a double-blind randomized cross-over design. As an index of *gastrocnemius* muscle oxidative capacity, the recovery rate of muscle oxygen consumption (mV̇O<sub>2</sub>) was measured by near-infrared spectroscopy using repeated, transient arterial occlusions following a brief bout of plantar-flexion exercise. Experiments were carried out after 7-14 days of hypoxic exposure, at the end of both supplementation periods, and in normoxia. **RESULTS:** In normoxia, the time constant of mV̇O<sub>2</sub> (13.2±4.9 s) was comparable to that observed in healthy active subjects. At altitude, the time constant of mV̇O<sub>2</sub> was significantly (p=0.01) faster in BEET-IT (9.3±3.4) vs. PLA (16.7±5.8). Plasma [nitrate] and [nitrite] were significantly higher in BEET-IT than in PLA. **CONCLUSIONS:** During prolonged exposure to hypobaric hypoxia, a three-day dietary nitrate supplementation accelerated the recovery kinetics of mV̇O<sub>2</sub>, suggesting an improvement of muscle oxidative capacity. Future studies will have to investigate if these results are related to an increased mitochondrial efficiency and/or to a better microvascular perfusion after nitrate supplementation in hypoxia.

3002 Board #6 June 2 3:15 PM - 5:15 PM

**Limb Muscle and Frontal Lobe Oxygenation Saturation during Exercise at Altitude Following Acute Nitrate Loading**

David M. Fothergill, Haley Dodson, Allison R. Loiselle. *Naval Submarine Medical Research Laboratory, Groton, CT.*  
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(No relationships reported)

**BACKGROUND:** It has been theorized that the ergogenic efficacy of nitrate (NO<sub>3</sub><sup>-</sup>) supplementation on aerobic performance may be best observed during exercise performed at altitude where the O<sub>2</sub> independent NO<sub>3</sub><sup>-</sup>-nitrite (NO<sub>2</sub><sup>-</sup>)- nitric oxide (NO) pathway may become an increasingly important source of NO bioavailability that could potentially favorably influence tissue blood flow and tissue oxygen saturation levels.

**PURPOSE:** To determine if acute NO<sub>3</sub><sup>-</sup> supplementation impacts limb muscle oxygen saturation (SmO<sub>2</sub>) and brain frontal lobe oxygen saturation (SbO<sub>2</sub>) during exercise under hypobaric hypoxia.

**METHODS:** Recreationally active individuals (11 males, 1 female; mean ± SD age = 38.1 ± 12.6 yr., sea level maximal oxygen uptake (VO<sub>2</sub>max) = 41.7 ± 5.7 ml/kg/min) conducted 2 exercise trials (nitrate loading (N), and placebo (P)) while exposed to a simulated altitude of 3,048 m in a hypobaric chamber. Each trial consisted of 15 min of steady state cycle exercise at 45% of their maximum sea level workload, followed by an incremental exercise test to exhaustion. 110 minutes before starting the steady state exercise in the N and P trials, subjects drank 500 ml of water containing either 20.4 mg/kg of NaNO<sub>3</sub> or the equivalent molar concentration of NaCl respectively, in a double-blind randomized, placebo-controlled cross-over fashion. Oxygen saturation of the vastus lateralis and frontal lobe of the brain were measured using near-infrared spectroscopy and were expressed as changes from their respective sea level rest conditions prior to analysis.

**RESULTS:** SmO<sub>2</sub> decreased linearly with increasing workload (p<0.00001) but did not differ between the N and P trials during the steady state submaximal exercise or at any workload during the VO<sub>2</sub> max exercise. SbO<sub>2</sub> also did not differ between the N and P trials during exercise at altitude. There was however a significant two-way interaction between workload and supplement condition for oxyhemoglobin concentration (ΔHbO<sub>2</sub>) of the frontal lobe during the VO<sub>2</sub>max test (F<sub>4,40</sub> = 4.37, p<0.01) that was due to a lower frontal lobe ΔHbO<sub>2</sub> in the N trial compared to the P trial that occurred only at the maximal workload (p <0.05).

**CONCLUSIONS:** Acute NaNO<sub>3</sub> supplementation does not alter SmO<sub>2</sub> or SbO<sub>2</sub> during steady state or maximal exercise at altitude, but may lower frontal lobe ΔHbO<sub>2</sub> only at maximal exercise.

**F-31 Thematic Poster - Nutritional Status of Athletes II**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
Room: 101

3003 **Chair:** Kelly L. Pritchett. *Central Washington University, Ellensburg, WA.*

(No relationships reported)

3004 Board #1 June 2 3:15 PM - 5:15 PM

**Comparison Of High And Low 25(OH)-Vitamin D Concentrations On Recovery From Resistance Exercise In Men**

Leonardo P. Oliveira<sup>1</sup>, Sandro Bartolomei<sup>1</sup>, Eliahu Sadres<sup>1</sup>, David Church<sup>1</sup>, Elliott Arroyo<sup>1</sup>, Joseph A. Gordon, III<sup>1</sup>, Alyssa N. Varanoske<sup>1</sup>, Ran Wang<sup>1</sup>, Kyle S. Beyer<sup>1</sup>, Jeffrey R. Stout, FACSM<sup>1</sup>, John A. Rathmacher<sup>2</sup>, Jay R. Hoffman, FACSM<sup>1</sup>.

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(No relationships reported)

**BACKGROUND:** Vitamin D status (VITD) has been related to impaired skeletal muscle function, and may be associated with recovery after muscle injury. Limited data exists on the relationship between VITD concentrations, muscle damage and inflammatory markers from an acute bout of exercise.

**PURPOSE:** Examine the effect of VITD concentrations on acute physiological responses and recovery indices from resistance exercise. **METHODS:** 15 resistance trained men (24±4 y) with at least 2 years of resistance training experience volunteered to participate in this study. Participants were grouped into a low 25(OH)-VITD (LVD; 26.7±1.7 ng·ml<sup>-1</sup>; n=7) or high 25(OH)-VITD (HVD; 37.2±7.2 ng·ml<sup>-1</sup>; n=8) group based upon baseline (BL) 25(OH)-VITD concentrations. Participants performed 8 sets of 10-12 repetitions at 70% of the maximal strength of the squat exercise, with 75 s of rest between sets. Performance [counter movement jump (CMJP), endocrine (testosterone [T] and cortisol [C]), inflammatory (IL-6 and C-reactive protein [CRP]), and muscle damage (creatin kinase [CK] and myoglobin [MB]) assessments were performed at BL, 30-min, 24-h, 48-h and 72-h post-exercise. Data was analyzed using a repeated measures ANOVA. To complement this procedure, magnitude based inferences were used to provide additional interpretation of the differences that VITD concentrations may have had on the recovery response. **RESULTS:** No significant interactions were noted between LVD and HVD in CMJP (p=0.26), C (p=0.97), T (p=0.21), CRP (p=0.30), IL-6 (p=0.58) or CK (p=0.16) responses to the exercise protocol. However, a significant interaction was observed in MB (p=0.05) responses. Although post-hoc analyses failed to see any significant differences between the groups at any time point, inferential analysis indicated that MB concentrations was "likely" higher at 30-min for LVD (87.2±57.4 ng·ml<sup>-1</sup>) than HVD (51.3±21.9 ng·ml<sup>-1</sup>). CRP levels were "likely" lower at 24-h (549±373 mg·L<sup>-1</sup> vs. 1344±1654 mg·L<sup>-1</sup>) and 48-h (565±386 mg·L<sup>-1</sup> vs. 1079±1077 mg·L<sup>-1</sup>) for HVD. Inferences for all other comparisons were unclear. **CONCLUSIONS:** Results indicated that HVD provides a degree of resiliency towards acute muscle damage and enhances recovery of high velocity resistance exercise compared to LVD. Further research using greater sample size appears warranted.

3005 Board #2 June 2 3:15 PM - 5:15 PM

**Exploring the Relationship between Soluble Fiber Intake and Bone Mineral Density in Athletes**

Anneliese M. Kuemmerle<sup>1</sup>, Jody L. Herman<sup>1</sup>, Emily N. Werner, FACSM<sup>1</sup>, Jacqui Van Grouw<sup>1</sup>, Rachel C. Kelley<sup>2</sup>, Francesco Alessio<sup>1</sup>, Michael L. Bruneau, 19102<sup>1</sup>, Stella L. Volpe, 19102, FACSM<sup>1</sup>. <sup>1</sup>Drexel University, Philadelphia, PA. <sup>2</sup>University of Florida, Gainesville, FL. (Sponsor: Stella Lucia Volpe, FACSM)  
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(No relationships reported)

Short chain fatty acids (SCFAs) produced by bacterial fermentation of soluble fiber in the gut enhance mineral absorption. SCFAs reduce luminal pH, affect signal pathways, alter epigenetic regulation, and foster the proliferation of immune-modulating gut bacteria, suggesting a positive correlation between soluble fiber intake and bone mineral density (BMD). **PURPOSE:** To evaluate the relationship between soluble fiber intake and total body BMD in athletes 18 years of age and older. **METHODS:**

Thirty-one participants (16 females, 15 males) who volunteered for a cross-sectional study underwent dual energy X-ray absorptiometry (DXA) scans and completed self-administered Block Food Frequency Questionnaires (FFQ). **RESULTS:** Participants' mean age was 35.7±10.9 years, and mean body mass index (BMI) was 25.32±3.77 kg/m<sup>2</sup>. Participants consumed an average of 1960.3±644.2 kilocalories/day. Mean daily soluble fiber intake was 7.1±2.3 grams/day. Average total body BMD was 1.28±0.12 g/cm<sup>2</sup>. There was no significant correlation between soluble fiber intake and BMD ( $r=0.188$ ,  $p=0.312$ ). No significant correlation was found between soluble fiber intake and BMD for women ( $r=0.057$ ,  $p=0.835$ ) or men ( $r=-0.477$ ,  $p=0.073$ ). A multiple linear regression was calculated to predict BMD based on soluble fiber intake controlling for intakes of calcium, vitamin D, and protein. No significant regression equations were found for the total sample ( $p=0.357$ ), women ( $p=0.617$ ), or men ( $p=0.177$ ). **CONCLUSIONS:** Soluble fiber intake was not correlated with BMD in this sample of athletes. Directions for future research include recruiting a larger sample and exploring the possibility of a synergistic relationship between soluble fiber and intake of minerals. These represent data from an unfunded research project

3006 Board #3 June 2 3:15 PM - 5:15 PM  
**Validation Of A Two-item Food Security Screening Tool For Male, Collegiate Athletes**

David H. Holben, Kacie Poll, Melinda Valliant, Hyun-Woo (David) Joung, *University of Mississippi, University, MS.*  
 (Sponsor: Mark Loftin, FACSM)  
 (No relationships reported)

Food insecurity (FI), lacking access to food for an active healthy life, is associated with poor nutrition and health outcomes. Collegiate athletes may have experienced FI during childhood (CH) or high school (HS) and may also experience it at college (COL), which may negatively impact food acquisition and habits. A brief CH food security status (FSS) screening tool was previously validated by Hager et al. (2010) in low-income families with children.

**PURPOSE:** To develop a brief FSS screening tool and to examine its sensitivity (SENS) and specificity (SPEC) in a sample of NCAA Division 1 male, collegiate athletes ≥18 years of age (y). **METHODS:** A cross-sectional survey of NCAA athletes from a Southeastern Conference (SEC) university was approved by the Institutional Review Board and conducted during August-September, 2016. The questionnaire included the USDA food security survey module and a 2-item measure to assess CH, HS, and COL FSS. USDA and Hager et al. methods were used to calculate FSS and SENS/SPEC, respectively. **RESULTS:** Participating athletes (n=93) were 19.7±1.4 y and primarily white, football players [race: white (n=45, 48.4%); black (n=38, 40.9%); other (n=10, 10.9%)] [sport: football (n=65, 69.9%); baseball (n=20, 21.4%); cross country/track (n=5, 5.4%); golf (n=3, 3.2%)]. The CH 2-item measure was highly SENS (92.9%) and SPEC (91.1%) for HS FSS, as was the HS 2-item method (SENS 92.9%, SPEC 94.9%). The COL 2-item measure was highly SENS (100%) and SPEC (88.9%) for COL FSS. **CONCLUSION:** A 2-item FSS can be used to screen for FI in male collegiate athletes. Further research to validate its use in a larger sample that includes females is warranted, as is research to assess the relation of FI to eating behaviors in athletes.

3007 Board #4 June 2 3:15 PM - 5:15 PM  
**The Relationship Between In-Race Nutrition and Finish Time for Ironman Triathletes**

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 (No relationships reported)

**PURPOSE:** The purpose of the present investigation was to determine the predictive power of triathletes' in-race nutrition plans during an Ironman triathlon on overall finish time. Aspects of the in-race nutrition plans considered were calories consumed per hour while biking, total caffeine consumed while biking, and total fluids consumed on the bike portion of the Ironman race. **METHODS:** Ironman triathletes (N= 152) were surveyed to determine their in-race nutrition plan at Ironman Wisconsin and the Ironman World Championships. A regression analysis was utilized to determine the predictive power of calories, fluid and caffeine consumed on the bike on overall Ironman finish time. **RESULTS:** Average Ironman finish time (N= 152) was 12:41:12 (+/-2:04:43), average calories consumed per hour on the bike was 268.83 (+/- 131.71). Average fluid consumed during the biking portion of the race was 3559.52 mLs (+/- 1802.52). Average caffeine consumed during the biking portion of the race was 89.16 mg (+/- 143.84). The amount of calories consumed per hour on the bike and in-race caffeine consumption was significantly ( $p < .05$ ) correlated with Ironman finish time ( $r = -.355$ ,  $r = -.191$ , respectively), while fluid intake was not significantly ( $p > .05$ ) correlated with Ironman performance ( $r = -.054$ ). Calories and caffeine consumption while biking were used to create a multiple regression equation. The overall regression model was statistically significant  $F(2, 137) = 12.845$ ,  $p < .05$ . The regression equation revealed that 15.8% of the variance in Ironman race time can be significantly ( $p < .05$ ) attributed to calories and caffeine consumption during the bike portion of the

race. **CONCLUSIONS:** Total fluid consumed on the bike portion of the Ironman was not correlated to overall finish time; however, calories per hour and total caffeine consumed on the bike both were negatively correlated with overall finish time. This suggests that greater calorie and caffeine consumption on the bike can contribute to decreased overall finish time, and hence an improvement in performance.

3008 Board #5 June 2 3:15 PM - 5:15 PM  
**Weight Cutting And Professional Mixed-martial Artists: How Do They Cut Weight And Who Is Advising Them?**

Michelle K. Alencar, David Bautista, John Sassone, Dustin Durke, Leilani Madrigal, Alison Ede. *CSU-Long Beach, Long Beach, CA.*  
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 (No relationships reported)

**PURPOSE:** Although mixed martial arts (MMA) has been around for decades, current peer-reviewed literature is limited to individual sports (such as boxing, judo, and wrestling) that compose mixed martial arts (MMA). Within other combat sports, weight cutting practices have included methods of extreme dehydration or food restriction; however data is lacking in professional MMA athletes. Thus, the purpose of this study was to survey professional MMA athletes about their current and past weight cutting methods as well as to investigate who is advising them nutrition and strength and conditioning.

**METHODS:** N=55 male professional mixed martial artists (18-40 yrs) were recruited from every weight class in the states of California and New Mexico. Participants were administered a questionnaire that had been reviewed by a registered dietitian, a certified strength and conditioning specialist, and an exercise physiologist. Data presented as percentage of frequency of responses calculated using IBM Analytics, SPSS v24.

**RESULTS:** The top 3 methods MMA fighters use in cutting weight were food restriction (87.3%), increased training (70.9%) and the Sauna (69.1%). Most MMA fighters do not utilize a professional nutritionist/dietitian for advice during either the weight cut (74.5%) or off-season (75.4%). In fact, only 7.3% reported they regularly used a professional nutritionist/dietitian when cutting weight. Fighters are receiving nutrition advice primarily from teammates (78.2%), while only 23.6% are getting any advice, on or off-season from a professional nutritionist.

**CONCLUSIONS:** Professional mixed martial artists report cutting weight for a fight using methods that can be considered dangerous and impair performance. Many reported receiving no professional advice on or off-season from a licensed nutritionist or dietitian.

3009 Board #6 June 2 3:15 PM - 5:15 PM  
**Nutrition Goals Prioritized By Elite Endurance Runners Undergoing A Nutrition Education Intervention**

Michelle Barrack<sup>1</sup>, Michael Fredericson, FACSM<sup>2</sup>, Tenforde S. Adam<sup>3</sup>, Emily Kraus<sup>2</sup>, Brian Kim<sup>4</sup>, Sonal Singh<sup>4</sup>, Andrea Kussman<sup>4</sup>, Kristen Gravani<sup>2</sup>, Yasi Ansari<sup>4</sup>, Beth Miller<sup>4</sup>, Aurelia Nattiv, FACSM<sup>4</sup>. <sup>1</sup>California State University, Long Beach, Long Beach, CA. <sup>2</sup>Stanford University, Palo Alto, CA. <sup>3</sup>Spaulding Rehabilitation Hospital, Cambridge, MA. <sup>4</sup>University of California Los Angeles, Los Angeles, CA. (Sponsor: Aurelia Nattiv, FACSM)  
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 (No relationships reported)

Few studies have evaluated goals selected by endurance runners and their sports dietitian to address nutritional deficits.

**PURPOSE:** To outline nutrition goal(s) chosen during a nutrition education session among a sample of NCAA Division I male and female endurance runners enrolled in a nutrition education intervention focused on optimizing intake of energy, bone building nutrients, and reducing the risk of bone stress injury.

**METHODS:** Fifty-nine collegiate distance runners from two institutions met with a sports dietitian for a 15-30 minute counseling session to address current food intake, exercise training, anthropometric measures and nutrition goals. Runners, with guidance from the sports dietitian, chose 1-3 goals from seven preselected goal options including adding ≥1 snacks/day; adding a meal/day; increasing intake of energy dense foods; increasing intake of carbohydrate rich foods; adding or modify a pre/post workout snack; increasing intake of calcium, vitamin D; eating more frequently. Chi-square analyses evaluated group differences.

**RESULTS:** The most common goals included 1) adding ≥1 snacks/day (45.8% of runners) and 2) adding or modifying a pre/post workout snack (40.7% of runners). Runners' least common goal was to eat more frequently (8.5% of runners). Female compared to male runners were more likely to choose the goal of adding a meal/day (18.5% vs. 3.1%,  $p=0.05$ ), whereas more runners with low BMI (< 18.5 kg/m<sup>2</sup>) compared to ≥18.5 kg/m<sup>2</sup> chose goal of increasing intake of energy dense foods (50.0% vs. 12.7%,  $p=0.05$ ). Runners characterized with "moderate" vs. "low" or "high" risk for the Female Athlete Triad (or comparable Male Triad) were more likely

to choose the goal of increasing intake of carbohydrate-rich foods (30.8% vs. 3.7% and 0%, respectively,  $p=0.02$ ). A larger proportion of runners with “high” vs. “moderate” or “low” risk selected the goal of adding a meal/day (40.0% vs. 11.5% vs. 3.7%,  $p=0.05$ ).

**CONCLUSIONS:** While the most common goal runners selected focused on adding  $>=1$  snacks/day, those classified with “high” risk for the Triad or low BMI prioritized adding a meal/day or increasing the energy density of foods consumed. These findings may aid runners and their sport dietitian in selecting goals for optimizing nutrient intake, which may benefit health and performance.

3010 Board #7 June 2 3:15 PM - 5:15 PM  
**Influence of a Nutrition Recovery Station Following Exercise on Acute Dietary Intake.**  
 Ben Desbrow, 4222<sup>1</sup>, Katelyn Barnes<sup>1</sup>, Gregory Cox<sup>2</sup>, Caroline Young<sup>1</sup>, Chris Irwin<sup>1</sup>. <sup>1</sup>Griffith University, Gold Coast, Australia. <sup>2</sup>Australian Institute of Sport, Gold Coast, Australia. (Sponsor: Professor Louise Burke, FACSM)  
 Email: b.desbrow@griffith.edu.au  
**Reported Relationships:** B. Desbrow: Royalty; Human Kinetics - Caffeine for Sports Performance Book.

**PURPOSE:** Immediate post-exercise access to fluid/food via a recovery station is a common feature of mass participation sporting events. Yet little evidence exists examining their impact on improving recovery or influencing subsequent dietary intake. This study aimed to determine if access to food/fluid during a post-exercise recovery period significantly alters dietary and fluid intakes over a 24hr period.  
**METHODS:** 127 (79 males) healthy participants (mean±SD, age=22.5±3.5y, body mass (BM)=73±13kg) completed two self-paced morning 10km runs separated by 1 week. Immediately following the first run, participants were randomly assigned to enter a “recovery station” (*ad libitum* water, sports drink and fruit) for 30min or leave without access to the recovery area. All participants completed the alternate recovery option the following week. Participants recorded nude BM before and after exercise and measured Urine Specific Gravity ( $U_{SG}$ ) before running and the following morning. Additionally, participants recorded all food and fluid consumed for both run days via a food diary and photographs which were analysed by a qualified dietitian. Paired-samples *t*-tests assessed differences in hydration and dietary outcome variables (Recovery vs No Recovery).  
**RESULTS:** No difference in pre-exercise  $U_{SG}$  or BM change during exercise were observed between intervention groups ( $p>0.05$ ). Attending the recovery zone resulted in a greater total daily fluid intake (Recovery=3.37±1.46L, No Recovery=3.16±1.32L,  $p=0.009$ ) but had no influence on daily total energy (Recovery=10.15±4.2MJ, No Recovery=10.15±3.9MJ), carbohydrate (Recovery=276±131g, No Recovery=264±128g) or protein (Recovery=118±61g, No Recovery=122±54g) ( $p>0.05$ ) intakes. Next day morning  $U_{SG}$  values were not different between groups (Recovery=1.018±0.007, No Recovery=1.019±0.009,  $p>0.05$ ).  
**CONCLUSIONS:** Attending a recovery station immediately following a 10km run has little impact on 24h exercise day dietary intake or rehydration in recreational runners.

**F-32 Thematic Poster - Physical Activity and Mental Health**  
 Friday, June 2, 2017, 3:15 PM - 5:15 PM  
 Room: 304

3011 **Chair:** Matthew P. Herring. University of Limerick, Limerick, Ireland.  
 (No relationships reported)

3012 Board #1 June 2 3:15 PM - 5:15 PM  
**Promoting Mental Among Urban Adolescents Through Physical Activity: Open-trial of Leaders@Play 2.0**  
 Eduardo E. Bustamante<sup>1</sup>, Tara G. Mehta<sup>1</sup>, Angela L. Walden<sup>1</sup>, Hannah Munson<sup>1</sup>, Aneisha Dunmore<sup>1</sup>, Grace Cua<sup>1</sup>, Stacy L. Frazier<sup>2</sup>. <sup>1</sup>University of Illinois at Chicago, Chicago, IL. <sup>2</sup>Florida International University, Miami, FL.  
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 (No relationships reported)

**PURPOSE:** Early adolescence is characterized by decreasing parental monitoring and increasing peer pressure to engage in risky behaviors that may initiate a trajectory toward poor school outcomes, association with deviant peers and stressful life events. High-quality physical activity programs can promote mental and physical health of urban youth by providing refuge from neighborhood violence and opportunities for social skills development and positive peer relations. **METHODS:** Middle school

youth across 5 Chicago Park District parks participated in an open trial of Leaders @ Play 2.0, a 1-2 hour biweekly component of a 6-week Summer Camp. Leaders @ Play was developed via university-community partnership, co-facilitated by park staff and mental health staff, and designed to teach and reinforce life skills (i.e., effective communication, emotion regulation, and problem solving) through physically active games and relaxation activities. The Strengths and Difficulties Questionnaire (SDQ) was completed by parents at baseline and post-test. The SDQ reports a prosocial scale, total problems scale, and 4 subscales (emotional problems, conduct problems, peer problems, and hyperactivity / inattention). Descriptive statistics were analyzed for all participants at baseline and paired *t*-tests and within-group effect sizes (Cohen’s *d*) were calculated for participants providing both baseline and post-test data. **RESULTS:** Youth (N=38) were 31% Hispanic; 26% African American; 55% low-income, 57% male, and M=13.2 years-old. Effect sizes demonstrated a moderate effect on prosocial behavior ( $t[1,14]=2.02, p=.063; d=0.70$ ) and a small effect on total problems ( $t[1,14]=2.00, p=.066; d=-.043$ ). Among subscales, emotional problems improved significantly ( $t[1,14]=2.66, p<.05; d=-.70$ ), a small non-significant effect size was evident for conduct problems ( $t[1,14]=1.19, p=.253; d=-.31$ ), while peer problems ( $t[1,14]=-0.37, p=.719; d=0.07$ ) and hyperactivity / inattention ( $t[1,14]=7.91, p=.442; d=-0.16$ ) were unaffected. **CONCLUSIONS:** Findings provide preliminary support for the potential of physical activity programs that systematically challenge and reinforce social skills to improve prosocial behaviors and decrease emotional problems amongst adolescents in urban settings.

3013 Board #2 June 2 3:15 PM - 5:15 PM  
**Is There A Shift In The Ideal Body In The Adolescents?**  
 Christine Sundgot-Borgen<sup>1</sup>, Kethe Engen<sup>1</sup>, Elin Kolle<sup>1</sup>, Jorunn Sundgot-Borgen, FACSM<sup>1</sup>, Monica Klungland Torstveit<sup>2</sup>, Solfrid Bratland-Sanda<sup>3</sup>. <sup>1</sup>Norwegian School of Sport Sciences, Oslo, Norway. <sup>2</sup>University of Agder, Kristiansand, Norway. <sup>3</sup>University College of Southeast Norway, Bø Telemark, Norway. (Sponsor: Jim Skinner, FACSM)  
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 (No relationships reported)

**PURPOSE:** A healthy body image is important for adolescents. It serves as a predictor of good quality of life and should be given focus when working to improve health in adolescents. Unfortunately, previous studies have reported that a high prevalence of male and female adolescents are dissatisfied with their bodies, and especially females have high drive for thinness. However, a muscular and lean body is presented as the new ideal body in the social media. Therefore, it is expected that this might affect the ideal body in the adolescents. The purpose is therefore to investigate how male and female adolescents report that a muscular and lean body is important, if there are differences between what male and females report, and whether this drive for muscularity and leanness is more prevalent than drive for thinness among male and female high-school students.  
**METHODS:** We used baseline data from an ongoing RCT aiming to enhance positive body image among high-school students in Oslo and Akershus County. A total of 1703 students aged 16-17 years ( $n=630$  males, BMI=21.7 kg/m<sup>2</sup> (2,8), and  $n=1073$  females, BMI=21.4 kg/m<sup>2</sup> (2,9)) were included. The Drive for Leanness Scale (DLS) and the Internalization; Thin/Low Body Fat subscale (of SATAQ-4) were used to assess prevalence of students with high scores on the Drive for leanness and Thin/Low Body Fat subscale. Pearson Chi-Square analyses were used to examine group differences. A *p*-value  $<0.05$  was considered significant.  
**RESULTS:** A significantly higher prevalence of female students (39%) compared to males (18%) had high scores on the Drive for leanness scale ( $p<0.001$ ). A significantly higher prevalence of females (17%) compared to male students (13%) had high score on the Thin/Low Body Fat subscale ( $p<0.05$ ). When comparing physically active male and females with non-active male and females, no significant difference was observed between groups on the Thin/Low Body Fat subscale.  
**CONCLUSIONS:** Our results show that a drive toward a muscular and lean body is more common among both male and female students as compared to the drive for thinness. This might indicate a shift in the ideal body especially for the female adolescents.

3014 Board #3 June 2 3:15 PM - 5:15 PM  
**Subjective and Physiological Predictors of Anxiety at Rest and During a Working Memory Task**  
 Brooks P. Leitner, Abigail Hsiung, Courtney Duckworth, Tiffany Lago, Christian Grillon, Monique Ernst, Robert Brychta, Kong Chen. National Institutes of Health, Bethesda, MD.  
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 (No relationships reported)

**Purpose:** Prior research has suggested that an acute bout of moderate exercise is associated with reduced state anxiety in healthy adults and patients with anxiety disorders. However, it is unclear if low-intensity exercise would have the same or

reduced impact on state anxiety as compared to moderate. Our aim was to combine subjective ratings of exertion and physiological measures to ascertain if low and moderate acute exercise influences anxiety at rest and during a working memory (WM) task.

**Methods:** In an ongoing study, 21 healthy adults (9 female, age: 26.5±1.25 yrs, VO2Max: 35.3±10.8 mL/kg/min.) performed three exercise sessions on a cycle ergometer: one maximal exercise test and two subsequent randomized 30-minute exercise sessions at moderate and low (60-70% and 10-20% heart rate reserve, respectively) intensities separated by approximately 1 week. Ratings of perceived exertion (RPE) were obtained every 5 minutes during each submaximal exercise session. 30 minutes after exercise, subjects performed a WM task (n-back) under standardized threat of electric shock and safe conditions. Anxiety was assessed subjectively by ratings on a scale from 1-10 before the task and after each of four runs of the n-back (3 difficulty loads: 0-back, 1-back, 3-back). Paired Ttests were used to test the difference in state anxiety following submaximal exercise and linear mixed effects tests were used to assess the influence of RPE these findings.

**Results:** Anxiety scores post-exercise were lower following moderate exercise during the 3-back while under threat of shock only after the first run (5.5±2.3 vs. 4.1±2.4, p=0.03). TTests did not show anxiety scores to differ at any other time points nor conditions (p's>0.05). RPE scores during moderate and low intensity exercises were negatively associated with anxiety 30-min post-exercise (before the n-back, B=-0.38±0.17, p=0.04), during the 3-back while under threat of shock (B=-0.51±0.17, p<0.01), and during the 3-back safe condition (B=-0.32±0.12, p=0.02).

**Conclusion:** Moderate exercise led to lower state anxiety than low intensity exercise during the highest difficulty WM task, yet these effects were short lasting. Higher RPE during exercise, up to 60-70% HRR, predicted lower anxiety at rest and during a cognitively challenging WM task under both anxiogenic and normal conditions.

3015 Board #4 June 2 3:15 PM - 5:15 PM

#### Longitudinal Influence Of Prolonged And Short Bouts Of Sedentary Time On Mental Wellbeing

Laura D. Ellingson<sup>1</sup>, Jacob D. Meyer<sup>2</sup>, Robin P. Shook<sup>3</sup>, Steven N. Blair, FACSM<sup>4</sup>. <sup>1</sup>Iowa State University, Ames, IA. <sup>2</sup>University of Wisconsin- Madison, Madison, WI. <sup>3</sup>Children's Mercy Hospital, Kansas City, MO. <sup>4</sup>University of South Carolina, Columbia, SC.

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Excessive sedentary time is related to poor mental wellbeing. However, the differential influence of sedentary time accumulated in prolonged versus short bouts on factors related to mental wellbeing is unknown. **PURPOSE:** To examine the longitudinal influence of sedentary bout length on mood, stress, and sleep over one year.

**METHODS:** Two hundred and seventy healthy adults (48% women; age 27.8 ± 3.7) completed the Profile of Mood States (POMS) and the Perceived Stress Scale (PSS), and wore a Sensewear Armband to objectively measure sedentary time, physical activity, and sleep duration and efficiency at baseline and one year later. Prolonged and short bouts of sedentary time were operationalized to those greater and less than 30 minutes in duration. Fixed effects regression analyses were performed with baseline minutes and changes in prolonged and short bouts of sedentary time and minutes of moderate and vigorous physical activity (MVPA) as predictors of changes in mood disturbance, stress, and sleep duration and efficiency over one year as outcomes.

**RESULTS:** For mood, the overall model was significant (p=0.04) with changes in prolonged (p=0.004) and short bouts (p=0.006) of sedentary time positively predicting changes in mood disturbance. For stress, the overall model trended towards significance (p=0.06) with only changes in prolonged bouts of sedentary time as a positive predictor (p=0.003). For sleep duration, the overall model was significant (p<0.0001) with changes in prolonged and short bouts of sedentary time as inverse predictors and change in MVPA as a positive predictor (all p<0.0001).

For sleep efficiency, the overall model was significant (p<0.03) with changes in both prolonged (p=0.017) and short bouts of sedentary time (p=0.008) as inverse predictors.

**CONCLUSIONS:** Changes in both prolonged and shorter bouts of sedentary time are predictive of future mood, stress, and sleep in healthy young adults adding to the evidence that sedentary time has negative, long-term consequences for wellbeing, regardless of how it is accumulated. Interestingly, in this sample of healthy adults, baseline levels of sedentary time and MVPA were not predictive of changes in mental wellbeing-related outcomes. Interventions targeting sedentary time may not need to target specific bout lengths to realize benefits.

3016 Board #5 June 2 3:15 PM - 5:15 PM  
Acute Moderate Exercise Improves Working Memory Efficiency In Humans

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(No relationships reported)

**Background:** Despite evidence indicating that a single bout of exercise can reduce state anxiety and improve cognitive function, (for review Chang et al. 2015, Ensari et al. 2015) few studies have examined the impact of acute exercise on the relationship between anxiety and cognition. The current study explores the modulatory effects of exercise on anxiety and working memory (WM) performance. Moderate exercise, compared to light exercise, was expected to improve WM performance, while decreasing self-reported anxiety and physiological measures (anxiety-potentiated startle) of anxiety.

**Methods:** Healthy adults (N = 21) of varied physical fitness levels underwent three exercise sessions on a cycle ergometer: one maximal exercise test to assess maximal heart rate (HR) and two subsequent randomized 30-minute exercise sessions at moderate (60-70% HR reserve (HRR)) and low (10-20% HRR) intensities. After exercise, subjects performed a WM task (n-back) under threat of unpredictable electric shock and safe conditions. Anxiety was probed using the acoustic startle reflex and retrospective subjective measures. WM performance (accuracy and reaction time), subjective anxiety, and startle variables were analyzed using 3-way ANOVAs, with Condition (threat, safety), Load (0-back, 1-back, 3-back), and Exercise (light, moderate) as within-subject factors.

**Results:** Participants reported higher subjective feelings of anxiety and had a greater startle response in the threat compared to the safe condition. Moderate intensity exercise resulted in a faster reaction time at a trend level time (F(1,19) = 3.34, p = 0.08) without compromising accuracy. This was most notable during the 3-back WM level (F(2,18) = 3.69, p = 0.05) during both safe and threat contexts. There was no effect of exercise level on subjective anxiety or anxiety-potentiated startle.

**Conclusion:** Acute moderate exercise improves cognitive efficiency (shorter reaction times) without compromising accuracy but does not reduce elevated state anxiety. This might be due to an increase in arousal that affects reaction time but not the distribution of working memory resources between cognitive function and anxiety. If this pattern strengthens with the full sample (N=36), we will (1) move to a patient population, and (2) apply this protocol to a neuroimaging study.

3017 Board #6 June 2 3:15 PM - 5:15 PM  
Use of a Sit-Stand Desk Reduces Wake Time During the Subsequent Night's Sleep

Christopher E. Kline, Robert J. Kowalsky, Sophy J. Perdomo, Bethany Barone Gibbs. *University of Pittsburgh, Pittsburgh, PA.*

(Sponsor: John M. Jakicic, FACSM)

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**Reported Relationships:** C.E. Kline: Contracted Research - Including

Principle Investigator; HumanScale.

Acute bouts of leisure-time physical activity commonly improve sleep on the subsequent night. However, the impact of sedentary behavior on sleep is unclear. Further, whether breaking up sedentary time during the workday improves the following night's sleep is unknown. **Purpose:** To examine whether breaking up prolonged sedentary time by standing during the workday leads to better sleep the following night in comparison to a sedentary workday. **Methods:** 25 inactive adults with untreated pre- or stage 1 hypertension (16 males, 42±12 yr, body mass index: 31.9±5.0 kg/m<sup>2</sup>) participated in a randomized crossover trial consisting of two simulated 8-h workdays: one with continuous sitting (SIT) and one with alternating periods of sitting and standing every 30 min (SIT-STAND). Sleep was assessed on the night following each simulated workday. Participants completed a diary to indicate sleep onset latency (SOL), number of awakenings, wakefulness after sleep onset (WASO), and depth and quality of sleep. Participants also wore an accelerometer on the non-dominant wrist (Philips Actiwatch Spectrum) to objectively assess sleep (bedtime, out-of-bed time, total sleep time, SOL, WASO). Paired t-tests and effect size calculations were used to evaluate differences in sleep following the two conditions.

**Results:** Diary-based WASO was significantly lower following SIT-STAND compared to SIT (13.9±30.1 min vs. 23.2±38.6 min; P=.03, d=0.47). Self-reported SOL, awakenings, sleep depth, and sleep quality were not significantly between conditions, though SIT-STAND led to small-sized reduction in SOL and awakenings (d=0.33 and d=0.29, respectively). There was a small-sized reduction in actigraphic WASO following SIT-STAND compared to SIT (30.2±12.7 min vs. 37.7±25.0 min; d=0.39), though this difference was not statistically significant (P=.09). Actigraphic estimates of bedtime, out-of-bed time, total sleep time, and SOL did not differ between conditions (P>.61, d<0.11). **Conclusion:** Alternating sitting and standing during the workday leads to small improvements in sleep on the night following the simulated workday, particularly in reduced wake time. Whether this effect on sleep remains or is enhanced with long-term reduction in workplace sedentary behavior deserves further exploration.

- 3018 Board #7 June 2 3:15 PM - 5:15 PM  
**Physical Activity As A Mediator Of Intervention Effects On Depression And Perceived Stress Among Latinas**  
 Andrea S. Mendoza-Vasquez<sup>1</sup>, Shira Dunsiger<sup>2</sup>, Britta Larsen<sup>3</sup>, Bess H. Marcus<sup>3</sup>. <sup>1</sup>UC San Diego/San Diego State University, San Diego, CA. <sup>2</sup>Brown University, Providence, RI. <sup>3</sup>UC San Diego, San Diego, CA.  
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Physical activity (PA) may reduce depression and stress. While Latinas have unique risk factors and buffers for depression and stress, there is limited research regarding the effects of PA on these outcomes within this population.

**PURPOSE:** The aim of this study is to investigate the potential mediating role of PA in the effects of a culturally and linguistically tailored PA intervention for Latinas on depression scores and perceived stress.

**METHODS:** Data are from a sample of 266 Latina women who participated in the Seamos Saludables intervention. Two product of coefficient mediation models were used to assess whether increases in Moderate to Vigorous PA (MVPA, as measured by the 7-day Physical Activity Recall) mediated the effect of the intervention on depression scores and perceived stress (measured by the Center for Epidemiologic Studies Short Depression Scale and the Perceived Stress Scale, respectively).

**RESULTS:** The Seamos Saludables PA intervention, which was successful in helping participants increase their PA, had no direct effect on change in depression scores, nor on change in perceived stress. Nevertheless, among completers, a significant indirect effect on depression scores ( $ab=-0.44$ ;  $CI=-0.87, -0.02$ ) and perceived stress ( $ab=-0.98$ ;  $CI=-1.75, -0.22$ ) was observed through PA. The intervention significantly increased MVPA at 12 months ( $B=57.96$ ,  $p<0.001$ ), and MVPA significantly reduced depression scores ( $B=-0.008$ ,  $p=0.018$ ) and perceived stress ( $B=-0.02$ ,  $p<0.001$ ), controlling for baseline depression and stress, respectively, and baseline MVPA.

**CONCLUSION:**

Even though there was no direct effect of the PA intervention on depression scores and perceived stress, higher levels of MPVA among participants were associated with reduced depression scores and perceived stress. Given that depression and stress are associated with negative mental and physical health outcomes, these findings represent a promising approach to improving health among Latinas.

- 3019 Board #8 June 2 3:15 PM - 5:15 PM  
**Psychological Antecedents and Consequences of Maximal Fitness Testing Among Firefighters**  
 Katie L. Andrews, Brian P. Carson, Stephen Gallagher, Matthew P. Herring. *University of Limerick, Limerick, Ireland.*  
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 (No relationships reported)

Little is known about psychological correlates of maximal aerobic and strength performance or psychological responses to maximal fitness testing among firefighters, a high-stress occupational group frequently exposed to psychological and physical stressors.

**PURPOSE:** To examine the psychological correlates of and acute responses to maximal fitness testing among firefighters. **METHODS:** Twenty-seven male firefighters, aged 31-53 years ( $42.3\pm 6.8$ ), currently working in Ireland completed measures of positive and negative affect (PANAS), mood (POMS), and state anxiety (STAI-Y1) before and 10-min after maximal fitness testing, including an isometric mid-thigh pull test followed by a maximal treadmill test. Multiple regression adjusted for age quantified associations between psychological variables and maximal aerobic capacity and full body force. Paired t-tests and standardized mean differences (SMD) quantified change in psychological outcomes in response to maximal aerobic and strength tests. **RESULTS:** Mean  $VO_{2max}$  was  $42.6\pm 7.3$  mL·min<sup>-1</sup>·kg<sup>-1</sup>. Mean full body force was  $2782.3\pm 507.6$  N. A significant inverse association was found between age and  $VO_{2max}$  ( $r=-0.42$ ,  $p\leq 0.03$ ). No outcomes were significantly associated with  $VO_{2max}$  ( $\beta$ :  $-0.14$  to  $0.25$ ; all  $p>0.17$ ) or maximal full body force ( $\beta$ :  $-0.24$  to  $0.35$ ; all  $p>0.07$ ). Though statistically nonsignificant, the direction of correlations with both  $VO_{2max}$  and maximal strength was consistent (i.e., positive or negative for both) for positive affect, feelings of energy, and state anxiety. Feelings of tension ( $p\leq 0.01$ ) and anger ( $p\leq 0.04$ ) were significantly improved, and feelings of confusion ( $p\leq 0.07$ ) and energy ( $p\leq 0.09$ ) were nominally improved. Exercise effects ranged from small-to-moderate for positive (SMD=0.15) and negative affect (SMD=0.27), feelings of depression (SMD=0.25), energy (SMD=0.31), confusion (SMD=0.36), anger (SMD=0.43), and tension (SMD=0.55), total mood disturbance (SMD=0.24), and state anxiety (SMD=0.27).

**CONCLUSIONS:** Mood, affect, and state anxiety did not significantly predict maximal aerobic capacity or strength among firefighters. Differential associations with aerobic capacity and strength were suggested. Acute maximal aerobic and strength testing resulted in small-to-moderate improvements in psychological outcomes.

**F-33 Thematic Poster - Special Populations**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
 Room: 403

- 3020 **Chair:** Geoffrey E. Moore, FACSM. *Healthy Living & Exercise Medicine Associates, Ithaca, NY.*  
 (No relationships reported)

- 3021 Board #1 June 2 3:15 PM - 5:15 PM  
**Assessment Of Cardiovascular Fitness In Wheelchair Rugby Athletes: Validation Of The 8-loop Field Test**  
 Kristian O. Nielsen<sup>1</sup>, William J. Bond, IV<sup>1</sup>, Peter Henriksen<sup>2</sup>, Tina Junge<sup>2</sup>, Ulrik Frandsen<sup>1</sup>, Per Aagaard<sup>1</sup>. <sup>1</sup>University of Southern Denmark, Odense, Denmark. <sup>2</sup>University College Lillebaelt, Odense, Denmark.  
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 (No relationships reported)

In wheelchair Rugby (WCR), the existence of large differences in disability level complicates utilizing traditional uniform test procedures among different WCR athletes. To date, no field tests measuring  $VO_{2peak}$  directly exist for the sport of wheelchair rugby. Thus, a strong need exist to establish valid and standardized, yet individually adjustable testing procedures to evaluate cardiovascular function and physiological mobility capacity in WCR.

**PURPOSE:** The present study aimed to develop an incremental field test ('8-loop') for WCR athletes, regardless of classification and disability, that involved continuous recording of progressive and maximum cardiovascular data, using an on-court standardized wheelchair exercise protocol. **METHODS:** Ten National Team male WCR athletes (31.2 years) were tested, comprising 7 athletes with tetraplegia, 1 with cerebral palsy, 1 with Charcot-Marie-Tooth Type 2 disease and 1 with lower limb amputations. All WCR classes were represented. An incremental 8-loop field test was performed to voluntary exhaustion to determine  $VO_{2peak}$ . The indoor test track consisted of a standardized 8-form (total length 226.2 m). During the test, progressive increases in lap velocity were indicated by sound signals to the athletes until failure to complete a lap within the intended lap time. Test validity was evaluated by direct measurements (Oxycon Mobile) of  $VO_2$  and RER during all laps performed. Furthermore, heart-rate (HR) progression was recorded throughout the test, and blood lactate concentration ([La], earlobe) was measured 2 minutes after test completion. **RESULTS:** During the 8-loop test, a  $VO_{2peak}$  of  $2014.4$  ml/min  $\pm 987.9$  (mean $\pm$ SD), RER  $1.11 \pm 0.15$ , HR  $143.8$  BPM  $\pm 26.4$  and [La] of  $4.1$  mmol/L  $\pm 1.7$  were measured.  $VO_{2peak}$  ( $r^2=0.83$ ,  $p<0.01$ ) and HR  $_{peak}$  ( $r^2=0.78$ ,  $p<0.01$ ) were strongly correlated to the number of stages (Laps) completed in the 8-loop test. **CONCLUSION:** Strong linear relationships were observed between the 8-loop test outcome (number of stages/laps completed) and the physiological variables obtained ( $VO_{2peak}$ , HR), which suggest that a high validity exist for this field test, when applied in elite wheelchair rugby athletes. Test-retest reliability of the 8-loop test should be evaluated in future studies.

- 3022 Board #2 June 2 3:15 PM - 5:15 PM  
**Physical Fitness And Cardiovascular Risk In People With Intellectual Disabilities**  
 Diana Alexandra Camargo, Sr.<sup>1</sup>, Marco Aurelio Rodriguez Mora<sup>2</sup>. <sup>1</sup>Santo Tomas University; *National University, Bogotá, Colombia.* <sup>2</sup>Santo Tomas University; *Bogotá, Colombia.*  
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 (No relationships reported)

**PURPOSE:** To determine the relationship between physical condition and indirect indicators of cardiovascular risk students with intellectual disability Gustavo Restrepo College. **METHODS:** This is an observational study - analytical cross section. The study makes an assessment of the anthropometric profile and physical qualities, using battery Brockport Physical Fitness for children under 18; for over 18 years, the same tests were used but with rates for their age. A sample of 175 students were evaluated, of whom 96 were men and 79 women. For statistical analysis SPSS was used, using normality tests Kolmogorov-Smirnov and Pearson correlation. **RESULTS:** The results in body composition showed higher for the population over 18 years compared with under 18 values; variables related to physical abilities had higher results in over 18 years. For variables that obtained normality in the population under 18 years, the Pearson correlation was applied, with confidence levels of 95%, where it was observed that the anthropometric variables saved a correlation positive correlation between them, which you are setting a higher cardiovascular risk ( $R = 0.85$ ,  $p 0.01$ ). As for the correlation between anthropometric variables and variables of physical fitness as  $VO_{2max}$ , and force variables, this correlation is negative ( $R = -0.365$   $p 0.01$ ), showing that students evaluated with anthropometric overweight and obesity has values less physical condition. In the population over 18 years is a negative correlation between

muscle strength and body composition variables and cardiovascular risk ( $R = -0.60$ ,  $p = 0.01$ ) was observed, and aerobic power equally between these variables ( $R = -0.428$ ,  $p = 0.01$ ). **CONCLUSION:** Although anthropometric measurements in children under 18 are generally below the limits of risk for cardiovascular disease, these results are close to those limits, which leads to argue that they need a specific prevention program. In itself a relationship between risk variables and qualities as strength and aerobic capacity is observed, so it is necessary to create programs that encourage the practice of physical activity in this population.

3023 Board #3 June 2 3:15 PM - 5:15 PM

### Relationship between Muscular Strength and Functional Balance in People Post-Stroke

Mayumi Wagatsuma, Taehoon Kim, Brenda Jeng, Cynthia Rhode, Hallie Bui, Kelly Ahrold, Teri Todd, Taeyou Jung. *California State University, Northridge, Northridge, CA.*  
(No relationships reported)

Impaired balance and weak muscle strength are common deficits associated with stroke. These deficits increase the risk of fall among people post-stroke. The relationship between muscular strength and balance was previously reported to be weak. However, the conclusion was made based on clinical balance assessments instead of biomechanical data. Limited research examined the relationship between balance and strength in people post-stroke. **PURPOSE:** To investigate the relationship between muscular strength and functional balance in people post-stroke. **METHODS:** A total of 20 people post-stroke completed balance and strength assessments over two separate visits. A computerized dynamic posturography system (NeuroCom International, Clackamas, OR, 2010) was used to perform four balance tests including limits of stability test (LOS), sit to stand test (STS), walk across test (WA), and step up and over test (SUO). In addition, participants completed isometric muscle strength tests of the trunk, hip, knee, and ankle. Peak torque was measured with a computerized dynamometer (Biodex Medical Systems Inc, Shirley, NY, 2012). Pearson's correlation test was used for statistical analysis. **RESULTS:** There was a strong correlation between max excursion (LOS test) and muscle strengths of knee flexor/extensor on the affected side ( $r$  values ranged between 0.721 and 0.793,  $p < 0.04$ ). A strong correlation was also found between step width (WA test) and muscular strengths of trunk extensor, knee flexor, ankle plantar-flexor, hip flexor and extensor on the unaffected side ( $r$  values ranged between 0.797 and 0.902,  $p < 0.01$ ). STS and SUO did not show any significant correlation with muscle strength. **CONCLUSIONS:** Our findings suggest that strengthening of the knee flexor/extensor may help people post-stroke to shift the weight to maximum range without losing balance. Also, our results indicate that the strength of the core and lower extremities muscles is strongly associated with gait stability.

3024 Board #4 June 2 3:15 PM - 5:15 PM

### Feasibility And Effectiveness Of High Intensity Exercise Training For High-Functioning Children With Autism Spectrum Disorder

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(No relationships reported)

**PURPOSE:** This study assessed the feasibility and effectiveness of a high intensity exercise program for high-functioning children with autism spectrum disorder (HFASD). **METHODS:** Thirty children with HFASD ( $M$  age:  $10.1 \pm 1.6$  yrs) engaged in a 1-hour exercise session, 4 d/wk for 5 weeks. Each session included an instruction period, warm-up, workout, related game, and cool-down. Child satisfaction surveys (7-point Likert scale) assessed perceived enjoyment of the session/program, difficulty of the activity(ies), level of staff support, physical benefits, etc. Staff satisfaction surveys assessed staff's enjoyment of running the session(s), clarity of the lessons, and utility of the manual and training. Fidelity of implementation (accuracy) was assessed in 67% of all sessions by staff not involved in exercise delivery. Biometric (i.e., height, weight, waist circumference, BMI) and physical performance data (i.e., strength, flexibility, cardiovascular fitness, power) were also collected. The intensity of physical activity during the sessions was assessed using accelerometers during the first and final week on parallel activities. Paired  $t$ -tests were used to assess pre to post program differences. **RESULTS:** Child satisfaction ratings indicated that when compared to other fitness/sport programs that they had participated in, this experience was very satisfying ( $M$ : 6.3), and that the overall feeling about the program was very positive ( $M$ : 6.4). The staff ( $N=7$ ) also rated the program very positively ( $M$ : 7.0). Results indicated that the program was implemented with a high level of accuracy (93.7%). Pre-posttest comparisons yielded statistically significant improvements in sit-ups in 60 seconds ( $M \Delta = 3.0$ ,  $p = 0.017$ ), air squats in 60 seconds ( $M \Delta = 6.9$ ,  $p = 0.001$ ), and standing long jump ( $M \Delta = 4.7$ ,  $p < 0.001$ ). Additionally, the rounds completed on parallel workouts

improved significantly ( $M \Delta = 1.4$ ,  $p = 0.011$ ), as did the time spent in moderate-to-vigorous intensity activities ( $M \Delta = 4.9$ ,  $p = 0.033$ ). There were no significant changes in biometric measures.

**CONCLUSION:** The high intensity exercise program was feasible (high levels of fidelity and child and staff satisfaction) and resulted in a number of significant improvements in the physical performance of children with HFASD.

3025 Board #5 June 2 3:15 PM - 5:15 PM

### Assessment of Arm Crank and Wheelchair Treadmill Ergometry in Wheelchair Basketball Players

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Assessing training program in competitive wheelchair basketball players is essential for successful competition and performance. **PURPOSE:** The aim of this study was to compare arm to treadmill wheelchair ergometry and to determine various metabolic and respiratory thresholds to provide athletes with optimal training prescription and training program. **METHODS:** Five male and 3 female wheelchair basketball players (age:  $29.3 \pm 2.9$  yrs; BW:  $68.0 \pm 14.3$  kg; Ht:  $164.5 \pm 20.6$  cm) of the first German division participated in this study. Participants were tested twice, once via arm ergometry and again via wheelchair treadmill in randomized order. Measured threshold variables were: blood lactate concentration ( $LA$  mmol.l<sup>-1</sup>), heart rate in beats per minute (HR bpm), power output in Watts (PO), energy expenditure (EE, Kcals), oxygen uptake ( $\dot{V}O_2$  ml.kg<sup>-1</sup>.min<sup>-1</sup>) and maximal performance expressed in percent (%). The data were calculated for differences via non-parametric statistical analysis, correlation and statistical significance ( $r$ ;  $P < 0.05$ ). The data was assessed according to two different concepts previously reported by Dickhuth and by Mader. **RESULTS:** When considering Dickhuth concept, our results yielded significant differences for LA ( $P < 0.025$ ), EE ( $P < 0.012$ ),  $\dot{V}O_2$  ( $P < 0.012$ ) and maximal performance ( $P < 0.036$ ). According to Mader concept, we found significant differences for HR ( $P < 0.012$ ), EE ( $P < 0.012$ ),  $\dot{V}O_2$  ( $P < 0.012$ ) and maximal performance ( $P < 0.02$ ). When utilizing Dickhuth concept, results yielded significant correlation for EE ( $r = 0.81$ ;  $P < 0.015$ ) only; while Mader concept revealed significant correlation for HR ( $r = 0.76$ ;  $P < 0.031$ ), EE ( $r = 0.81$ ;  $P < 0.015$ ) and maximal performance ( $r = 0.81$ ;  $P < 0.015$ ). **CONCLUSION:** Our results revealed that measures generated from arm ergometry vs. wheelchair treadmill are not useful to monitor training prescription. The large and expected significant differences in  $\dot{V}O_2$  uptake alone between arm and treadmill tests lacked usefulness of the tests. We therefore recommend using treadmill test for wheelchair basketball players as it better mirrors demands of wheelchair basketball competition.

3026 Board #6 June 2 3:15 PM - 5:15 PM

### Is the Metabolic Cost of Running Different for Athletes with Unilateral Versus Bilateral Transtibial Amputations?

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Running-specific prostheses (RSPs) enable athletes with transtibial amputations to run. Yet, it is unknown if distance running performance is different between athletes with unilateral vs. bilateral amputations. **PURPOSE:** Metabolic cost affects distance running performance. Thus, we sought to compare the metabolic cost of running for athletes with unilateral and bilateral transtibial amputations using RSPs. **METHODS:** 10 athletes with unilateral and 5 athletes with bilateral transtibial amputations each completed 15, 5-minute trials on a treadmill ( $\leq 6$  trials per day) at 2.5 or 3.0 m/s, with at least 5 minutes rest preceding each trial. Participants used a different RSP configuration for each trial. RSP configurations consisted of a randomly assigned: prosthetic model (A, B, C) stiffness category (recommended  $\pm 1$ ), and height (recommended  $\pm 2$  cm). We instructed participants to fast for at least 3 hours prior to testing. We measured and averaged the rates of oxygen consumption ( $\dot{V}O_2$ ) using open-circuit expired gas analysis during the final 2 minutes of each trial. We normalized  $\dot{V}O_2$  by participant mass, which included running gear, for each RSP condition. We then divided  $\dot{V}O_2$  by velocity to calculate the metabolic cost of transport (CoT) in ml O<sub>2</sub>/kg/km. We independently compared the lowest (best) and highest (worst) CoTs from athletes with unilateral and bilateral amputations using two-tailed  $t$ -tests. Significance was set at  $\alpha = 0.05$ . **RESULTS:** The lowest and highest CoTs for athletes with unilateral amputations were  $200.1 \pm 14.0$  and  $238.4 \pm 16.5$  ml O<sub>2</sub>/kg/km (mean  $\pm$  SD), respectively. The lowest and highest CoTs for athletes with bilateral amputations were  $186.2 \pm 12.3$  and  $226.9 \pm 22.7$  ml O<sub>2</sub>/kg/km (mean  $\pm$  SD), respectively. The lowest ( $p = 0.085$ ) and highest ( $p = 0.282$ ) CoTs were similar for both cohorts. For context, Olympic qualifying, sub-elite, and recreational non-amputee runners elicit CoTs of

181.9 ± 9.1, 187.5 ± 9.7, and 190.5 ± 13.6 ml O<sub>2</sub>/kg/km (mean ± SD), respectively.  
**CONCLUSION** The metabolic cost of running is similar for athletes with unilateral and bilateral transfibular amputations, indicating that distance running performance may be the same for both groups.  
 This project was supported by the BADER Consortium, a DoD CDMRP cooperative agreement (W81XWH-11-2-0222).

3027 Board #7 June 2 3:15 PM - 5:15 PM

**Physiological Responses To A Simulated Half-marathon Road-race In Elite Wheelchair Racing Athletes**

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Technology has traditionally limited research on wheelchair racing (WCR) to simulated training studies based on heart rate and speed. Practical technology is now available to examine actual physiological responses in real-time. **PURPOSE:** The purpose of this study was to characterize physiological responses across a 25-km time trial in WCR athletes with paraplegic spinal cord injury. **METHODS:** Eight internationally-elite WCR athletes (27.5±4.0 yrs, 162.5±18.6 cm, 53.5±10.9 kg, 21.5±6.7 yrs post injury) completed a maximal exercise test and 25-km time trial separated by three to five days. Energy expenditure and related variables were measured continuously during the time trial with a portable metabolic unit (COSMED K4b2, Chicago, Illinois) with field conditions of 21°C, 39.6% humidity, and wind at 22.4 km\*hr<sup>-1</sup>. Blood samples were collected before and immediately after the cessation of the trial to determine blood glucose and lactate concentrations. Core temperature was measured using an ingestible sensor thermistor. **RESULTS:** Six participants completed the 25-km race course (50:42±5:10 minutes) and provided usable data (Table 1). Mean VO<sub>2</sub> and HR were 73% and 92% of peak values, respectively. There was a significant increase in blood lactate concentration from 0.8±0.2 at baseline to 3.9±1.8 mmol/L after the race (P=0.001). Blood glucose concentrations did not differ from pre- (83.2±1.8 mg/dL) to post-race (91.0±6.6 mg/dL)(P=0.30). Core temperature increased from 37.2±0.3 to 38.7±1.2°C immediately after exercise (P=0.007). **DISCUSSION:** We demonstrate the physiologic response to competitive conditions in elite WCR athletes. Similar to elite able-bodied endurance athletes, WCR athletes sustained a high exercise intensity predominantly through carbohydrate metabolism. Our findings enable more accurate estimates of energy expenditure and have implications for the design of effective training strategies.

Table 1. Acute Physiological Responses (M±SD)

Variable	Rest	25-km Time Trial	Trial Range
VO <sub>2</sub> (ml*kg <sup>-1</sup> *min <sup>-1</sup> )	5.0±1.2	32.8±4.6	31–37
HR (bpm)	72.2±11.3	172.7±11.4	161–184
VE (L*min <sup>-1</sup> )	9.3±1.4	86.9±20.1	65–124
Calorie Expenditure (kcal*min <sup>-1</sup> )	1.2±0.2	8.4±2.1	6–9
RER	0.80±.04	0.98±.03	.93–1.02
CHO Utilization (%)	30.1±18.7	84.9±8.3	73–92
FAT Utilization (%)	58.9±12.0	13.6±7.0	6–24

3028 Board #8 June 2 3:15 PM - 5:15 PM

**Reliability & Validity Of Aquatic Deep Water Peak VO2 Testing For Individuals With Spinal Cord Injury**

William H. Scott<sup>1</sup>, Anna Ogonowska-Slodownik<sup>2</sup>, Peter H. Gorman<sup>1</sup>, Robert Slodownik<sup>2</sup>, Paula R. Geigle<sup>1</sup>. <sup>1</sup>University of Maryland School of Medicine, Baltimore, MD. <sup>2</sup>Franz Josef Pisudski University of Physical Education, Warsaw, Poland.  
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 (No relationships reported)

**PURPOSE:** To understand the reliability of peak VO<sub>2</sub> testing for individuals with spinal cord injury (SCI) in deep water and on land arm cycle ergometer; and to determine the relationship between these two testing conditions. **METHODS:** Nineteen participants (15 men, 4 women) with SCI enrolled in a pilot study to assess peak VO<sub>2</sub> using a Cosmed metabolic cart and tubing connection unit (Aquatrain): (1) in supported vigorous deep water exercise (aquatic), and (2) on land arm cycle ergometer. Participants randomized into either aquatic or arm cycle ergometer

measurements, separated by 48 hours both conditions. Seventeen individuals (13 men and 4 women) completed both testing conditions and two others completed only arm ergometer sessions.

**RESULTS:** Peak oxygen consumption correlated clinically and statistically significantly for both conditions, aquatic (n=17, r=0.93, p<0.001) and arm cycle ergometry (n=19, r=0.95, p<0.001); and a Pearson correlation between aquatic and arm cycle peak VO<sub>2</sub> existed (n=17, r=0.70, p<0.002). We hypothesized a priori lower extremity motor score (LEMS), age, gender, and weight could potentially impact peak VO<sub>2</sub> outcomes. For these participants only LEMS influenced supported deep water peak VO<sub>2</sub>, n=14, B=0.66, p<0.008, and arm cycle ergometer peak VO<sub>2</sub>, n=16, B=0.54, p<0.025.

**CONCLUSIONS:** Determining peak VO<sub>2</sub> for individuals with SCI is highly reproducible for arm cycle ergometry and in supported deep water with the metabolic cart Aquatrainer connection. Additionally, supported deep water peak VO<sub>2</sub> testing is reliable (R=0.93) and valid (r=0.70) compared to arm cycle ergometry (gold standard). Clinically it is important to assess peak VO<sub>2</sub> after an aquatic intervention using the same conditions as the treatment conditions, and both supported deep water and arm cycle ergometer provide reliable and valid peak VO<sub>2</sub> outcomes.

**F-34 Thematic Poster - Sports Injuries: Friend or Foe?**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
 Room: 505

3029 **Chair:** Steven P. Broglio, FACSM. University of Michigan, Ann Arbor, MI.

(No relationships reported)

3030 Board #1 June 2 3:15 PM - 5:15 PM  
**Epidemiology Of Sudden Death In American Youth Sports**

Brad D. Endres, Rebecca L. Stearns, Robert A. Huggins, Douglas J. Casa, FACSM. *Korey Stringer Institute, Storrs, CT.*  
 (No relationships reported)

Little epidemiological data on the incidence of injury and sudden death in American youth sport exists. **Purpose:** Describe the epidemiology of sudden death (SD) in organized American youth sport. **Methods:** SD surveillance was conducted from 8/1/2011 to 10/27/2016 via LexisNexis and other publicly available news or media reports. A certified athletic trainer reviewed each case to confirm the official cause of SD and/or offer a speculated cause of SD if official cause was unknown. Cases of SD that occurred in youth athletes 17 years of age and younger in organized sports were included. Cases of athletes at the high school level or higher were excluded. Details of the athlete (age, gender, level of play), event (sport, event type, activity), and death (date of incident, date of death, location of death, official and speculated cause of death) were examined. **Results:** From 2007-2015, 45 SDs (average = 5 deaths/yr) were reported in American youth sports. The age range of SD was from 8-17 years old. The mean age of SD was 13 ± 2 years old. The overall incidence rate was 0.23 deaths/100,000 participants. The deadliest year was 2015 with 11 cases. When broken down into three-year segments, 6 SDs occurred from 2007-2009, 16 from 2010-2012, and 23 from 2013-2015. From 2007-2015, males experienced a greater number of SD compared to females (n=36, 80% of all deaths). Basketball had the highest number of SDs from 2007-2015, with a total of 16 occurrences. The most frequent cause of SD was cardiac-related (n=34, 76% of all deaths). Furthermore, 15 of the 16 basketball deaths (94%) were cardiac related. **Conclusions:** From 2007-2015 45 youth athletes died while playing organized sport, with an increasing number of SDs in more recent years. Males experienced a greater number of SDs than females. The sport and condition with the greatest SDs were basketball and cardiac-related SDs, respectively. With an overall incidence of 0.23 SDs/100,000 participants, these rates are on par with reported high school SD rates from 2007-2014 school years as reported by the National Center for Catastrophic Sport Injury Research (average=0.24/100,000). This study sets a precedent for further examination into youth sport SD and supports the need for mandated health and safety guidelines in this population.

FRIDAY, JUNE 2, 2017

3031 Board #2 June 2 3:15 PM - 5:15 PM

**Epidemiology Of Sports-related Concussion In Japanese High School Athletes**Fumiko TSUKUDA, Female<sup>1</sup>, Kousuke TAKEUCHI<sup>2</sup>, Shinobu TANAKA<sup>2</sup>, Takeshi KOMATSU<sup>2</sup>, Masao KANAMORI<sup>1</sup>.<sup>1</sup>Ritsumeikan University, Kusatsu, SHIGA, Japan. <sup>2</sup>Biwako Seikei Sport College, Otsu, SHIGA, Japan.

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As a result of epidemiological articles on sports-related concussion (SRC) in Japan, few articles were published. Incidence rate of sports-related concussion among high school student athletes in Japan has not been researched. **PURPOSE:** To describe epidemiology of SRC in Japanese high school Athletes. **METHODS:** SRC data from the medical check among 18-19 years old students in total 368 athletes were analyzed. Data are collected from history of concussion, neurological symptoms (SCAT2), Balance Error Scoring System (BESS) by the assessment of concussion held in Zurich (McCrory P et al. 2012). Incidence are obtained to estimate the experience rate of three person-years among the subjects. Cases of concussion are ascertained by certificated Japanese athletic trainer and sports doctors. Symptoms comparisons were made using two-way ANOVA with repeated measures. **RESULTS:** Experience rate of concussion during high school three years were 2.72 percent of ascertain cases, and 4.08 percent of total cases (ascertain and uncertain). Incident rates of ascertained cases were estimated to be 0.013 person-year, rates of total cases be 0.020. Injury rate per 1000 Athletic-Exposures were 0.42 with Men's basketball, 0.22 with Men's soccer. The rates of concussion in basketball were higher than Americans (Daneshvar DH, 2011 and Giza CC, 2013). The rates in soccer were lower. Headache, Pressure in head, Dizziness were statistically increased the number from the result of SCAT2. Higher Incidence among sports are observed in Men's basketball and Men's Soccer. There were not significant different from annual practice time between concussion (CC) and non-concussion (NCC) cases, basketball CC: 1364.0 hours/year. NCC: 1155.8 hours/year. Balance Error Scoring System at baseline were CC: 27.34, NCC: 27.38. Limitations: We could not evaluate the rate of Rugby, American-football and Judo because of a few players.

**CONCLUSIONS:** Incident rates of concussion of Japanese high school students were estimated to be 0.013 person-year at least. Injury rate per 1000 Athletic-Exposures were 0.42 with Men's basketball, 0.22 with Men's soccer.

3032 Board #3 June 2 3:15 PM - 5:15 PM

**Developmental Stage And Age At Time Of First Concussion Influences Subsequent Concussion Risk**Julianne D. Schmidt<sup>1</sup>, Katherine Rizzone<sup>2</sup>, Nicole L. Hoffman<sup>1</sup>, Michelle L. Weber<sup>1</sup>, Jeffrey Bazarian<sup>2</sup>. <sup>1</sup>University of Georgia, Athens, GA. <sup>2</sup>University of Rochester, Rochester, NY.

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(No relationships reported)

Sustaining a single concussion increases the risk of sustaining a subsequent concussion. Individuals that sustain their first concussion during childhood may be at greater risk for sustaining multiple concussions throughout their lifetime, due to a longer window of vulnerability. **PURPOSE:** To determine whether developmental stage and age at first concussion influence risk of subsequent concussion. **METHODS:** A total of 23,582 collegiate athletes from 26 universities and military cadets from 3 military academies completed a concussion history questionnaire (15,232 males, 8,335 females, 15 missing; age: 19.9±1.4 years, mass: 77.4±17.2 kg, height: 177.3±10.4 cm). Participants were asked to self-report the number of concussions and age at time of each injury. Participants with concussion histories (n=3,819) were categorized as having sustained their first concussion during childhood (<10 yo) or adolescence (≥10 yo & ≤18 yo) based on World Health Organization criteria. We then determined the number of subsequent concussions sustained prior to age 18. We used a Poisson regression to model developmental stage predicting risk of subsequent concussion. A second model was developed to determine whether age at first concussion predicted subsequent concussion risk ( $\alpha = 0.05$ ). **RESULTS:** Of the 3,819 participants with a previous concussion, 251 (6.6%) sustained their first concussion during childhood and 3,568 (93.4%) during adolescence. Participants that sustained their first concussion during childhood had 81% higher risk of sustaining subsequent concussions (RR=1.81, 95% CI: 1.49, 2.21) compared to those that sustained their first concussion during adolescence. Subsequent concussion risk decreased by 10% for each additional year of age at the time of first concussion (RR=0.90, 95% CI: 0.88, 0.92). **CONCLUSION:** Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Concussion prevention strategies are of particular need at the youth level to prevent children from sustaining their first concussion at a young age.

3033 Board #4 June 2 3:15 PM - 5:15 PM

**Sex Differences In Head Injuries Among Collegiate Soccer Players: NCAA ISS, 2004-2009**Avinash Chandran, Mary Barron, Beverly Westerman, Loretta DiPietro, FACSM. *The Milken Institute School of Public Health, Washington, DC.* (Sponsor: Loretta DiPietro, FACSM)

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(No relationships reported)

Some of the highest rates of head injuries and concussion among all contact/collision sports are observed in soccer; yet, the multifactorial determinants of head injuries among players remain relatively undefined. **PURPOSE:** To examine sex-differences in the rate and the severity (lost days of participation, resultant concussions) of head injuries among collegiate soccer players between 2004 and 2009, while controlling for several covariables previously linked to injury occurrence. **METHODS:** Data from the National Collegiate Athletic Association Injury Surveillance System (NCAA-ISS) were used to calculate injury incidence density (ID) per 1000 athletic exposures (AE). The rate ratio (RR), along with the 95% Wald confidence interval (CI), compared ID among female, relative to male soccer players. Multivariable logistic regression and multivariable negative binomial regression modeling then tested the relation between sex and head injury incidence and severity while controlling for contact, setting, and competition level. **RESULTS:** Between 2004 and 2009, the sex-specific rate of soccer-related head injuries was 0.87 per 1000 AEs in women and 0.71 per 1000 AEs in men (RR = 1.23, 95% CI = [1.08, 1.41]). The rate of head injuries due to player-to-player contact was comparable between women and men (RR=0.95, 95% CI=[0.81, 1.11]); however, the rate of injury due to contact with apparatus was nearly 2 1/2-fold higher (RR=2.46, 95% CI = [1.76, 3.44]) and the rate due to contact with a playing surface was over two-fold higher (RR=2.29, 95% CI = [1.34, 3.91]) in women than in men. We also observed a significant joint effect between sex and contact in our regression models, with a particularly notable antagonistic interaction observed while modeling head injuries. **CONCLUSION:** Among female players, head contact with a ball, a goal post, or the playing surface may be especially deleterious compared with head contact with another player.

3034 Board #5 June 2 3:15 PM - 5:15 PM

**National Hockey League Players' Concussion And Lower-Body Injury Risk Across the 2012-2015 Seasons**Kathryn L. O'Connor, Tanu Bhargava, Andrew L. Lapointe, Steven P. Broglio, FACSM. *University of Michigan, Ann Arbor, MI.* (Sponsor: Steven P. Broglio, FACSM)

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(No relationships reported)

Recent literature has indicated that concussion increases musculoskeletal injury risk. Various studies have demonstrated post-concussion changes in gait and posture, but few studies focus on orthopedic trauma. **PURPOSE:** Investigate the association between concussion and lower-body injury risk in the NHL players during 2012-2015 seasons. **METHODS:** Season statistics and injuries were compiled from hockey-reference.com. All head injuries were reviewed, using public news reports, to determine evidence for concussive injury. Over the four seasons 3505 athlete seasons (2012: n = 839, 2013: n = 886, 2014: n = 882, 2015: n = 898) were compiled with 2048 unique NHL players. Each injury was classified as illness, lower-body, upper-body, concussion, undisclosed, or other. Primary analyses examined the first and second injuries. Odds ratios and 95% CI were calculated for the likelihood of concussion after a lower-body injury and the likelihood of lower-body injury after concussion. Upper-body injuries were not examined as they could be concussive injuries per the NHL reporting guidelines. **RESULTS:** Players had an average age: 26.8 years (SD=4.6), height: 185.7 cm (SD=5.3), weight: 91.7 kg (SD=6.8), and games played: 45.3 (SD = 27.7). The majority of the players were forwards 65% (n = 2286). Across four seasons, 48% (n = 1673) of all athletes had at least one injury or illness with an average of 9.4 (SD = 12.8) games lost per season. There were 141 recorded concussions (4.1%) and 900 lower body injuries (26%) from 2012-2015. Players whose first injury was to the lower-body had 3 times (95% CI: 1.48-6.24) the odds of subsequent concussion within the same season compared to those without lower-body injury. Furthermore, players whose first injury was a concussion had 2.25 (95% CI: 1.28-3.96) times the odds of a lower body injury within the same season.

**CONCLUSIONS:** Athletes with concussion have greater subsequent lower-body risk when compared to athletes with no injury or illness. However, it may be that certain athletes are generally more injury prone than others given the bidirectional association between concussion and lower-body injury. Future studies should investigate individual characteristics to determine specific injury risk and identify at-risk athletes.

3035 Board #6 June 2 3:15 PM - 5:15 PM  
**Prediction of Injury among Elite Dancers: Three Years of Prospective Surveillance**  
 Marijeanne Liederbach<sup>1</sup>, Evangelos Pappas<sup>2</sup>, Leigh Schanfein<sup>1</sup>, Beth Glace<sup>3</sup>. <sup>1</sup>*NYU Langone Medical Center Hospital for Joint Diseases, New York, NY.* <sup>2</sup>*University of Sydney, Sydney, Australia.* <sup>3</sup>*Lenox Hill Hospital Northwell Health, New York, NY.* (Sponsor: Mal McHugh, FACSM)  
 (No relationships reported)

Injuries in dance are commonplace and distressing in terms of human and financial impact. It is the hope of dance medicine healthcare professionals and educators to detect risk for injury prospectively, often through screening efforts. It is known that screening has been very useful for rapport building, improving health literacy and facilitating entryways to local healthcare systems. However screening, as we have been conducting it, has still not proven to be predictive of injury despite implementation of preventative interventions such as pre-season conditioning programs. **PURPOSE:** To test the predictive validity of four patient reported outcome measures (PRO) in addition to an array of motor control designed clinical performance-based outcome measures (CPBO) collected during preseason screening in predicting subsequent season time loss injury. **METHODS:** 241 elite classical dancers (21.5±5.0 years; 69 men, 172 women) who received regular onsite care consented to participate in PRO and CPBO-based preseason screenings and ongoing, healthcare practitioner documented injury surveillance. The PRO's utilized in this study were the Discomfort Rating Scale (DRS); the World Health Organization Functional Scale (WHO); the Profile of Mood States total score (POMS) and the Eating Attitudes Test-26 (EAT). Data were analyzed with a multivariate logistic regression model for the outcome variables "injured in subsequent season" and "number of therapy visits in subsequent season". **RESULTS:** All PRO variables were associated with the primary outcome variables ( $p=0.003$ ,  $R^2=0.492$ ,  $R^2=0.242$ , adjusted  $R^2=0.205$ ). **CONCLUSION:** Injury prevention screening for dancers should include PRO scores to predict those at greatest risk for time loss injury.

3036 Board #7 June 2 3:15 PM - 5:15 PM  
**Injury in D III Volleyball Players is Associated with Preseason Jump and Hop Measures**  
 Jason Brumitt<sup>1</sup>, Alma Mattocks<sup>2</sup>, Phil Lentz<sup>3</sup>, Jeremy Loew<sup>4</sup>. <sup>1</sup>*George Fox University, Newberg, OR.* <sup>2</sup>*Spalding University, Louisville, KY.* <sup>3</sup>*Pacific University, Forest Grove, OR.* <sup>4</sup>*Lewis and Clark College, Portland, OR.* (Sponsor: Mitchell J Rauh, FACSM)  
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 (No relationships reported)

**Purpose:** Collegiate volleyball (VB) players are at risk for sports injuries. Reported time-loss injury rates for female Division III (D III) collegiate VB players range from 4.0 to 5.4 injuries per 1000 athletic exposures (AEs). Identifying risk factors in this population may help coaches to reduce injury rates via targeted training programs. The purpose of this prospective cohort study was to determine the ability of 2 functional performance tests (FPTs) [the standing long jump (SLJ) and/or the single-leg hop (SLH) for distance] to identify female D III VB players who may be at an increased risk for a non-contact time-loss lower quadrant (LQ = low back and lower extremities) injury. **Methods:** 68 female VB players (18.9 ± 1.0 years old) from 5 D III teams performed 3 trials of each FPT in the preseason. Off-season training habits were also collected. Mean SLJ and SLH distances (normalized to height) were used for study analysis. Injury rates were calculated per 1000 AEs for initial and subsequent injuries. Crude and adjusted odds ratios (OR) were calculated to identify the risk association between preseason FPT measures and LQ injury. **Results:** The mean SLJ distance was 0.82 ± .09 and the mean SLH distances were 0.68 ± 0.09 (R) and 0.68 ± 0.11 (L). Fourteen initial time-loss injuries [thigh/knee region = 5; foot/ankle region = 9] and 2 subsequent time-loss injuries (foot/ankle = 2) occurred during the study. The initial time-loss injury rate was 3.0 (95% CI: 1.7-5.0) per 1000 AEs and the subsequent injury rate was 5.6 (95% CI: 0.9-18.4) per 1000 AEs. Individual test performance did not discriminate risk; however, a limb symmetry index (LSI) > 10% was associated with an increased risk of LQ injury (OR = 3.8; 95% CI: 1.0, 13.5). Suboptimal FPT scores and an LSI > 10% was associated with an increased risk of LQ injury (OR = 21.2; 95% CI: 2.1, 210) and foot/ankle (FA) injury (OR = 14.3; 95% CI: 2.0, 102.9). Adjusted OR were calculated for the aforementioned categories adjusting for off-season weightlifting reports: 1) LSI > 10% (AOR 5.5; 95% CI: 1.3, 22.3); 2) suboptimal FPT scores and LQ injury (AOR 25.7; 95% CI: 2.2, 299); 3) suboptimal FPT scores and FA injury (AOR 16.3; 95% CI: 1.9, 139). **Conclusions:** Suboptimal performance on a battery of FPTs may be useful as a screening tool to identify female D III VB players at risk for a non-contact time-loss LQ injury.

3037 Board #8 June 2 3:15 PM - 5:15 PM  
**The Injury and Illness Profile of 23055 Participants in a 94.7km Cycle Race - Cross-Sectional Study**  
 Dina C. Janse van Rensburg, FACSM, Mia Breed, Lizelle Fletcher, Catharina C. Grant, Audrey Jansen van Rensburg, Martin P. Schweltnus, FACSM. *University of Pretoria, Pretoria, South Africa.*  
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**INTRODUCTION:** The Momentum 94.7 Cycle Challenge is an annual recreational long distance cycling event in South Africa. Medical support at such an event is imperative, with little known regarding the risk of acute traumatic injuries and acute medical illness. **PURPOSE:** To describe the incidence and patterns of acute injury and medical illness and difference between sexes during a mass community cycling race. **METHODS:** A descriptive study of the 2014 Momentum 94.7 Cycle Challenge, documenting the incidence of acute traumatic injuries and acute non-traumatic medical illness in 23055 race starters (males=17520, females=5236, not specified=299) during the 94.7km distance. **RESULTS:** An incidence (per 1000 starters) of 38.69 (females=38.39, males=36.52) for all medical illness; with an incidence of 11.88 (females=16.42, males=10.73) for adverse medical events and of 1.3 (females=2.67, males=0.86) for serious adverse events, were reported. The incidence of non-traumatic medical complaints was 32.48 (females=31.32, males=33.39) and of traumatic injuries was 3.99 (females=7.07, males=3.14). Females had a higher risk of sustaining traumatic injuries ( $p<0.001$ ), central nervous system ( $p=0.0062$ ) and eye complaints ( $p=0.0107$ ). The musculoskeletal system had the most complaints, 80.7%. Males 10-16yrs ( $p=0.0013$ ) and females 23-39yrs ( $p=0.0336$ ) and >50yrs ( $p=0.0002$ ), had a higher risk for traumatic injuries. **CONCLUSIONS:** A reported ratio of 1:26 (females=1:26, males=1:28) of all starters developed medical complaints; with 1:84 cyclists (females=1:61, males=1:93) that developed adverse events and did not finish the race; and 1:769 participants (females=1:374, males=1:1163) developing serious adverse events that required hospitalisation. The majority of admissions for traumatic injuries were followed by cardiovascular complaints. A wide spectrum of medical complaints can be expected during mass recreational sport events, with a higher risk for females to sustain traumatic injuries, and encounter central nervous system and eye complaints. The majority of disorders involved the musculoskeletal system. Information regarding the pattern and type of medical encounters can prove useful during planning and management of similar future events.

### F-35 Free Communication/Slide - Physical Activity Intervention Trials

Friday, June 2, 2017, 3:15 PM - 5:00 PM  
 Room: 402

3038 **Chair:** Melissa Napolitano. *The George Washington University, Washington, DC.*  
 (No relationships reported)

3040 June 2 3:15 PM - 3:30 PM  
**Effects Of Three-stages Training Program On Balance And Functional Fitness For Community-dwelling Old-old Japanese**  
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 (No relationships reported)

**PURPOSE:** To examine effectiveness of three-stages physical training program on balance ability and ADL-related functional fitness for community-dwelling Japanese old-old females. **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; 13 females, 80.0±2.3 yrs, BMI 23.0±1.8) and the 1time/week group (LFG; 10 females, 81.3±3.6 yrs, BMI 21.4±1.3). 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 an elastic band. The last stage was to learn three minutes arm and legs combined 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 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 83±5% and 71±8% respectively. Sitting & standing time (HFG: 18.4±5.6 to 16.2±5.4 sec., LFG: 17.4±3.9 to 17.4±3.6sec., F=3.205, P=0.088), zigzag walking time (HFG: 19.6±3.0 to 17.0±3.3sec., LFG: 17.1±4.2 to 16.8±2.9sec., F=12.18, P=0.002), one-leg standing time with eyes open (HFG: 6.1±3.1 to 13.3±4.4 sec., LFG: 5.9±2.3 to 6.1±1.8sec., F=26.44, P=0.000), knee extension strength (HFG: 181.5±39.6 to 208.5±41.5 N, LFG: 192.0±15.5 to 196.5±14.5 N, F=4.775, P=0.040), and balance ability (area covering of COP; HFG: 15.3±5.8 to 10.6±7.1 cm<sup>2</sup>, LFG: 14.6±4.1 to 17.2±8.9 cm<sup>2</sup>, F=7.064, P=0.015, total length of COP; HFG: 148.3±31.9 to 100.7±27.4 cm., LFG: 141.0±30.2 to 135.7±37.2 cm, F=12.183, P=0.002) also improved significantly in HFG. Fear of falling score was not change in both groups. **CONCLUSIONS:** Three-stage physical training program was effective on balance ability and functional fitness for Japanese old-old females.

3041 June 2 3:30 PM - 3:45 PM

**Both MBSR and Aerobic Exercise Training can Affect Physical Activity Behavior in Sedentary Individuals**

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Mindfulness-Based Stress Reduction (MBSR) and aerobic exercise training (AET) have emerged as robust programs to improve health and wellbeing. Physical activity may be enhanced to a similar degree by MBSR and AET, although their relative effects on physical activity have not been objectively assessed.

**PURPOSE:** To compare the effects of 8-weeks of MBSR and AET on objectively measured physical activity.

**METHODS:** Participants underwent 7-days of physical activity monitoring (Actigraph GT3X) at baseline prior to randomization, and again following completion of 8-weeks of training in MBSR or AET, or neither (no-treatment control group). Actigraph-based average daily minutes of sedentary, light, moderate, vigorous and moderate-to-vigorous (MVPA) activities were calculated. Weekly time spent in MVPA lasting longer than 10 minutes (MVPA Bouts) was calculated to assess physical activity engagement sufficient to meet national recommendations. Groups were compared via pairwise comparisons of changes in MVPA and MVPA Bouts from pre-randomization (August) to post-intervention (November).

**RESULTS:** Sufficient data for analysis ( $\geq 3$  week and  $\geq 1$  weekend day,  $> 10$  hours/day) were obtained from 49 participants (18 MBSR, 14 AET, 17 control) out of 66 who enrolled. Reflecting a seasonal decline (Aug to Nov), daily MVPA decreased in all groups: control by 17.9 ± 25.7 min/day, MBSR by 5.7 ± 7.5 min/day, and AET by 7.4 ± 14.3 min/day, without statistically significant differences among the groups (all  $p > 0.05$ ). MVPA Bouts decreased 77.3 ± 106.6 min/week in the control and 15.5 ± 37.0 min/week in the MBSR group, with a nonsignificant difference favoring MBSR ( $p = 0.080$ ); AET increased MVPA Bouts by 5.7 ± 64.1 min/week, significantly different from control ( $p = 0.029$ ) but not MBSR ( $p = 0.564$ ).

**CONCLUSIONS:** This pilot study showed that while exercise training leads to more minutes of MVPA sufficient to meet physical activity guidelines compared to a no-treatment control, MBSR training may mitigate seasonal decline with similar effects to exercise training on daily MVPA and MVPA in 10+ min bouts. As these findings indicate that MBSR training has beneficial effects on MVPA, future research is needed to determine if MBSR improves wellbeing through changes in physical activity.

3042 June 2 3:45 PM - 4:00 PM

**Effects of High-intensity Interval Training and Moderate-intensity Continuous Training on Sleep in Sedentary Obese Adults**

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Regular moderate-intensity physical activity has been shown to improve sleep duration and quality in individuals with mild to moderate sleep complaints. It is not known whether more vigorous exercise may have similar, more pronounced, or even detrimental effects on sleep. **PURPOSE:** To examine the effects of high-intensity interval training vs. moderate-intensity continuous training on objectively- and subjectively-measured sleep parameters. **METHODS:** Fifteen volunteers (35.1 ± 8.1 y; BMI = 36.0 ± 5.0 kg/m<sup>2</sup>) completed 8 weeks (3 d/wk) of either high-intensity interval training (HIIT (n=8): 10, 1-min intervals at 90-95% of heart rate max (HR<sub>max</sub>))

or moderate-intensity continuous training (MICT (n=7): 30 min at 70-75% of HR<sub>max</sub>) on cycle ergometers. Subjects wore accelerometers (Actigraph GT3x+) on the non-dominant wrist during sleep periods for seven consecutive days at baseline, week 5, and week 8. Measures of total sleep time (TST, min), sleep onset latency (SOL, min), and sleep efficiency (SE, %) were derived. Participants also completed the Pittsburgh Sleep Quality Index (PSQI) at baseline and after training. **RESULTS:** For Actigraph-measured sleep, SOL was marginally improved in HIIT (-1.92 ± 3.9 min) compared to MICT (+4.92 ± 8.15 min,  $p = 0.08$ ,  $d = 0.61$ ). SE was also marginally improved in HIIT (+2.5 ± 5.2%) compared to MICT (-3.8 ± 4.6,  $p = 0.06$ ,  $d = 0.65$ ). No changes were observed for TST. For PSQI-measured sleep, MICT showed favorable improvements compared to HIIT for sleep latency ( $p=0.09$ ,  $d = 0.51$ ), sleep duration ( $p=0.06$ ,  $d = 0.57$ ), sleep efficiency ( $p=0.07$ ,  $d = 0.55$ ), and the global score ( $p=0.03$ ,  $d = 0.67$ ), but no differences were observed for sleep quality, disturbances, medication use, or daytime dysfunction. **CONCLUSION:** This study is the first to compare HIIT vs. MICT on sleep using both actigraphy and subjective measures. Our results suggest that in comparison to moderate-intensity continuous training, high-intensity interval training may lead to the perception of poorer sleep quality. Conversely, objectively measured sleep quality may respond more favorably to HIIT than MICT.

3043 June 2 4:00 PM - 4:15 PM

**Six Months of Aerobic Fitness Training on Daily Affect in High-Stressed Family Caregivers**

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**PURPOSE:** Positive (PoA) and negative affect (NeA) independently contribute to psychological and physical health. Observational studies have shown that active adults have greater daily PoA than less active individuals, whereas there is inconsistent evidence for NeA. We report results of a randomized controlled trial on the effects of 24 weeks of aerobic training on daily PoA and NeA.

**METHODS:** Sixty-three high stress family caregivers of persons with dementia were randomized into a waitlist control group (n = 33) or a 24-week aerobic training intervention group (n = 30). Treatment group participants gradually increased weekly moderate-to-vigorous activity to 150 minutes per week by the 8<sup>th</sup> week in the study. Prior to randomization and again in the 24<sup>th</sup> week, participants completed 6 online ecological momentary assessments per day for 7 days. A visual analog scale of 0 to 100 was used to assess PoA and NeA. Based on the circumplex theory of emotion, we further divided PoA and NeA along their dimensions, valence and activation, leading to four types: Positive Deactivated (PDA), Positive Activated (PAA), Negative Deactivated (NDA), Negative Activated (NAA).

**RESULTS:** Mixed models revealed that change over time ( $\Delta$ ) between exercise and control group caregivers was significantly different for PoA, NeA, and the four subcomponents (all  $p$ 's < .001). Exercisers significantly increased daily PoA ( $\beta_{\Delta} = 6.18$ , SE = 0.64, CI = 4.93, 7.42) and decreased NeA ( $\beta_{\Delta} = -4.74$ , SE = 0.62, CI = -5.96, -3.54,  $p < .001$ ) compared to baseline, whereas the control group increased in both PoA and NeA (PoA:  $\beta_{\Delta} = 1.74$ , SE = 0.56, CI = 0.63, 2.84,  $p = .002$ ; NeA:  $\beta_{\Delta} = 2.35$ , SE = 0.55, CI = 1.28, 3.42,  $p < .001$ ). These effects were consistent for PDA, PAA, NDA, NAA, with one exception: PAA did not increase significantly in waitlist control participants ( $p = .31$ ).

**CONCLUSIONS:** All caregivers increased in daily PoA after 6 months, however, those who exercised increased significantly more. On the other hand, there was a significant distinction in the pattern for daily NeA: exercisers decreased and control participants increased. These findings have implications for understanding the role of fitness training on daily affective states, especially in family caregivers of persons with a progressive disorder.

3044 June 2 4:15 PM - 4:30 PM

**Health In Pregnancy and Postpartum (HIPP): Targeting Gestational Weight Gain and Postpartum Weight Loss**

Sara Wilcox, FACSOM, Jihong Liu, Gabrielle Turner-McGrievy, Judith Burgis, Cheryl Addy, Ellen Wingard, Brandi Blackmon, Alicia A. Dahl, Lara Schneider. *University of South Carolina, Columbia, SC.*  
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Interventions to prevent excessive weight gain and promote postpartum weight loss have modest results, particularly in overweight and obese women.

**PURPOSE:** To describe the rationale and design of the HIPP trial; discuss recruitment strategies, challenges, and yield to date; and present baseline demographic and physical activity (PA) data.

**METHODS:** HIPP is a randomized controlled trial enrolling women from SC who are <16 wks gestation, overweight or obese, white or African American, 18 to 44 yrs old, without exercise contraindications. Participants are randomized to a behavioral lifestyle intervention or usual care (target N=400) and assessed at baseline, 32 wks gestation, and 6- and 12-mos postpartum. Outcomes include gestational weight gain (primary) and PA (secondary) measured with the Sensewear Armband. The behavioral lifestyle intervention, grounded in Social Cognitive Theory, consists of two individual counseling sessions (early pregnancy and postpartum), weekly or biweekly pregnancy counseling calls, biweekly postpartum counseling calls, 10 pregnancy and 16 postpartum podcasts, and an optional private Facebook group (to 6-mos postpartum). The usual care group receives monthly mailings and a matched number of podcasts on non-weight related topics.

**RESULTS:** To date, 95 participants have enrolled, representing 16% of women who completed a screening form and were initially eligible. Eight (16%) have withdrawn, two due to medical ineligibility. Barriers to enrollment include failure to reach women for telephone screening, ineligibility, and no shows to baseline visits. These challenges led to increasing recruitment sites and replacing group intervention sessions with individual telephone counseling. At baseline, participants were 10.0 ± 2.1 wks gestation, 30.2 ± 5.6 yrs old, 44% nulliparous, 34% African American, 60% college graduates, and 48% obese. Baseline armband average wear-time was 23.5 ± 0.3 hrs/d. Participants accumulated 36 ± 22 total mins/d of MVPA and 5399 ± 2303 steps/d. 32-wk data show trends favoring the intervention group (40 vs. 26 mins/d MVPA, 5078 vs. 4620 steps/d).

**CONCLUSION:** HIPP is an innovative study that addresses gaps in the literature. Recruitment posed challenges necessitating study modifications. Primary outcome results are expected in 2019.

Funded by NIH/NICHHD.

3045 June 2 4:30 PM - 4:45 PM

### Effects of a Long-Term Physical Activity Program on Activity Patterns in Mobility Impaired Older Adults

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**Purpose:** To examine the effect of a long-term structured physical activity intervention on accelerometer-derived metrics of activity composition changes in older adults at high risk for mobility disability.

**Methods:** Participants were randomized to either a physical activity (PA) or health education (HE) program. The PA intervention included a walking regimen with strength, flexibility, and balance training. The HE program featured health-related discussions and a brief upper body stretching routine. Participants (n = 1,341) wore a hip-worn accelerometer for ≥10 h/day for ≥3 days at baseline and again at 6, 12 and 24 months post-randomization. Total physical activity (TPA)—defined as movements registering 100+ counts/min—was segmented into the following intensities: low light (LLPA; 100-759 counts/min), high light (HLLPA; 760-1,040 counts/min), low moderate (LMPA; 1,041-2,019 counts/min), and high moderate and greater (HMPA; 2,020+ counts/min) physical activity. Patterns of activity were characterized as bouts (defined as the consecutive minutes within an intensity).

**Results:** Both groups decreased TPA (-10.5±1.0 minutes/day annually), but the PA intervention attenuated this effect (PA vs HE: +6.4±2.1 minutes/day, p<0.001). This attenuation shifted TPA composition by increasing daily time in HLLPA (1+ bouts: 0.8±0.3; 5+ bouts: 0.2±0.04; 10+ bouts: 0.1±0.02 minutes), LMPA (1+ bouts: 2.7±0.4; 2+ bouts: 2.4±0.3; 5+ bouts: 2.0±0.2; 10+ bouts: 1.1±0.1 minutes), and HMPA (1+ bouts: 2.8±0.4; 2+ bouts: 2.5±0.3; 5+ bouts: 2.1±0.3; 10+ bouts: 1.7±0.2 minutes). All findings were statistically significant at p<0.01.

**Discussion:** The PA intervention increased physical activity by shifting the composition of activity toward higher intensity activity in longer duration bouts. However, a long-term structured physical activity intervention did not completely eliminate overall declines in total daily activity experienced by mobility impaired older adults.

3046 June 2 4:45 PM - 5:00 PM

### Effects of Supervised and Unsupervised Physical Activity Programs for Weight Loss

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Both supervised and unsupervised physical activity programs have been included within a standard behavioral weight loss intervention (SBWI). However, few studies have directly compared supervised and unsupervised physical activity within the context of a SBWI.

**PURPOSE:** This study examined changes in moderate-to-vigorous physical activity (MVPA), fitness, and weight in response to a supervised physical activity program prescribed in minutes per week (SUP-PA), an unsupervised physical activity program prescribed in minutes per week (UNSUP-PA), and an unsupervised physical activity program prescribed in steps per day (STEP) during a SBWI.

**METHODS:** Adults (N=52, age: 43.5±10.1 years, BMI: 31.5±3.5 kg·m<sup>-2</sup>) participated in a SBWI and were randomized to STEP (n=18), UNSUP-PA (n=17), and SUP-PA (n=17). Subjects were prescribed a calorie-restricted diet (1200-1800 kcal·day<sup>-1</sup>) and to progressively increase physical activity (SUP-PA and UNSUP-PA: 150 min·week<sup>-1</sup>; STEP: 10,000 total steps·day<sup>-1</sup> with 2,500 brisk steps·day<sup>-1</sup>). All three groups attended weekly in-person group intervention sessions for 12 weeks. SUP-PA also attended supervised activity sessions, whereas UNSUP-PA and STEP engaged in unsupervised physical activity.

**RESULTS:** MVPA in bouts of ≥10 minutes significantly increased over the 12-week intervention by 11.5±31.2 min·day<sup>-1</sup> in STEP, 16.1±25.8 min·day<sup>-1</sup> in UNSUP-PA, and 21.6±24.9 min·day<sup>-1</sup> in SUP-PA (p<0.001) with no differences between groups (p=0.94) or group by time interaction (p=0.81). Weight significantly decreased (p<0.001) with no significant difference between groups (STEP=-5.3±3.6 kg, UNSUP-PA=-5.1±3.3 kg, SUP-PA=-3.8±3.0 kg) (p=0.81). Fitness increased significantly greater in both SUP-PA (3.8±1.6 ml·kg<sup>-1</sup>·min<sup>-1</sup>; 0.22±0.23 L·min<sup>-1</sup>) and UNSUP-PA (3.8±3.2 ml·kg<sup>-1</sup>·min<sup>-1</sup>; 0.17±0.24 L·min<sup>-1</sup>) compared to STEP (1.3±2.4 ml·kg<sup>-1</sup>·min<sup>-1</sup>; -0.04±0.19 L·min<sup>-1</sup>) (p<0.05).

**CONCLUSIONS:** Unsupervised physical activity prescribed in min·week<sup>-1</sup> or steps·day<sup>-1</sup> may elicit a similar increase in MVPA and reduction in weight compared to supervised physical activity within a SBWI. However, physical activity prescribed in steps·day<sup>-1</sup> may elicit less favorable changes in fitness. Whether results are consistent across a longer intervention period warrants further investigation.

### F-36 Free Communication/Slide - Weight Management

Friday, June 2, 2017, 3:15 PM - 4:45 PM  
Room: 103

3047 **Chair:** Kathleen Woolf, FACSM. *New York University, New York, NY.*

(No relationships reported)

3048 June 2 3:15 PM - 3:30 PM

### Iso-caloric Two-intensity Intermittent Exercise Blunts Detection, Leptin Response, And Dietary Compensation In Obese Women

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**PURPOSE:** Whether obesity can influence appetite, hormonal responses to, and compensation for exercise energy expenditure (EEE) is uncertain. We tested the hypotheses that: (1) EEE suppresses appetite but increases post-exercise food intake independently of obesity, and (2) the effect may be mediated by energy-sensing hormones leptin and insulin.

**METHODS:** The 57-y old lean (BMI 23.4 kg/m<sup>2</sup>) and obese (BMI 33.6 kg/m<sup>2</sup>) women remained sedentary (SED) or did iso-caloric high- or a low-intensity, intermittent exercise (HIIE 80%, LIIE 40% of VO<sub>2</sub>max, respectively) one h after the morning (0700 h) and mid-day (1300 h) weight-maintenance meals. After the evening 1900 h

meal, an ad-libitum snack (2100 h) assessed compensation for EEE. A visual analog scale evaluated the appetite. Plasma glucose, FFAs, insulin and leptin were measured at 30 to 60-min intervals.

**RESULTS:** Meal intake (1350 vs 1473 Kcal) and mean EEE at two intensities during morning and mid-day postprandial periods (PPs) (1821 and 2202 Kcal) were similar in lean and obese women, respectively, as was EE during SED day (758 and 818 Kcal). This resulted in 529 and 380 Kcal positive energy balance on SED days and a 471 and 729 Kcal negative energy balance on exercise days in lean and obese women, respectively. Lean women ate an additional 256, and obese women 261 Kcal, of ad-libitum snack in SED trials. On LIIE and HIIE days, lean women increased snack intake by 24.6 and 37.9 %, respectively, but failed to compensate for 32 and 25% of exercise energy deficit. Corresponding increases of snack intake by obese women to LIIE and HIIE was 6 and 15%, and the compensation for EEE failed by 62 and 58%, respectively. Hunger was similarly suppressed during mid-day, but not morning, LIIE and HIIE in lean, but not the obese subjects, while obesity did not affect PP fullness. In LIIE and HIIE trials at mid-day, but not morning, exercise, a rise in FFAs was greater in lean than in the obese. In lean, but not the obese women, exercise suppressed PP insulin responses and led to a 5%, 12-h-sustained decline in plasma leptin.

**CONCLUSIONS:** EEE at intensities differing by a factor of two, suppresses hunger after the mid-day meal, PP insulin after morning and mid-day meals and leptin over a 12-h period in lean, but not the obese women. Obesity blunts detection, hormonal responses, and dietary compensation to EEE.

3049 June 2 3:30 PM - 3:45 PM

### Effects Of Steady-state And High-intensity Exercise On Compensatory Eating Behavior

Emily J. Sauers, Jonathan P. Klein, Chad A. Witmer, Gavin L. Moir, Shala E. Davis. *East Stroudsburg University, East Stroudsburg, PA.* (Sponsor: Shala Davis, FACSM)  
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Obesity is a worldwide epidemic despite volumes of information while overwhelming evidence exists suggesting exercise and calorie restriction helps manage weight. Studies have shown significant differences in weight loss between high-intensity interval training and moderate continuous training potentially due to compensatory eating behaviors. **PURPOSE:** The aim of this study is to observe the differences in eating behaviors following high intensity intervals (HI) and continuous steady state (SS) running. **METHODS:** Nine lean (BMI=23.90±2.15 kg/m<sup>2</sup>) exercise trained college-aged (23.56±3.78 years) males (n=3) and females (n=6) participated in this study. Preliminary assessment included informed consent, medical history, body composition, and VO<sub>2max</sub> (ParvoMedics, Sandy, UT). Subjects were randomized to one of three trials: control, HI, or SS. Subjects arrived fasted to the lab between 6:00-8:00 am. Subjects were given a 20oz sports drink and rested for 30 minutes prior to exercise. During the HI exercise, subjects exercised on a treadmill at 1:1 work:recovery ratio alternating one minute at 90% VO<sub>2max</sub> and one minute at 50% VO<sub>2max</sub>. Subjects completed 16 intervals. During the SS exercise, subjects ran on a treadmill at 70% VO<sub>2max</sub> for 33 minutes. Subjects sat quietly for 32 minutes during the control trial. Food logs were collect 24 hours before and after exercise bouts. Data was analyzed using a two-way repeated measures ANOVA (IBM SPSS, Armonk, NY). Significance was set at p=0.05. All data are presented as mean±SE. **RESULTS:** Caloric expenditure was higher during exercise than control (CON: 77.42±3.48kcal, HI: 321.06±24.16kcal, SS: 345.04±24.28kcal, p<0.001) but not different between HI and SS (p=0.49). Caloric intake was not different between trials (CON: 1557.11±172.48kcal, HI: 1849.78±149.80kcal, SS: 1683.11±142.73kcal, p=0.23). Carbohydrate intake was not different between trials (CON: 186.22±25.03g, HI: 224.89±24.28g, SS: 201.44±22.98g, p=0.41). Fat intake was not different between trials (CON: 55.44±8.31g, HI: 72.50±9.05g, SS: 63.44±4.66g, p=0.16). Protein intake was not different between trials (CON: 78.33±28.36g, HI: 69.33±10.18g, SS: 70.00±13.96g, p=0.64). **CONCLUSION:** Subjects diet did not differ in total energy or macronutrient intake after HI and SS exercise.

3050 June 2 3:45 PM - 4:00 PM

### Aerobic Exercise Training Increases Dietary Restraint and Reduces Hunger and Energy Intake in Overweight/ Obese Adults

Tanya M. Halliday, Kristina T. Legget, Allison K. Hild, Jason R. Tregellas, Edward L. Melanson, FACSM, Marc A. Cornier. *University of Colorado Anschutz Medical Campus, Aurora, CO.*  
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(No relationships reported)

Exercise is associated with changes in energy intake, but findings are conflicting and mechanisms underpinning responses are unclear.

**PURPOSE:** To determine how aerobic exercise (AEX) training influences appetite, food-related behaviors, and energy intake.

**METHODS:** Previously sedentary, overweight/obese (OB/OW) adults (6F, 2M; 33±4 yr; BMI: 30.8±3 kg/m<sup>2</sup>) completed a 12-week supervised AEx program (5x/wk, energy expenditure ~400 kcal/session). At baseline (PRE) and post-intervention (POST), participants consumed a test breakfast meal (25% of daily energy requirements). Hunger and satiety were evaluated every 30 minutes for 3 hours using visual analog scales. Dietary restraint and disinhibition were assessed via Three-Factor Eating Inventory questionnaire. Subsequently, *ad libitum* energy intake was measured for 3-days under free-living conditions using participant selected meals provided by our metabolic kitchen. PRE-POST differences were assessed using paired sample t-tests. **RESULTS:** Body mass (91.9±19.8 vs. 90.4±20.5 kg, mean±SD) and composition (36±8 vs. 35±6 % fat mass) did not change (p=0.115 and p=0.515, respectively). Fasting hunger was significantly reduced (81±11 vs. 66±20, p=0.048). In response to the test meal, there was a trend for a reduction in hunger area under the curve (AUC) (7228±1459 vs. 6088±2244 pg/mL, p=0.066) but no change in Satiety AUC (7556±2808 vs. 8451±2617, p=0.452). Dietary restraint increased (9.9±2 v. 13.5±5, p=0.045), but disinhibition was unchanged (7.3±3 v. 6.9±3, p=0.476). 3-day *ad libitum* energy intake tended to decrease (2624±1222 vs. 2307±1161 kcal, p=0.089).

**CONCLUSIONS:** AEx training resulted in reduced *ad libitum* energy intake in OB/OW adults. This was due to decreased hunger cues and increased food-related cognitive restraint. However, because body mass did not change, it is possible that compensatory alterations in free-living energy expenditure and/or habitual energy intake occurred. Larger trials including measures of gut peptides and neuroimaging will be necessary to fully elucidate the bio-behavioral mechanisms responsible for predicting changes in appetite, energy-intake, and body weight regulation in response to AEx training.

**FUNDING:** ADA 1-14-TS-07 (PI: Cornier), NIH K01DK100445 (PI: Legget), NIH T32DK007446 (Halliday)

3051 June 2 4:00 PM - 4:15 PM

### Effect Of Employment Status On Physical Activity And Sedentary Behavior Long-term Post-bariatric Surgery

Ryan ER Reid<sup>1</sup>, Tamara E. Carver<sup>1</sup>, Tyler GR Reid<sup>2</sup>, Katerina Jirasek<sup>1</sup>, Kathleen M. Andersen<sup>1</sup>, Nicholas V. Christou<sup>1</sup>, Ross E. Andersen, FACSM<sup>1</sup>. <sup>1</sup>*McGill University, Montreal, QC, Canada.* <sup>2</sup>*Stanford University, Stanford, CA.* (Sponsor: Ross E Andersen, FACSM)  
Email: ryan.reid@mail.mcgill.ca  
(No relationships reported)

Chronic sedentarism and weight re-gain are both serious concerns following bariatric surgery. Pre-surgery, employment rates are lower compared to the normal weight population. Participation in daily activity is affected by multiple factors such as age, sex, high socioeconomic status and white collar occupations, which are also inversely associated with obesity severity. **PURPOSE:** To explore the influence of employment status on the daytime sedentary and physical activity habits of bariatric patients long-term post-surgery. **METHODS:** 59 adults aged 51.19 ± 8.91 years, weighing 95.24 ± 25.0 kg with a BMI of 34.64 ± 10.11 kg/m<sup>2</sup> having undergone bariatric surgery 9.98 ± 3.09 years earlier participated in this study. Participants were asked to wear an ActivPal™ tri-axial accelerometer attached to their mid-thigh for seven consecutive days, 24 hours/day. All participants wore the device for ≥ 4 days and ≥ 22 hours/day. Self-reported nighttime sleeping facilitated distinguishing this from day sitting time. Patients were collapsed into two groups: employed (N =21), or unemployed (N = 38). Sedentary time and steps were divided by total day time monitored and expressed as steps/hr and percent of day spent in sedentary behavior. ANCOVA was performed comparing the two groups on their steps/hr and percent sedentary time controlling for age, sex, BMI, and percent weight regained post-surgery. **RESULTS:** Employment status did not influence steps/hr for Week (F(1, 54) = 2.78, p = .10) or Weekend (F(1, 54) = 2.97, p = .091). Moreover, employment status did not influence percent sedentary time for Week (F(1, 54) = .36, p = .550) or Weekend days (F(1, 54) = 1.29, p = .260). **CONCLUSION:** Employment status does not appear to affect the percentage of the day spent in sedentary behaviors or physical activity among patients long-term post-bariatric surgery. Future research should focus on tailoring both exercise and lifestyle programs to meet the needs of employed and unemployed patients.

3052 June 2 4:15 PM - 4:30 PM

### Diet plus Varying Doses of Physical Activity on Weight Loss: The Heart Health Study

Renee J. Rogers, Meghan R. McGuire, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John M. Jakicic, FACSM)  
Email: r.j.rogers@pitt.edu

**Reported Relationships: R.J. Rogers: Contracted Research - Including Principle Investigator; Weight Watchers International, Inc..**

**PURPOSE:** This study examined whether adding physical activity recommended for public health (150 min/wk) or weight control (250 min/wk) to a diet enhanced weight loss or selective cardiometabolic risk factors in obesity across 12 months.

**METHODS:** Participants (N=383; Age=44.7±8.2 years, BMI=32.4±3.8 kg/m<sup>2</sup>) were randomized to a reduced calorie diet (DIET, N=127), diet plus a moderate dose of physical activity (MOD-EX, N=129), or diet plus a high dose of physical activity (HIGH-EX, N=127). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. MOD-EX was prescribed physical activity that progressed to 150 min/wk with HIGH-EX progressed to 250 min/wk. Physical activity, weight, waist circumference, and resting blood pressure were assessed at 0 and 12 months.

**RESULTS:** Retention at 12 months was 86.6% in DIET, 80.6% in MOD-EX, and 83.5% in HIGH-EX. Physical activity at 0 and 12 months was 65.4±73.8 and 88.2±104.3 min/wk in DIET; 68.7±93.8 and 179.1±125.3 min/wk in MOD-EX; and 71.5±84.4 and 228.8±148.3 min/wk in HIGH-EX (Group X Time p<0.001). Weight decreased at 12 months (DIET: -9.9±8.3 kg, MOD-EX: -10.8±8.2 kg, HIGH-EX: -9.5±7.3 kg) (p<0.001), with no difference between groups. There were also significant and similar changes across groups in waist circumference at 12 months (DIET: -8.8±8.1 cm, MOD-EX: -10.4±8.8 cm, HIGH-EX: -9.3±7.4 cm) (p<0.001). Resting systolic and diastolic blood pressure decreased significantly (p<0.001) by 4.3±10.1 mmHg and 2.6±6.6 mmHg, respectively; however, there was no difference between groups.

**CONCLUSIONS:** MOD-EX and HIGH-EX engaged in physical activity that was consistent with the prescribed doses of physical activity; however, this did not improve weight loss, waist circumference or resting blood pressure compared to DIET at 12 months. It is likely that compensation in energy balance occurred in response to physical activity that limited additional weight loss or changes in selective cardiometabolic risk factors. Additional research is warranted to understand the physiological and behavior compensation that may occur in response to these interventions in adults with obesity.

Supported by: NIH (R01 HL103646)

3054 June 2 4:30 PM - 4:45 PM

**Metabolic Flexibility Among Women In Response To A Single High Fat Meal.**

Alyssa Olenick, Regis Pearson, Nuha Shaker, Rachel Tinius, Maire Blankenship, Evie Oregon, Don Hoover, Jill Maples. *Western Kentucky University, Bowling Green, KY.* (Sponsor: Dr. James Green, FACSM)

(No relationships reported)

Metabolic flexibility is the ability to adjust substrate oxidation according to nutrient availability. For example, one that fails to increase fat metabolism in response to a high fat meal would be characterized as metabolically inflexible. This metabolic inflexibility may lead to weight gain and the development of metabolic disease. Previous studies have shown that obese women are metabolically inflexible in response to short-term high fat diets compared to lean women. However, the acute response to a single high fat meal has not been described. **PURPOSE:** To determine if obese women are metabolically inflexible in response to a single high-fat meal, compared to lean. **METHODS:** Baseline (T1), fasting glucose, resting energy expenditure (REE), lipid and carbohydrate oxidation (estimated using indirect calorimetry), were assessed for lean (n= 4; Age=26.5±4.43 yrs; BMI=23.6±1.7) and obese (n= 2; Age=35.5±2.1 yrs; BMI=34.7±7.6) Caucasian women. Participants then consumed a high fat shake (975 kcal, 62% fat). Additional REE, lipid and carbohydrate oxidation measurements were taken at 120 (T2) and 240 (T3) minutes post shake. **RESULTS:** There were no significant differences in age between groups. T1 REE was significantly higher (p<0.05) among obese (1930.2±179.3 kcal) women compared to lean (1607.7±120.0 kcal) women. There was a significant time effect on lipid and carbohydrate oxidation (p<0.05) and a significant BMI effect (p<0.05) on lipid oxidation. Lipid oxidation increased among both groups, but was significantly higher among obese (T1=0.12±0.01, T2=0.14±0.01, T3=0.13±0.01) women compared to lean (T1=0.08±0.01, T2=0.11±0.01, T3=0.10±0.01) at all three time points. Although not significant, there was a trend for the lean women to increase lipid oxidation to a greater extent from T1 to T2 (lean 38.3±13.8% increase vs. obese 16.7±0.0% increase; p=0.11). **CONCLUSIONS:** Current preliminary data suggest that lipid oxidation is higher among obese women compared to lean after consuming a single high fat meal. The obese women appear to respond similarly in terms of metabolic flexibility, compared to lean women. A single high fat meal may not be enough of a stimulus to elicit the metabolic inflexibility previously reported among obese women in response to a high fat diet. Supported for by WKU Graduate School Research Grant

**F-37 Clinical Case Slide - Pulmonary**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
Room: 507

3055 **Chair:** Dennis Khalili-Borna, FACSM. *Kaiser Permanente, Fontana, CA.*

(No relationships reported)

3056 **Discussant:** Steven R. Boas, FACSM. *CARE Specialists, Inc., Glenview, IL.*

(No relationships reported)

3057 **Discussant:** Todd May. *Naval Hospital Camp Pendleton, Camp Pendleton, CA.*

(No relationships reported)

3058 June 2 3:15 PM - 3:35 PM

**Episodes Of Near-syncope In A Runner**

Darrika D. Van<sup>1</sup>, Thomas G. Allison<sup>2</sup>, Michael S. Emery<sup>3</sup>.  
<sup>1</sup>Indiana University Health, Indianapolis, IN. <sup>2</sup>Mayo Clinic, Rochester, MN. <sup>3</sup>Indiana University School of Medicine, Indianapolis, IN.

Email: dvan@iuhealth.org

(No relationships reported)

**History:** A 14-year-old female cross-country & track athlete presents with complaints of near syncope towards the end of exercise. Her symptoms do not occur during training only during competitive events in particular when attempting to catch an opponent near the end of a race. She is also a swimmer and has never experienced symptoms with competitive swimming. These episodes have been accompanied by lightheadedness and dizziness and she would "stumble" across the finish line. They have not resulted in bodily injury and she recovers quickly. She has no other past medical history or medications. The family history is noncontributory.

**Physical Examination:**

Height 5'3". Weight 98 pounds. BMI 17.4  
Blood Pressure 101/56; heart rate 97 bpm  
Well-developed young female who appears mildly anxious  
Normal lung auscultation  
Cardiovascular exam with regular rate and rhythm; no murmurs/gallops/rubs

**Differential Diagnosis:**

1. Primary cardiac arrhythmia
2. Cardiovascular structural abnormality
3. Vasovagal response
4. Postural orthostatic tachycardia syndrome
5. Anxiety

**Tests and Results:**

ECG: Normal ECG with sinus rhythm at 83bpm.  
Echocardiogram: All chambers normal size and function with no valvular abnormalities.  
Baseline Spirometry: Normal  
Cardiopulmonary Stress Test with reproduction of symptoms on the treadmill:  
Peak VO2 45.3 mL/Kg/min (100% predicted)  
Peak O2 pulse 9 mL/beat (97% predicted)  
Max HR 212 bpm (103% predicted)  
Stress ECG: sinus rhythm throughout without ischemic changes  
Immediate recovery BP 124/60 (peak BP not obtained due to symptoms)  
Peak respiratory rate 77 (53 at AT)  
Tidal volume at peak 899 mL/breath (resting 612 mL/breath; AT 821 mL/breath)  
Breathing reserve at peak 32%  
VE/VCO2 at AT 26  
Vt/FVC at peak 29% (27% at AT)

**Final Working Diagnosis:** Dysfunctional breathing with patterned disorder breathing

**Treatment/Outcomes:**

1. Reassurance of no primary cardiovascular abnormality
2. Lifestyle modification including liberalizing salt and fluid intake
3. Encouragement to work on breathing mechanics with her coaches and/or referral to speech pathology

3059 June 2 3:35 PM - 3:55 PM

**Chronic Dyspnea - Running**Jack Nickless, Anthony Romeo. *Midwest Orthopaedics at Rush, Chicago, IL.**(No relationships reported)*

**HISTORY:** 63 year-old male presented to clinic with complaint of continued severe shortness of breath status-post left total shoulder arthroplasty. Surgery was performed under general anesthesia with interscalene nerve block for regional anesthesia. Previously, patient had been running 3 miles per day and golfing regularly without issues. Immediately after the surgery, he began to notice a significant decrease in his functional status due to SOB. He now has difficulty walking up one flight of stairs, cutting the grass, or golfing more than 9 holes because of the SOB he experiences with activity. Denies fevers, chills, cough, hemoptysis, chest pain, palpitations, and calf pain. He is otherwise very happy with the improvements in pain, ROM, and overall functionality of his left shoulder s/p left TSA.

**PHYSICAL EXAMINATION:** VS: BP 132/76, P 66, Temp 36.7 C, Resp 18, SpO2 96%; Gen: Awake, alert, cooperative, NAD; Lungs: No increased work of breathing, good air exchange, CTAB, No rales or wheezing; CV: RRR, +S1S2, no S3 or S4, no murmurs noted; Neuro: AOX3, sensation to light touch intact throughout LUE, no focal deficits; Skin: Surgical incisions clean, dry, and intact

**DIFFERENTIAL DIAGNOSIS:** 1. Atelectasis 2. Pulmonary Embolism 3. Underlying pulmonary condition (COPD vs. pulmonary fibrosis vs. lung carcinoma) 4.

Congestive heart failure 5. Diaphragmatic paralysis from phrenic nerve injury

**TEST AND RESULTS:** CTA Chest: significant pleural effusion, negative for PE; CXR: elevated left hemi-diaphragm

**FINAL WORKING DIAGNOSIS:** Left diaphragmatic paralysis secondary to phrenic nerve injury associated with interscalene block

**TREATMENT AND OUTCOMES:**

1. Patient initially on Aspirin and encouraged to ambulate for DVT prophylaxis 2. Provided with an incentive spirometer to prevent post-op atelectasis 3. Extensive outpatient Cardiology and Pulmonology evaluations without findings of underlying medical condition to explain symptoms 4. Suspected phrenic nerve injury associated with pre-operative interscalene block 5. Pulmonary rehabilitation performed with minimal improvement symptoms 6. We have discussed the possibility of further pulmonary rehabilitation vs. neurosurgical consultation for possibility of phrenic nerve decompression with possible nerve graft

3060 June 2 3:55 PM - 4:15 PM

**Thirteen-year-old Female Football Player With Shortness Of Breath**Mark R. Johnson. *SIU SOM, Springfield, IL.**(No relationships reported)***HISTORY:**

Patient is a 13 yo otherwise healthy female who complains of Shortness of Breath (SOB) and chest discomfort. Patient is a football player (tackle) in a community football program. SOB is described as a chest tightness in the mid chest starting 10 minutes into running. She denies throat tightens and reports expiratory wheezing. She has an associated cough. Rest and relaxation relieve symptoms. Albuterol helps with symptoms. Patient has had trauma to her chest while playing football.

PMH: Had tonsillectomy adenoidectomy otherwise noncontributory

FMH/Social: No significant

**PHYSICAL EXAMINATION:**

Vitals Wt 89kg(99%), Ht 157cm(40%), BMI 36(99%)

117/73, 78, 16, 99%

General: Stocky well developed female with significant muscular development

HEENT: Unremarkable

Chest: Tender to palpation costosternal articulations, no bruising, no pectus

Lungs: Clear to auscultation, symmetric, no retractions

Heart: RRR no murmur, normal pulses, normal capillary refill

Abdomen: Soft NT ND no mass, no HSM

Neuro: Non-focal

**DIFFERENTIAL DIAGNOSIS:**

EIB, Extra-thoracic Airflow Obstruction, relative deconditioning, obesity-associated dyspnea, Pulmonary Hypertension, Chest Wall Injury, Costochondritis/Tietze

**TEST AND RESULTS:**

CXR/Bilateral Ribs: Unremarkable

RAST Environmental Panel: No significant reactions

CPET: VO2 3492(135%), VO2/kg 39.7, VeVO2 22AT 32Max, ETCO2 40/36, Flow Limitation at significant levels starting halfway through testing and approached nearly all the expiratory phase. In last 30 seconds developed stridor, strap muscle use that responded to coaching for on abdominal breathing and concentration on exhalation.

**FINAL WORKING DIAGNOSIS:**

Physiologic flow limitation resulting in extra-thoracic airflow obstruction

**TREATMENT AND OUTCOMES:**

1. Weight reduction with goal of BMI 30-32 (approximately 10-15kg)
2. If symptoms persist after weight reduction will consider speech therapy referral
3. Full activity as tolerated without limitation

3061 June 2 4:15 PM - 4:35 PM

**Right Upper Quadrant Pain In a Soccer Player**Jason T. Losee. *Evergreen Sports Medicine Fellowship, Augusta, ME.* (Sponsor: James Dunlap M.D., FACSM)

Email: thomaslosee@msn.com

*(No relationships reported)*

Abdominal injuries are rare in sports. However, unrecognized, they can be serious and even life threatening. A 16-year-old F. soccer player presented with worsening RUQ abdominal pain after being struck in the abdomen by a soccer ball. Two days prior she had been kicked by a goalie in the abdomen, although she did not experience much pain with that incident. In the ED the patient denied chest pain or pressure, cough, congestion, shortness of breath, vomiting, diarrhea, constipation, black or bloody stools. PMH: allergic rhinitis. PSH: none. Allergies: NKDA. Meds: Flonase. **PHYSICAL EXAMINATION:** Temp 98.4 deg, HR 85, BP 116/60, SaO<sub>2</sub> 100% on room air. Well-developed and well-nourished. Alert and oriented to person, place and time. Head normocephalic and atraumatic. Pupils equal, round, reactive to light and accommodation. Sclera anicteric. No conjunctiva injection. Extraocular movements intact. Trachea midline. Lungs clear to auscultation with normal breath sounds bilaterally. Abdomen soft with tenderness in the RUQ and voluntary guarding. No rigidity, rebound, abrasions, Grey-Turner sign, or Cullen's sign. No masses or hepatosplenomegaly. No CVA tenderness. No focal or neurological deficits.

**DIFFERENTIAL DIAGNOSIS:**

1. Rib contusion/fracture
2. Liver contusion/laceration
3. Bowel perforation
4. Traumatic pancreatitis
5. Pancreatic laceration/pseudocyst
6. Retroperitoneal hematoma
7. Rectus sheath hematoma
8. Pulmonary contusion
9. Splenic contusion/laceration.
10. Kidney hematoma/laceration

**TESTS AND RESULTS:**

WBC count of 14.6, Hgb and hematocrit of 13.7 and 41. Urine preg. negative, BUN and Cr 21 and 1.03, alk phos 109, ALT 304, AST 346, Total Bilirubin 0.6, Lipase 76, CRP <0.29, lactic acid 0.9, monospot neg, UA positive for trace ketones.

CT abdomen and pelvis with contrast:

- Three hepatic contusions without laceration or hemoperitoneum

**FINAL/WORKING DIAGNOSIS:**

Liver contusions

**TREATMENT AND OUTCOMES:**

1. Liver enzymes and WBCs trended to normal.
2. Cleared for light stationary biking at one month.
3. Patient has not been cleared for full sport participation. She will avoid contact sports participation for three months from the time of injury. May consider a repeat CT scan at that time to verify resolution of the contusions.

3062 June 2 4:35 PM - 4:55 PM

**Splenic Injury - Football**Jennifer Kim. *Kaiser Fontana, Fontana, CA.* (Sponsor: Robert Sallis, FACSM)

Email: jennyskimmd@gmail.com

*(No relationships reported)*

**HISTORY:** A 21-year-old football wide receiver sustained a hit to his left ribs by an opposing player's helmet during the last quarter of a mid-season game. After being tackled, the athlete was able to get up and walk off the field.

**EXAMINATION:** Athlete was assessed on the sidelines shortly after injury and found to have localized tenderness along the lower left ribs. He reported mild nausea but no dizziness or shortness of breath. Pain was made worse by twisting movements of the torso and deep inspiration. He was given a bag of ice to place on his ribs. At the end of the game his exam and symptoms had not changed. A few hours later he noticed the pain was worse with supine position. Pain did not improve with Tylenol. Late in the evening, the intensity of pain did not subside and began to radiate to his left shoulder.

**DIFFERENTIAL DIAGNOSIS:**

1. Rib contusion
2. Lower rib fracture(s)
3. Splenic injury

**TEST AND RESULTS:**

On the advice of his trainer, the athlete went to ED that night. X-rays of the ribs were negative for fracture. No further studies were done. He was diagnosed with rib contusion and discharged home with pain medication. The following morning, his pain had worsened and he developed emesis with attempts to eat. Again on the advice of his trainer he returned to Urgent Care. The examining physician noted abdominal bloating and left upper quadrant tenderness. He was then sent to the ED where a CBC drawn was notable for anemia. Ultrasound and CT abdomen confirmed diagnosis of splenic laceration.

**FINAL/WORKING DIAGNOSIS:**

Splenic laceration, grade IV

**TREATMENT AND OUTCOMES:**

1. After reviewing the CT scan, it was determined that immediate surgical intervention was not needed
2. Athlete was admitted to ICU where serial Hb/Hct was monitored for the next 48 hours. Hct stabilized and athlete remained hemodynamically stable
3. Athlete was discharged from hospital with restrictions on return to play until 3 months post injury. He is feeling well but unable to return to football before the end of this season.

3063 June 2 4:55 PM - 5:15 PM

**Blunt Abdominal Trauma at Pre-season Scrimmage**

Brian J. Schutzbach<sup>1</sup>, Mark Lavallee, FACSM<sup>2</sup>. <sup>1</sup>Greenville Health System, Greenville, SC. <sup>2</sup>Wellspan Health, York, PA. (Sponsor: Mark Lavallee M.D., FACSM)  
Email: brian.j.schutzbach@gmail.com

(No relationships reported)

**History:** 17 year old male wide receiver came to the sideline with severe 7/10 sharp, stabbing, mid abdominal pain at a high school scrimmage after he had caught a pass and was tackled. He was unaware if a body part or a helmet struck him in the abdomen. Another teammate came over and said he was sandwiched by two players. He denied any radiation of his pain. He noted associated difficulty breathing and numbness in his fingers bilaterally. He also pitches for baseball team with aspirations of playing college baseball. **Physical Examination:** Sideline examination of abdomen showed a soft, non-distended, thin abdomen with normal bowel sounds and maximal tenderness in the left upper quadrant. He also displayed guarding. Patient was mentating well but was tachypneic with normal lung sounds. His skin was cool in the distal extremities. After 5 mins of rehydration and monitoring, he was evaluated again with similar findings of 7/10 abdominal pain. The abdominal exam was repeated and no significant improvements were noted. The decision was made him to transfer him to the local emergency department by EMS for imaging of his abdomen and closer monitoring. **Differential Diagnosis:** 1. Diaphragmatic Spasm 2. Rectus Sheath Hematoma 3. Splenic Laceration 4. Rib Fracture 5. Kidney Laceration 6. Liver Contusion 7. Anxiety with Tachypnea causing Hypocarbica **Tests and Results:** CT Abdomen and Pelvis with IV Contrast shows an extensive irregular mid splenic fracture at the level of the hilum measuring from 3.5 to 5.5 cm. There is hypodense intraperitoneal fluid extending across the upper abdomen and down both flanks into the cul-de-sac. Left renal upper pole laceration with contained intracapsular hematoma. **Final/Working Diagnosis:** Grade IV Splenic Laceration **Treatment and Outcomes:** 1. Transferred to Level 1 trauma center for embolization of splenic artery 2. Monitored vitals, hemoglobins and pain control s/p embolization 3. Surgical team performed splenectomy due to persistent sever pain and presence of hemoperitonenum despite stable hemoglobins. 4. Discharged home without complications and did not return to play football again. 5. Patient was able to return to throwing activities for baseball at 8 weeks after initial injury.

**F-38 Clinical Case Slide - Shoulder II**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
Room: 401

3064 **Chair:** Jason L. Zaremski, FACSM. *University of Florida, Gainesville, FL.*  
(No relationships reported)

3065 **Discussant:** Ramsey Shehab. *Henry Ford, Detroit, MI.*  
(No relationships reported)

3066 **Discussant:** Shawn F. Kane, FACSM. *U.S. Army, Carthage, NC.*  
(No relationships reported)

3067 June 2 3:15 PM - 3:35 PM

**Weakness In Shoulder After A Football Collision**

Timothy Gill, Kevin Duprey. *Crozer-Keystone Health System, Springfield, PA.* (Sponsor: Thomas Kaminski, FACSM)  
(No relationships reported)

**HISTORY:** 16 year old male football player presented to the office with left shoulder weakness 5 days after he was clipped and landed on his left shoulder. At time of injury, he experienced a dull 6/10 ache in the lateral shoulder, but was able to continue playing for the last few minutes of the game. The following morning, he developed difficulty moving his arm, including reaching across his body and tying his shoes. His shoulder pain was gradually improved at the time of the visit, but weakness persisted.

**PHYSICAL EXAMINATION:** He has full painless active cervical ROM, Spurling's Negative. Left shoulder exam reveals a diminished painless ROM with forward flexion to 20 degrees and abduction to 20 degrees. He has external rotation to 70 degrees and internal rotation to T10 bilaterally. He has 4/5 strength with internal rotation, 5/5 with external rotation, 3/5 with abduction and forward flexion. He has mild tenderness to palpation over the anterior shoulder. He has no tenderness over the SC, AC, or the supraspinatus. He has a negative scarf test and resisted adduction. He has a drop arm with lowering from abduction.

**DIFFERENTIAL DIAGNOSIS:** Supraspinatus tear; Labral Tear; Axillary nerve palsy, shoulder dislocation, Cervical radiculopathy, Cervical disc herniation, Humerus fracture.

**TEST AND RESULTS:** X-ray of the shoulder revealed no evidence of fracture, dislocation or other abnormality. MRI of the shoulder revealed marrow contusion of the greater tuberosity, mild subchondral subdeltoid bursitis and no rotator cuff or labral tear appreciated.

**FINAL WORKING DIAGNOSIS:** Transient axillary nerve palsy with osseous contusion of humerus.

**TREATMENT AND OUTCOMES:** Over the following two weeks, he regained full strength and motion. Axillary nerve palsy, commonly associated with shoulder dislocations, is rare following a simple fall to the ground.

3068 June 2 3:35 PM - 3:55 PM

**A New Frontier for the Medial Clavicle**

Sam Hwu<sup>1</sup>, Garry W.K. Ho, FACSM<sup>1</sup>, Keith W. Lawhorn<sup>2</sup>. <sup>1</sup>*Sports Medicine Fellowship Program, Virginia Commonwealth University - Fairfax Family Practice, Fairfax, VA.* <sup>2</sup>*OrthoVirginia, Fairfax, VA.*  
Email: sam.hwu@gmail.com  
(No relationships reported)

**History:** A 63 year-old male presented with a 2-week history of left upper extremity pain after being hit by a car on his left side while riding his bicycle. He sustained fractured ribs, an extraarticular fracture-dislocation of the left medial clavicle, a minimally displaced oblique fractured left scapular body, and a displaced, comminuted fractured left distal radius for which he underwent ORIF. While hospitalized, he was informed there were no surgical options to treat his left clavicle fracture-dislocation. **Physical Examination:** Examination revealed a male with his left arm in a sling. He had a prominent anterior sternoclavicular joint and deformity of his medial clavicle. His range of motion was limited due to pain and guarding. He had 2+ radial pulses, intact sensation to light touch, and no obvious motor dysfunction of his upper extremities.

**Differential Diagnosis:** 1. Anterior sternoclavicular joint dislocation 2. Medial clavicular fracture-dislocation

**Tests and Results:** Left shoulder CT scan: 1. Comminuted, anteriorly angulated fracture of the medial aspect of the left clavicle with severe shortening and subluxation of sternoclavicular joint. 2. Minimally displaced oblique fracture through scapular body. Multiple anterior and posterior ribs. No pneumothorax.

**Final Diagnosis:** 1. Medial clavicular fracture with significant shortening and fracture-dislocation of sternoclavicular joint. 2. Minimally displaced scapular body fracture. 3. Anterior and posterior rib fractures.

**Treatment and Outcomes:** He underwent an ORIF of his medial clavicle fracture-dislocation using a 7-hole 15-mm hook plate. The plate was placed under the inferior border of the medial head of the clavicle and superior to the first rib to push the lateral clavicle fragment posteriorly to reduce the fracture. Screws were placed in the hook plate to stabilize the fracture and maintain the clavicle out to length as much as possible. The arm was ranged with mild motion of the hook plate under the sternum and the fracture stable. His scapular and rib fractures were treated nonoperatively. A hook plate is designed for fixation of a lateral clavicle fracture, but its use in medial clavicle fractures has not been well established. We offer this case as an example of a successful outcome using this novel operative approach.

3069 June 2 3:55 PM - 4:15 PM

**Shoulder Injury - Ground Level Fall**Kevin M. Mullins, Brian A. Davis, FACSM. *University of California, Davis, Sacramento, CA.*

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*(No relationships reported)***HISTORY:**

A 60-year-old woman sustained a right shoulder injury after falling from a chair onto an outstretched arm 2 years ago. She immediately had severe right lateral shoulder pain, worse with abduction. Outside facility workup included normal x-rays, C Spine MRI with a small annular posterior disc bulge at C6-7, Shoulder MRI with mild increased T2 signals at insertional sites of supraspinatus and long head biceps tendons. NCS of median/ulnar nerves were normal and needle EMG of deltoid, infraspinatus, serratus anterior and rhomboid major also normal. She was treated with a subacromial corticosteroid injection and therapy with minimal improvement, and is now presenting with unresolved chronic symptoms impacting her ADLs.

**PHYSICAL EXAMINATION:**

On inspection decreased muscle bulk in right trapezius on shoulder shrug and scapular retraction. No tenderness to palpation. Passive range of motion full in all planes, and notable for right scapular hike with abduction greater than 60 degrees and loss of adduction control of scapula, as it rides into anterior/superior supraclavicular region. Active shoulder abduction limited to 54 degrees when standing due to weakness, but able to obtain full 170 degrees when supine. Strength of right trapezius is 4/5, remaining muscles 5/5 with scapula stabilized. Sensation intact to light touch and shoulder impingement maneuvers are negative.

**TEST AND RESULTS:**

Our repeat NCS done personally was significant for an abnormal right spinal accessory nerve CMAP to the trapezius with significantly decreased amplitude and onset latency comparable to the left side. Needle EMG was evident for normal right deltoid, infraspinatus, serratus anterior, rhomboid major but markedly abnormal right upper and middle trapezius findings with increased insertional activity, fibrillation potentials, positive sharp waves, polyphasic MUAPs and reduced recruitment.

**FINAL WORKING DIAGNOSIS:**

Right incomplete spinal accessory neuropathy - mostly affecting upper fibers.

**TREATMENT AND OUTCOMES:**

1. Collaboration with sports medicine orthotist for molding of a customized scapular stabilizer/restraining brace.
2. Physical Therapy Rx for shoulder girdle complex strengthening and range of motion exercises.
3. Patient with significant improvement in pain, range of motion, and general function with brace.

3070 June 2 4:15 PM - 4:35 PM

**Shoulder Pain in a Professional Contemporary Ballet Dancer**Brennan Boettcher, Jonathan Finnoff, FACSM. *Mayo Clinic, Rochester, MN.* (Sponsor: Jonathan Finnoff, FACSM)

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*(No relationships reported)***History:**

A 22 year-old male professional ballet dancer presented with a 1 year history of non-radiating, posterior right shoulder pain. The pain severity was between a 0-8/10, and was aggravated when lifting other dancers. He denied any instability, clicking or catching, weakness, or numbness or tingling.

One year ago, while dancing, he fell on his right shoulder/neck. By report, a c-spine MRI revealed a cervical disc herniation (unknown level). He was treated successfully with physical therapy, but his pain gradually recurred.

**Physical Examination:**

Fit appearing 22 year-old male in no distress.

At rest, the right shoulder was elevated and protracted. There was subtle scapular dyskinesia with a delay in right scapular movement and prominent right medial scapular border.

He was tender over the supraspinatus and infraspinatus muscles.

Cervical and shoulder motion were full and symmetric.

Special tests revealed a (-) Spurling's, and mild peri-scapular pain with position one of O'Brien's, empty can and Hawkins's impingement tests.

Neurovascular exam was normal.

**Differential Diagnosis:**

Rotator cuff tendinopathy/tear

Labral tear

Scapular dyskinesia

Peri-scapular myofascial pain

Subacromial bursitis

Cervical radiculopathy

Glenohumeral instability

**Tests and results:**

Complete diagnostic shoulder ultrasound revealed supraspinatus, infraspinatus, and teres minor hyperechogenicity and loss of the normal muscular architecture with atrophy, consistent with fibrofatty infiltration from his prior C5 or C6 radiculopathy. Subacromial bursa was hypertrophic, consistent with subacromial bursopathy.

**Final/Working diagnosis:**

Scapular dyskinesia, likely secondary to right C5 or C6 chronic radiculopathy with denervation changes to the supraspinatus, infraspinatus, and teres minor.

Subacromial bursopathy

**Treatment and Outcome:**

The patient was given a rehabilitation program for scapular stabilizers, rotator cuff, postural positioning, stretching anterior shoulders, and trial of Kinesio tape. The patient returned to ballet, was advised to use caution with lifts.

He was given the option of returning in 4-8 weeks for an ultrasound guided subacromial corticosteroid injection if there was no improvement with rehabilitation.

3071 June 2 4:35 PM - 4:55 PM

**Return to Kipping After Shoulder Injury: Introducing a Novel Unloading Rehabilitation Technique**Kevin Messey<sup>1</sup>, Sarah Mahasin<sup>2</sup>, David Bazzo<sup>1</sup>, Kenneth Vitale<sup>1</sup>.<sup>1</sup>University of California San Diego, San Diego, CA. <sup>2</sup>King Saud University, Riyadh, Saudi Arabia.*(No relationships reported)*

**HISTORY:** 42-yr F CrossFitter with insidious L shoulder pain x 3 mth, worse on ER localizing to posterior shoulder. Notably worse on kipping, at bottom & top of kip. Mild pain after workout, night pain if sleeps on left. No h/o dislocation. No paresthesias or weakness. No recent trauma but frequently loads shoulder with ballistic exercises & Olympic lifts. Trains for CrossFit 1.5hr x 6 d/wk. Tried PT 6 visits, still could not kip, snatch, pull-up. Currently training for competition in 1 month.

**PHYSICAL EXAM:**

Forward head posture, L trunk rotation, L shoulder elevation, L scapula anterior tilt. Tender periscapular muscles & bicipital groove. ROM Ext: 0, Flex: 180, ER @ 90: 90, IR @ 90: 60; increased pain with ABD + ER. Rotator cuff strength intact. No instability. Positive Speed's, Hawkins. Positive Crank, O'Brien's. AC joint testing negative. Cervical spine exam normal other than C7 abrasion from barbell loading. Normal neurovascular exam. **DIFFERENTIAL DIAGNOSIS:** 1. Rotator cuff tear 2. Labral tear 3. Bicipital tenosynovitis 4. Post-traumatic loose body, osteoarthritis 5. Adhesive capsulitis **TEST & RESULTS:** X-ray: mineralization at medial surgical neck, possible IGHL injury. MR arthrogram: anterosuperior labral tear from 12 to 3 o'clock; extensive chondral delamination anterior glenoid, focal high-grade chondral loss central glenoid; intra-articular bodies in posterior recess; supraspinatus/infraspinatus tendinosis. **FINAL/WORKING DIAGNOSIS:** 1. Type 1 SLAP tear 2. Supraspinatus/infraspinatus tendinosis 3. Glenoid osteoarthritis 4. Intra-articular bodies 5. Radiological evidence of remote IGHL avulsion **TREATMENT & OUTCOMES:** 1. Rest, activity modification, naproxen prn. 2. PT, ART, cupping; still unable to kip or snatch. 3. Athletic Training Services for biomechanical analysis, rehabilitation & injury prevention strategies. Treatments included PNF throwers program, pec minor release, swing stretch, plank T rotation, plank board slide. 4. Re-introduction of kips utilizing Keiser device and harness unloading at 114lbs resulted in pain-free kipping with preserved technique. Progressions included further unloading at reduced assistances of 110, 100, 90, 80, 70, 50 lbs in a 6x6 set. At ≤70 lbs. could reproduce typical rhythm of kipping. 5. Returned to sport at 1 mth and able to compete in CrossFit competition.

3072 June 2 4:55 PM - 5:15 PM

**An Atypical Cause of Shoulder Pain in a Male Ballet Dancer**Mark Bender, David Leffers, Sean Spence. *University of South Florida, Tampa, FL.*

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*(No relationships reported)*

**HISTORY:** A 17 year old male, with a history of Type 1 Diabetes presented to our clinic with a complaint of left shoulder pain after an injury that he sustained while participating in ballet practice. He reports that his partner lost her balance during a lift which caused him to overcompensate and shift positions quickly. During this maneuver he felt a sudden, sharp pain in his left shoulder and discontinued practicing. Following this incident he was unable to elevate his arm although he did not complain of any numbness or paresthesia's.

**PHYSICAL EXAMINATION:** Upon exam, there was no evidence of swelling or ecchymosis around the neck/anterior deltoid and he was neurovascularly intact. He had increased pain with deep inspiration but no shortness of breath or additional respiratory abnormalities. Forward flexion and abduction of the arm were limited to approximately 45° due to pain. Passive range of motion was diminished to 90° with inability to reach end range due to pain. There was no pain to palpation along the clavicle or AC joint; however palpation of the first rib at the base of the neck elicited significant pain.

**DIFFERENTIAL DIAGNOSIS:**

First rib stress fracture  
Rotator cuff tear  
Cervical sprain

**TEST AND RESULTS:** A left sided rib series was performed which demonstrated an incomplete fracture of the first rib. No significant displacement was seen although slight elevation of the distal clavicle was noted which appeared to be chronic.

**FINAL WORKING DIAGNOSIS:** Stress fracture of the first rib

**TREATMENT AND OUTCOMES:**

Refrain from participating in ballet practice for 4-6 weeks with gradual return to dance  
Arm immobilization with a sling  
Vitamin D/Calcium supplementation  
Repeat isolated rib radiographs at 2 and 6 weeks  
Patient was re-evaluated at 2 and 6 weeks post-injury. At 2 weeks the patient was instructed to participate in graded physical therapy but due to insurance issues he was unable to start until 6 weeks post-injury.  
At 6 weeks, he displayed full shoulder elevation and abduction and there was no significant pain to palpation over the first rib. He endorsed some mild discomfort over the trapezius and scalene muscles and his shoulder strength was graded 4/5.  
Repeat plain films demonstrated proper rib alignment and some early bridging callus formation. He was instructed to follow-up in 1 month and to begin physical therapy

**F-51 Basic Science World Congress/Poster - Stress and Behavior**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3096 Board #1 June 2 2:00 PM - 3:30 PM

**Anxiety Level Moderates the Acute Impact of Light and Moderate Intensity Aerobic Exercise on Working Memory**

Olga G. Berwid<sup>1</sup>, Sarah C. O'Neill<sup>2</sup>, Nacima Chen<sup>2</sup>. <sup>1</sup>York College, City University of New York, Jamaica, NY. <sup>2</sup>The City College of New York, New York, NY.

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(No relationships reported)

**PURPOSE:** Accruing evidence suggests that there is an improvement in working memory immediately after a single bout of moderate-intensity aerobic exercise with smaller and more variable effect sizes in healthy young adults than in other groups (Ludyga et al., 2016). Individual differences in the impact of exercise on cognition mediated by a variety of different factors may account for some of this variability. The aim of the current study was to determine whether the impact of both light- and moderate-intensity aerobic exercise on verbal and nonverbal working memory differs in individuals who report higher versus lower levels of trait anxiety.

**METHODS:** 125 young adults were administered Operation Span (O-SPAN) and Symmetry Span (S-SPAN) tasks twice; once after spending approximately 40 minutes completing questionnaires including the State-Trait Anxiety Inventory (STAI-T); and once after 40 minutes of either moderate-intensity (>60% of age-predicted maximum HR) or light-intensity (<55% of age-predicted maximum HR) aerobic exercise. Session order was counterbalanced across participants and participants were randomly assigned to exercise intensity. A median split on the STAI-T was used to separate participants into lower and higher anxiety groups. The impact of exercise and anxiety on WM was examined in 2 (Intensity) x 2 (Anxiety Level) x 2 (Session) mixed-factorial analyses of variance.

**RESULTS:** For S-SPAN performance, there was a significant Anxiety x Session interaction ( $F = 4.04$ ;  $p = .047$ ; partial eta-squared = .032) indicating that those reporting higher levels of trait anxiety may benefit slightly more from exercise than those with lower levels of anxiety. For O-SPAN performance, there was a significant 3-way Intensity x Anxiety Level x Session interaction ( $F = 6.27$ ;  $p = .014$ ; partial eta-squared = .05) revealing differing patterns of moderate- and low-intensity exercise for the higher and lower anxiety groups. There were no other significant effects.

**CONCLUSIONS:** The data suggest that light- and moderate-intensity aerobic exercise may exert different impacts on working memory in individuals reporting lower versus higher levels of trait anxiety; however, effect sizes are small.

3097 Board #2 June 2 2:00 PM - 3:30 PM

**Physical Fitness, Physiological and Sleep Responses to Stress in Women**

Abigail J. Leonard, Meir Magal, FACSM, Daniel Henderson, Christina Huber, Lyndsay Wolfe, Andrea Tobar, Shannon K. Crowley. North Carolina Wesleyan College, Rocky Mount, NC.  
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(No relationships reported)

**PURPOSE:** Stress-related psychiatric disorders (such as depression) are twice as common in women as in men and have been linked to aberrations in physiological and psychological stress responding. Being physically fit may be protective against the development of adverse symptoms related to stress, however, to date, there has been limited investigation of the relationship between physical fitness and behavioral and physiological responses to stress which considers the profound influence of the ovarian cycle on physiological and behavioral stress responding. This study aims to investigate the relationship between physical fitness and physiological and behavioral (sleep disturbances) responses to stress in women during the follicular phase of the menstrual cycle (when ovarian hormones are low and stable). **METHODS:** Following a two-tiered screening process, 10 healthy women (18-45y) who were medication-free and had regular menstrual cycles were enrolled. Participants completed: (1) enrollment visit, (including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) psychosocial stressor protocol for the collection of hemodynamic [blood pressure (SBP, DBP) and heart rate (HR)] and hormonal stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can influence the physiological response to stress.

**RESULTS:** Though not significant at this time, preliminary results from this ongoing study show that higher levels of physical fitness may be associated with lower sleep reactivity to stress ( $r = -.43$ ,  $p = 0.17$ ) and reduced wake after sleep onset (WASO;  $r = -.58$ ,  $p = .07$ ). Consequently, increased WASO was significantly associated with increased SBP and DBP reactivity to an acute psychosocial stressor ( $r$ 's = .78, .65;  $p$ 's = .01, .05 respectively). **CONCLUSIONS:** If confirmed in our larger sample results suggest that, in women, physical fitness may be protective against the physiological response to stress, perhaps via reduction in stress-related sleep disturbances.

3098 Board #3 June 2 2:00 PM - 3:30 PM

**Physical Fitness, Hemodynamic and Affective Responses to Psychosocial Stress in Women**

Christina Huber, Meir Magal, FACSM, Daniel Henderson, Abigail Leonard, Lyndsay Wolfe, Andrea Tobar, Shannon K. Crowley. North Carolina Wesleyan College, Rocky Mount, NC.  
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(No relationships reported)

**PURPOSE:** Studies suggest that adaptations resulting from regular physical exercise training might positively impact physiological adaptations to psychological stressors. A reduced physiologic sensitivity to psychosocial stressors may be one mechanism by which physical fitness may serve to buffer the deleterious effects of chronic stress. However, to date, there has been limited study of the relationship between physical fitness and physiological and affective stress responding in women which considers the profound influence of the ovarian cycle on physiological and affective responses to stress. This study aims to investigate the relationship between physical fitness and physiological and affective responses to stress in women, while considering ovarian cycle phase effects on the stress response. **METHODS:** Following a two-tiered screening process, 10 healthy women (18-45y) who were medication-free and had regular menstrual cycles were enrolled. Participants completed an enrollment visit, (including perceived stress assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); and a psychosocial stressor protocol for the collection of hemodynamic [blood pressure (SBP, DBP) and heart rate (HR)], affective, and hormonal stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can influence the physiological response to stress. **RESULTS:** Preliminary results from this ongoing study show a trend for higher levels of physical fitness to be associated with lower SBP ( $r = -.58$ ,  $p = 0.08$ ) and DBP ( $r = -.56$ ,  $p = 0.09$ ) reactivity to stress. Interestingly, higher physical fitness was significantly associated with a more negative affective response to the psychosocial stressor tasks (speech:  $r = .70$ ,  $p = .02$ , math:  $r = .71$ ,  $p = .02$ ). **CONCLUSIONS:** If confirmed in our larger sample, results suggest a possible dissociation of the physiological and psychological stress responses associated with physical fitness in women during the follicular phase of the menstrual cycle.

3099 Board #4 June 2 2:00 PM - 3:30 PM  
**Factors Underlying The Contribution Of Psychological Stress To The Induction of Exercise-Related Menstrual Disturbances**

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 (No relationships reported)

**PURPOSE:** Our previous findings have shown a significant relationship between the severity of exercise-related menstrual disturbance and an increase in perceived stress. In this analysis, we examined underlying factors that contribute to changes in psychological stress with the induction of exercise-related menstrual disturbances in a 3-month exercise and caloric restriction intervention in sedentary, regularly menstruating women (n=36). **METHODS:** Women (age 18-24 yrs, BMI 18-28 kg/m<sup>2</sup>) were randomized to either an exercise only group or one of four groups designed to induce an energy deficit through varying combinations of caloric restriction and exercise over 3 menstrual cycles preceded by a Baseline cycle. The intervention included exercise (5 d/wk, 50-85% VO<sub>2</sub>max, 20-75 min) and controlled diet. Menstrual function and reproductive hormones were characterized using daily urinary estrone-1-glucuronide (E1G), pregnanediol glucuronide (PdG), luteinizing hormone, and menstrual calendars. Depressive symptoms were assessed with the Beck Depression Inventory (BDI). Presence of eating disorders was assessed using the Eating Disorder Inventory (EDI). Psychological stress was determined with the Perceived Stress Scale. Other factors investigated were anthropometrics, fitness, age, and reproductive factors. **RESULTS:** The intervention caused moderate weight loss (-2.59 ± 0.35 kg), increases in fitness, declines in body fat and declines in E1G and PdG (p < 0.006). Perceived stress increased significantly across the intervention (p < 0.001). Changes in perceived stress were associated with baseline luteal phase PdG AUC (r = 0.387, p = 0.024), change in body weight (p = 0.017, R = 0.401), change in fat free mass (p = .020, r = .391), and the change in BMI (r = 0.419, p = 0.012) such that higher baseline PdG concentrations and greater reductions in BMI and body weight were associated with lower increases in perceived stress. Baseline scores of BDI and EDI were not significantly related. Age, fitness, body composition, luteal phase length, and follicular phase E1G were also not significantly predictive of PSS. **CONCLUSION:** Stress sensitivity as defined by changes in perceived stress and related menstrual disorders may depend on baseline ovarian status and changes intervention induced changes in anthropometrics.

3100 Board #5 June 2 2:00 PM - 3:30 PM  
**The Effects of an Acute Bout of Yoga on Anxiety Symptoms in Response to a Carbon Dioxide Inhalation Task in Women**

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<sup>1</sup>Columbia University Medical Center, New York, NY. <sup>2</sup>University of Illinois at Urbana-Champaign, Urbana, IL. <sup>3</sup>University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Steven J. Petruzzello, FACSM)  
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 (No relationships reported)

**Purpose:** Yoga as a physical exercise might be a feasible approach for anxiolysis, yet this has not been systematically investigated in well-designed studies that include an anxiety producing challenge. Such research is particularly salient for women, who are significantly more affected by clinical and subclinical anxiety symptoms than men. This study compared the effect of a single bout of vinyasa-style yoga versus a stretching control condition for improving anxiety symptoms induced by a 5-min, 7.5% CO<sub>2</sub>-inhalation protocol in women with self-reported high anxiety sensitivity.

**Methods:** Eighteen women (mean age=22, SD=5) with self-reported elevated anxiety sensitivity completed 2 experimental conditions (40 min of guided yoga or a light stretching protocol) in a randomized, counterbalanced order. Participants completed the CO<sub>2</sub>-inhalation task before, immediately after and 1 hour after the experimental conditions and completed measures of state anxiety and panic before and after each inhalation task. Respiratory measures of tidal volume, ventilation and respiratory rate were collected during each of the inhalation tasks.

**Results:** Based on the results of the repeated measures ANOVA, there was no evidence for a differential pattern of change in self-reported anxiety or respiratory outcomes in response to the CO<sub>2</sub>-inhalation task between the 2 conditions (F(2,16)=1.06;  $\eta_p^2=.07$ ; P>.05). There was a significant main effect of CO<sub>2</sub>-inhalation task (i.e., from pre- to post-inhalation) on the self-reported panic and anxiety symptoms in both conditions (P<.05). Collapsed over exposure and condition, there was a reduction in cognitive anxiety over time (i.e., from baseline to immediately post and 1-hour post-condition) (F(2,16)=9.63;  $\eta_p^2=.36$ ; P<.05).

**Conclusion:** There appears to be an overall effect of general physical activity for attenuating cognitions of anxiety, irrespective of the physiological responses. Light-to-moderate intensity vinyasa-style yoga does not appear to be more efficacious than

a light stretching session for improving symptoms of anxiety and panic in response to the anxiety-provoking stimulus. The inhalation task administered in the present study is a reliable method for mimicking both acute panic and more generalized anxiety symptoms under laboratory conditions.

3101 Board #6 June 2 2:00 PM - 3:30 PM  
**Relationship Between Food Addictive Behavior and Physical Activity in College-aged Students**

Charlie Huberman, Rebecca Bryant, Stephen Van Rij, Erica Geisler, Sara Sharp, Bailey Koch, Stephen P. Bailey, FACSM.  
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 (No relationships reported)

Acute exercise has been associated with reduced cravings for addictive substances. Excessive exercise has been associated with maladaptive eating behavior. It is unclear if a relationship exists between physical activity and food addictive behavior. **PURPOSE:** The purpose of this investigation is to determine if food addictive behavior is influenced by physical activity in college-aged students. **METHODS:** 241 college-aged students (18-24 years of age; 55 male, 186 female) were recruited from University and Community College settings and asked to complete the Yale Food Addiction (YFA) Scale 2.0 and the International Physical Activity Questionnaire (Last 7-Days) (IPAQ) using an on-line platform. The YFA identifies up to 11 diagnostic indicators of food addiction and provides diagnoses of mild, moderate, or severe food addiction. **RESULTS:** 19 of 241 (7.9%) of participants were diagnosed with moderate (2.5%) or severe (5.4%) food addiction (FADD). Participants displayed 1.62±0.15 symptoms of food addictive behavior with 31.5% having 1-3 symptoms, 7.5% having 4-5 symptoms, and 10.4% having 6 or more symptoms. BMI was higher in participants with food addiction (Non-FADD=24.1±0.3 FADD=26.9±1.9, p=0.02); however, no differences were found in vigorous (Non-ADD=1851±251 MET-min/week, FADD=1920±799 MET-min/week), moderate (Non-ADD=777±107 MET-min/week, FADD=869±409 MET-min/week), or walking (Non-ADD=1262±139 MET-min/week, FADD=2051±583 MET-min/week) activity. The distribution of participants with Low (Non-FADD=13.5%, FADD=10.5%), Moderate (Non-FADD=42.1%, FADD=42.1%), and High (Non-FADD=44.4%, FADD=47.4%) levels of physical activity was similar between the groups. Interestingly, participants with High (2.10±0.27 symptoms) levels of physical activity displayed more symptoms of food addictive behavior than participants with Moderate (1.41±0.15 symptoms) and Low (1.06±0.27 symptoms) levels of physical activity (p=0.03). Participants with High (14.1%) levels of physical activity were also more likely to display 6 or more symptoms of food addictive behavior than participants with Moderate (4.9%) and Low (3.2%) levels of physical activity. **CONCLUSIONS:** The results of this investigation suggest that High levels of physical activity may be associated with more symptoms of food addiction.

3102 Board #7 June 2 2:00 PM - 3:30 PM  
**Neural Response to Food Cues After Moderate and Vigorous Exercise in Women: A Randomized Crossover Trial**

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 (No relationships reported)

**PURPOSE:** This study examined the effect of different intensities of acute exercise on attention allocation to visual food cues.

**METHODS:** This crossover study utilized treatment conditions that were randomized and counter-balanced. Fifty-two adult women, 18-29 years, were compared under three separate conditions: no exercise, 45 min of moderate-intensity exercise at 3.9 METs and 22.5 min of vigorous-intensity exercise at 7.8 METs. To measure attention allocation to visual food cues, participants were shown a passive viewing task consisting of a continual stream of pictures of food (high and low calorie) and non-food stimuli while brain activity was monitored using an EEG. The late positive potential (LPP) component of the scalp-recorded event-related potential (ERP) was used for data analysis.

**RESULTS:** The 52 women included in the study were on average 21.4 ± 2.2 years old, weighed 62.4 ± 11.2 kg, and had a BMI of 22.7 ± 3.4 kg m<sup>-2</sup>. EEG results were analyzed from 39 of the 52 women. There was no significant difference between picture type (high-energy dense, low-energy dense and neutral) and LPP response. There was a significant difference in condition (P = 0.045), with vigorous exercise resulting in a higher (1.94 ± 2.93 μV) LPP response than either the moderate (1.45 ± 1.95 μV) or non-exercise (1.40 ± 1.65 μV) condition. However, the condition (no exercise, moderate exercise or vigorous exercise) by picture type (high calorie, low calorie or non-food) interaction was not significant (P = 0.184).

**CONCLUSIONS:** The results of this study shows that an acute bout of vigorous exercise did not alter neural response to visual food cues compared to neutral pictures.

There was a global response to all pictures, with the vigorous condition demonstrating a more pronounced LPP response. However, what this response means for appetite is not clear since it was not food specific.

3103 Board #8 June 2 2:00 PM - 3:30 PM  
**Impact Of Acute Aerobic Exercise On Cue Reactivity To High-fat Foods In College-aged Women**

Rebecca Bryant, Carlie Huberman, Stephen Van Rij, Sara Sharp, Erica Geisler, Bailey Koch, Stephen Bailey, FACSM. *Elon University, Elon, NC.*  
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 (No relationships reported)

Acute aerobic exercise has been shown to reduce craving for various addictive substances like cigarettes and alcohol. A similar effect has been seen in children when examining brain fMRI responses to fatty foods. **PURPOSE:** The purpose of this investigation is to examine the impact of acute aerobic exercise on cue reactivity to fatty and healthy foods in typical college-aged women. **METHODS:** Six women (Age=24.7±0.9 years, BMI=26.6±2.5), VO<sub>2peak</sub>=35.3±4.1 ml·kg<sup>-1</sup>·min<sup>-1</sup>) completed 2 experimental sessions. During one session subjects rested for 30 minutes and during the other session subjects exercised for 30 minutes at a moderate exercise intensity (77±1% of Peak HR) on a semi-recumbent bike. Treatments were applied in a counter-balanced fashion and subjects fasted for 4 hours prior to each session. Prior to and immediately following each session, EEG data were collected using a 64-channel EGI Geodesic EEG System 300 series while subjects were exposed to 280 images (40 Distractor (DIS), 120 Fatty Foods (FAT), 120 Healthy Foods (HEALTHY)). Images were presented in a random order and proceeded by a fixation stimulus using a variable time span (0.5 to 1.5 sec). After collection, data were processed to calculate the mean and peak voltage associated with the P300 (200-500 ms post stimulus) in all electrodes. For this investigation, only the electrodes associated with the parietal lobe of the brain were used for comparison and average EEG responses in these electrodes are presented here. **RESULTS:** Reaction time to distractor stimuli was reduced following exercise (Pre=513±8 ms, Post=483±10 ms, p=0.004) as compared to resting (Pre=530±17 ms, Post=522±15 ms, p=0.22) Acute aerobic exercise had no impact on the EEG response to FAT (Mean Response: Pre=0.35±1.42 μV, Post=0.42±1.66 μV; Peak Response: Pre=1.71±1.41 μV, Post=2.08±1.68 μV) or HEALTHY (Mean Response: Pre=-0.39±0.76 μV, Post=0.42±1.28 μV; Peak Response: Pre=1.74±0.82 μV, Post=2.63±1.52 μV) images. **CONCLUSION:** These findings suggest that acute aerobic exercise of moderate intensity does not influence cue reactivity to images of fatty and healthy foods in normal college-aged women.

3104 Board #9 June 2 2:00 PM - 3:30 PM  
**Neural Activation to Food Cues and Cognition in Sedentary Obese Endometrial Cancer Survivors Seeking Weight Loss**

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**PURPOSE:** Sedentary behavior and obesity increase the risk of endometrial cancer (EC), particularly Type I forms, which are increasing in the U.S. Further, although death rates from most cancers are decreasing, overall mortality rates for EC are increasing; and, obese EC patients have significantly poorer survival rates compared to normal weight EC patients. No prior studies have examined neural activation in response to food cues as well as sedentary behavior and cognition in obese EC survivors. **METHODS:** Therefore, we evaluated appetitive behavior using a visual food cue functional magnetic resonance imaging (fMRI) task as well as sedentary behavior and cognition using Trails A & B and Symbol Digits Modalities Tests in 42 obese EC survivors seeking weight loss. **RESULTS:** We found increased activation in response to high-calorie food cues after eating a meal in brain regions associated with food-related reward (dorsolateral prefrontal cortex, amygdala; whole brain cluster corrected, p<0.05) in obese EC survivors. In addition, cognitive tests suggest scores in obese EC patients are lower than normative data for similar age and gender. We are currently evaluating correlations between sedentary behavior, cognitive scores and neural signals in differentially activated brain regions. **CONCLUSIONS:** To our knowledge, this is the first study to evaluate cognitive and sedentary behavior correlates of neural activation in response to food cues in obese EC survivors and, these data may also help inform future work in other adult obese populations with and without cancer.

This work was supported by NIH NCI R01-CA175100.

3105 Board #10 June 2 2:00 PM - 3:30 PM  
**Neurocognitive Improvements Following a 12-Month Diet and Physical Activity Intervention**

Jamie Cohen, Chelsea M. Stillman, Jennifer C. Watt, Renee J. Rogers, John M. Jakicic, FACSM, Kirk I. Erickson. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John Jakicic, FACSM)  
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**PURPOSE:** Obesity is associated with decreases in cognitive function, including changes in working memory and executive control. Yet, we know very little about whether weight loss through an energy-restricted diet and increased physical activity (PA) improves cognitive function. The aim of this study was to evaluate whether weight loss following a 12-month dietary and physical activity intervention was associated with improved cognitive performance.

**METHODS:** 115 overweight and obese adults (89 female) participated in a 12-month diet and PA intervention. Participants were middle-age (mean at baseline=44.7±8.5 years) and well educated (mean=16.5±2.5 years). Participants were assigned to one of three groups: One group engaged in dietary restriction alone, while the other two groups engaged in either 150 minutes per week or 250 minutes per week of moderate intensity exercise, in addition to an energy-restricted diet. All participants completed neuropsychological tests measuring decision-making (Iowa Gambling Task; IGT), inhibitory control (color-word Stroop), working memory (N-Back), and processing speed/set shifting (Task Switch). Paired-samples t-tests compared baseline with post-intervention cognitive performance. The results reported below are collapsed across group, as the investigators remain blind to group assignment.

**RESULTS:** Following the intervention, participants' BMI decreased by 2.4±3.3 kg/m<sup>2</sup>, p<.001. Participants performed significantly better post-intervention on the IGT [t(114)=-2.42, p=.016], N-Back [2-Back RT t(114)=2.686, p=.008], and Task Switch [RT t(113)=3.759; accuracy t(113)=-2.016, p=.046] compared to baseline. There were no significant changes in Stroop Task performance from baseline to follow-up. The changes in cognitive task performance were not significantly associated with change in BMI.

**CONCLUSIONS:** A 12-month diet and physical activity intervention in overweight and obese adults is associated with improved cognitive performance across multiple cognitive domains. **FUNDING:** This research was supported by funding from NIH/NIDDK grants R01095172 (PI: Erickson) and R01HL103646 (PI: Jakicic).

3106 Board #11 June 2 2:00 PM - 3:30 PM  
**Benefits of Acute Aerobic Exercise on Neuroplastic Potential in Depression**

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Depression affects millions of Americans and is a leading contributor to disability and mortality in the United States. Evidence indicates that neuroplasticity is impaired in those with depression and successful treatment for depression appears to reestablish neuroplastic potential. Aerobic exercise (AE) has well-established antidepressant effects and has been shown to modulate neuroplasticity in non-depressed subjects. To date, the acute influence of exercise intensity on indices of neuroplastic adaptation have yet to be described. **PURPOSE:** To examine the efficacy of acute AE as a neuro-modulatory intervention in non-depressed control subjects. **METHODS:** Thirteen non-depressed subjects (8 female; 34.5 ± 8.7 years old) completed three experimental sessions that included assessment of corticospinal excitability (CE), AE (15 minutes) and paired associative stimulation (PAS) to determine neuroplastic potential. CE was assessed via transcranial magnetic stimulation and surface electromyography of the abductor pollicis brevis muscle before and after exercise, and for one hour after PAS. AE was performed on a stationary cycle ergometer at low intensity (LO), 35% heart rate reserve (HRR); high intensity (HI), 70% HRR; or a non-exercise control condition (CON). The primary outcome was change in peak-to-peak motor evoked potential amplitude relative to baseline assessment. **RESULTS:** Mean post-exercise CE across all time points was increased 26.2% in the LO condition, and 2.9% in the CON condition while the HI condition reduced CE 6.3%. Immediately following exercise, the LO condition produced a rapid 27.1% increase in CE while the HI condition produced a rapid 16.3% decrease in CE. Both the LO and HI conditions demonstrated a homeostatic response immediately post-PAS with a 15.0% reduction and 27.8% increase in CE, respectively. **CONCLUSION:** Lower exercise intensity appears to have a greater influence on increasing CE. Interestingly, the rapid effects of exercise appeared to be reversed by PAS suggesting the presence of homeostatic metaplasticity during these conditions. Modulation of CE via exercise in depression has yet to be established but may underlie the anti-depressant effects of AE. Work examining the influence of AE on CE in depression is currently in progress.

**F-52 Free Communication/Poster - Activity Interventions and Programming in Youth**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3107 Board #12 June 2 3:30 PM - 5:00 PM  
**Improvements in Family Nutrition and Physical Activity during FitKids360: Associations with Adiposity Changes**

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**Purpose**

The Family Nutrition and Physical Activity survey (FNPA) is a validated health behavior survey for assessing childhood obesity risk, but it has not been evaluated as a tool to track behavior change over time. The current study assessed FNPA in youth who completed a pediatric weight management program, and compared associations between FNPA and adiposity changes.

**Methods**

Youth 5-16 years old with a BMI $\geq$ 85<sup>th</sup> percentile participated in FitKids360, a 6-week, multidisciplinary, family-based intervention aimed at improving physical activity, nutrition, and sedentary behaviors. The FNPA was parent-reported pre and post intervention, and height and weight were assessed via trained program staff. Total FNPA and subscale scores were calculated, including screen time, physical activity, family meals, food and beverage choices, parental food restrictions and rewards, and sleep routines. Participants were grouped based on BMI percentile (BMI%) changes during treatment, after which FNPA scores were compared across genders, age groups, and BMI-change categories.

**Results**

A total of 1102 youth (10.7 $\pm$ 3.0 years) initiated treatment, and 790 completed the program (72% retention). Mean FNPA scores significantly increased 5.6 $\pm$ 7.4 points ( $p<0.001$ ) while BMI% decreased -0.43 $\pm$ 2.12 percentile points ( $p<0.001$ ). After adjusting for baseline FNPA, youth <11 years of age had higher post FNPA scores than older youth ( $p<0.001$ ), but FNPA did not differ between genders. When grouped by high ( $\leq-0.5\%$ ), moderate ( $-0.5$  to  $0.0\%$ ), and low ( $\geq 0.0\%$ ) BMI% changes, youth with high reductions had healthier FNPA scores (63.2 $\pm$ 7.8) than those with low BMI% changes (59.6 $\pm$ 8.1) ( $p=0.005$ ), and a trend towards higher scores than those with moderate reductions (61.7 $\pm$ 7.3) ( $p=0.080$ ). FNPA subscales also differed between BMI% groups, such that greater adiposity reductions were associated with healthier beverage choices ( $p=0.034$ ) and lower screen time ( $p=0.005$ ).

**Conclusions**

FitKids360 completers improved FNPA scores and reduced age- and sex-adjusted BMI. After adjusting for baseline differences, youth with the highest post-treatment FNPA scores had the greatest improvements in adiposity. The FNPA appears to be a useful tool for tracking progress in obesity-related health behavior changes during family-based pediatric weight management.

3108 Board #13 June 2 3:30 PM - 5:00 PM  
**The Experimental Effect Of Parental Attentiveness On Children's Physical Activity**

Michael J. Rebold<sup>1</sup>, Cody Croall<sup>2</sup>, Emily Cumberledge<sup>2</sup>, Melanie Hall<sup>2</sup>, Lindsey Raunikaitis<sup>2</sup>. <sup>1</sup>*Hiram College, Hiram, OH.* <sup>2</sup>*Bloomsburg University of Pennsylvania, Bloomsburg, PA.*  
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Current evidence supports the notion that children's physical activity levels may be influenced by parental interactions. One potential factor may be parent attentiveness. While evidence from non-experimental studies provides support that when parents are actively attentive it is positively associated with their children's physical activity, it is heretofore unknown what the causal impact of a parent being actively attentive versus non-attentive may be on the amount and intensity of their child's physical activity. **PURPOSE:** To assess the amount, intensity, enjoyment (i.e., liking), and preference of children's physical activity under two conditions; *parent actively attentive* and *parent non-attentive*. **METHODS:** Ten children ( $n = 6$  boys, 4 girls) between the ages of 3-6 years old participated in each condition for 30-minutes in which they were taken to a gymnasium and had free-choice access to a variety of physical and/or sedentary activities. In addition to accelerometry data, at the end of each 30-minute session children were asked to indicate their liking. Children were then

asked if they would like to play for an additional 10-minutes. After both conditions were completed, each child indicated which condition was their favorite. **RESULTS:** More counts ( $p = 0.04$ ) were accumulated during the *parent actively attentive* (96,547  $\pm$  33,075.26 counts) condition than the *parent non-attentive* (48,316.30  $\pm$  46,101.47 counts) condition. More time ( $p = 0.01$ ) was allocated to sedentary activities during the *parent non-attentive* (19.50  $\pm$  13.30 minutes) condition than the *parent actively attentive* (2.80  $\pm$  3.55 minutes) condition. Children liked ( $p = 0.004$ ) the *parent actively attentive* (9.05  $\pm$  1.21 cm) condition more than the *parent non-attentive* (4.42  $\pm$  3.18 cm) condition. There was no significant difference ( $p = 0.56$ ) between the proportion of children who chose to participate in the additional 10-minute bonus period during the *parent actively attentive* (50%) condition and the *parent non-attentive* (40%) condition. **CONCLUSION:** When parents are actively attentive children's physical activity increased by 99.82% and reduced sedentary behavior by 85.64%. *Parental attentiveness* during bouts of physical activity may be an important component to consider when children are engaging in physical activity.

3109 Board #14 June 2 3:30 PM - 5:00 PM  
**Evaluation of a Teacher-Led Physical Activity Intervention in Preschool Children**

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(No relationships reported)

More than half of preschool-aged U.S. children spend their time in a structured preschool setting largely engaged in sedentary behaviors. Given the low levels- yet importance of physical activity (PA) for prevention of obesity, preschools may be an ideal environment to engage a large number of children at an early age. **PURPOSE:** To examine whether a teacher-led PA intervention increased moderate-to-vigorous physical activity (MVPA) in preschool-aged children. **METHODS:** An evidence-based PA curriculum was implemented in a local preschool over 12-weeks, 3 times per week by classroom teachers with assistance provided by UVM students enrolled in a service-learning course. Main outcomes were objectively measured, MVPA by accelerometry. Measures were performed at baseline, 2 intervention points, and 1-week post-intervention. A total of 35 children (4-5 years, 12 females, 23 males) who had at least 3 days of valid data were included in the analyses. **RESULTS:** Significant ( $p<0.05$ ) changes were observed in minutes of MVPA/day, sedentary minutes/hour and MVPA/hr. Minutes of MVPA/day significantly increased from pre- to post-intervention (56.55 $\pm$ 3.9 vs. 72.61 $\pm$ 3.9). Significant increases were observed from baseline to both intervention point 1 and post-intervention (8.45 $\pm$ 0.4 vs. 10.8 $\pm$ 0.6 and 10.9 $\pm$ 0.4, respectively). Sedentary time also significantly decreased from 43.42 $\pm$ 0.6 min/hr at baseline to 40.61 $\pm$ 0.5 min/hr at post-intervention. **CONCLUSIONS:** The findings from this study support a teacher-led intervention to increase MVPA in preschool-aged children. These findings are promising as teacher-led PA interventions may be a potentially viable and cost-effective means to accomplish a myriad of health-related goals. Further evaluation of the PA curriculum in a larger cohort and over a longer period of time is warranted.

3110 Board #15 June 2 3:30 PM - 5:00 PM  
**Effectiveness Of A Low-cost Exercise Intervention For Pediatric Obesity**

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**PURPOSE:** Regular physical activity improves health profiles and quality of life in youth with obesity (YWO), and participation in sport-specific events reportedly improves self-efficacy among youth with little athletic experience. This project retrospectively evaluated the feasibility and efficacy of an ongoing low-cost physical activity intervention to prepare YWO for an athletic event (5K run/walk).

**METHODS:** The Healthy Lifestyle Clinic (HLC), a multidisciplinary weight management clinic at Le Bonheur Children's Hospital, hosted a race team for a 5K run/walk event. HLC patients were offered a training program designed to be engaging, minimally burdensome for clinical staff, and focused on preparing exercise-naïve YWO to complete a 5K. Training included 3 weekly aerobic sessions (20-45 minutes) with duration and intensity increased based on rating of perceived exertion. Participants completed workout logs and were invited to workouts in the community with HLC staff members. Weekly phone calls were made to monitor progress, engagement, and individualize the program. On average, phone calls lasted <10 minutes. Retrospective review of medical records and patient communications, was IRB approved.

**RESULTS:** Initially 28 YWO expressed interest in the training program. Twelve YWO (11.4 $\pm$ 2.6 yrs, 151.3.4 $\pm$ 13.3 cm tall, 88 $\pm$ 24.5 kg, 99.1 $\pm$ 0.76 BMI %ile) actively engaged (reporting >70% adherence) with the training, and 6 participants completed

the 5K race (all 1<sup>st</sup> time racers). Almost 60% of participants attended all community workouts and those who completed the 5K had greater parent engagement than those who did not. Similarly, those who engaged in more frequent phone contact were more engaged in the training program. More than 80% of families who participated requested the program become a recurring HLC offering, indicating a desire for more exercise interventions. Themes of improved physical appearance, self-worth, and athletic competence emerged from patient reports. All those who completed the race expressed likelihood to attempt another race.

**CONCLUSIONS:** This program was feasible, minimally burdensome, and cost-effective. It had a positive effect on self-reported motivation, physical fitness, and self-efficacy. Parental involvement was a driving factor for program adherence and race completion.

3111 Board #16 June 2 3:30 PM - 5:00 PM  
**Effects Of 5-week Summer School Program On Inflammatory Markers And Oxidative Stress In Female Adolescents**

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Physical inactivity and obesity in adolescents cause a complex health issue. Especially, physical activity levels are markedly decreased during summer vacation in low socio-economic status communities, compared to academic school periods. It was also reported that physical fitness was progressively declined in children who did not participate in exercise programs during summer vacation. Thus, this study seeks to provide further evidence for the role of summer school programs.

**PURPOSE:** To determine the effects of summer school programs including 2-hour exercise per day on systemic blood inflammation and total antioxidant status in female adolescents.

**METHODS:** Thirty high school female students were recruited and 15 students were assigned to the summer school attendant group (SA) and completed summer school programs with 2-hour exercise daily for 5 weeks and 15 students were in non-summer school attendant group (NSA). Plasma tumor necrosis factor alpha (TNF- $\alpha$ ), C-reactive protein (CRP), and total antioxidants were measured immediately before and after summer vacation. One-way ANCOVA was used to determine differences in TNF- $\alpha$ , CRP, and total antioxidant changes between the groups.

**RESULTS:** Plasma TNF- $\alpha$  was reduced in SA group after summer vacation, compared with the NSA (7.79 $\pm$ 2.0 pg/ml vs. 8.33 $\pm$ 2.2 pg/ml, respectively,  $P=0.001$ ). CRP level was decreased in the SA group after summer vacation, compared with the NSA (7.7 $\pm$ 0.7 mg/L vs. 8.2 $\pm$ 0.7 mg/L, respectively,  $P=0.005$ ). Total antioxidant concentrations were elevated in the SA group after summer vacation, compared with the NSA (1.96 $\pm$ 0.4 mM/L vs. 1.80 $\pm$ 0.2 mM/L, respectively  $P=0.018$ ).

**CONCLUSION:** Five weeks of exercise programs in summer school may ameliorate systematic inflammation and decrease oxidative stress in female adolescents. Thus, these findings may support that school-aged adolescents, while attending at summer school programs, have beneficial outcomes on the cardiovascular health, especially in low socio-economic status communities.

3112 Board #17 June 2 3:30 PM - 5:00 PM  
**Different Exercise Doses On Fitness , Fatness And Inhibition Control Of Adolescents.**

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**Purpose:** To study the effects of different dose of exercise training on cardiorespiratory fitness, body fat percentage and inhibition control of adolescents.

**Methods:** A physical activity intervention program was conducted among 12-14 years' adolescents. 78 students (38 boys) were recruited into the plan after the approval of parents and teachers. According to the classes, we divided the participants into 3 groups. They were low-dose(30min/d,n=20) or high-dose(60min/d,n=23) aerobic training(12wk,5d/wk), or control condition(usual physical activity,n=24);rates of attendance was 55%. Training intensity was the 50%~70% heart rate reserve. We used the breath-by-breath technique to test the VO<sub>2peak</sub>. The Bioelectrical Impedance analysis was used to measure the body fat percentage. Inhibition control was measured by a modified Eriksen flanker task. Between-group differences were tested using analysis of covariance(ANCOVA) with adjustment for baseline values and within-group differences were tested using *t* tests. For statistically significant analyses of variance ( $P<0.05$ )

**Results:** Participants had mean VO<sub>2peak</sub> of 33.0ml/min/kg at baseline survey. 12 weeks later, after adjustment for the baseline value, compared with control group, the exercise groups increased VO<sub>2peak</sub> greater( $F=3.87,p=0.03$ ). The mean(SE) VO<sub>2peak</sub>

was 38.78(1.10) in low-dose and 38.46(1.04) in high-dose. But the VO<sub>2peak</sub> in control group was 34.98(1.03). There was no significant difference between low-dose and high-dose group. For girls, the decrease in body fat percentage in the high-dose physical training group, but not in the low-dose group, was significantly greater than that in the control group( $F=3.94, P=0.03$ ). But there were no significant changes in fatness values of boys from baseline to 3 months. After adjustment for the baseline value, there were no significant changes in inhibition control values from baseline to 3 months in any of the exercise groups vs the control group.

**Conclusion:** Three months of 30 or 60 min/d aerobic training improved fitness, and demonstrated dose-response benefits on general adiposity for girls. However, the effects of exercise intervention on inhibition control for 12-14 aged students should do further research.

Supported by National Science and Technology Support Programm(2012BAK21B02)

3113 Board #18 June 2 3:30 PM - 5:00 PM  
**Exercise Intensity and Sleep in Obese Youth Before, During and After Weight Management Camp**

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(No relationships reported)

**PURPOSE:** To compare overall sleep time, sleep efficiency and exercise intensity of participants before, during and after a weight management camp for youth with obesity.

**METHODS:** Fifteen obese youth, ages 9 to 13 years, were recruited at an open house for an overnight weight management camp. Informed consent/assent was obtained. Subjects wore GENEActiv accelerometers 24 hours/day for approximately one week before, during, and after camp. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), moderate (MPA) and vigorous (VPA), as well as total sleep time (TST) and sleep efficiency (EFF). The participants' activity levels and other subject characteristics were compared during the week of camp and weeks at home.

**RESULTS:** Complete usable data was obtained from 10 (67%) participants (6 boys, 4 girls). Mean age ( $\pm$ SD) was 11.7  $\pm$  1.2 years. Mean BMI was 32.25  $\pm$  5.1 kg/m<sup>2</sup>. During camp, participants averaged less daily SED than at home (428.38  $\pm$  63.20 minutes,  $p=0.0003$ ) and more MPA (363.4  $\pm$  38.63,  $p=0.0001$ ) and VPA (55.05  $\pm$  33.96,  $p=0.0055$ ). There was no significant difference in TST between weeks. There was a significant difference in EFF between weeks ( $p=0.04$ ), with the highest EFF occurring during camp (86.7%). Neither BMI nor age were correlated to TST or EFF.

**CONCLUSION:** Obese youth exercise longer at higher intensities while participating in a summer weight management camp versus on their own at home. Sleep efficiency also improves while at camp. This suggests that accumulating more daily MVPA leads to improved sleep, and further studies are needed to more closely examine this relationship in obese youth.

3114 Board #19 June 2 3:30 PM - 5:00 PM  
**Effect Of A Physical Activity Intervention On Letter And Number Recognition In Preschoolers**

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There is considerable evidence that physical activity (PA) may improve some components of cognition and academic performance in preschool-aged children. Increasing PA in an effort to enhance learning in preschoolers may be ideal, particularly as this age group experiences a high rate of cognitive development and neurophysiological change. However, the literature on PA and academic performance related outcomes, such as school readiness skills, in preschoolers is limited.

**PURPOSE:** The purpose of this study was to examine the effects of a 12-week PA intervention on school readiness-related cognitive skills (i.e. letter and number recognition) in preschool children. **METHODS:** Two preschool centers (n=41 children; 53.6% male; mean $\pm$ sd: age=4.3 $\pm$ 0.7; BMI percentile=52.5 $\pm$ 26.3) were randomized to a 12-week preschool-based PA intervention (INT; n=19 children) that incorporated short-bout PA lessons embedded into the Massachusetts Early Learning Standards or a health-tracking control group (CON; n=22). School readiness cognitive skills were assessed by recognition of symbols (i.e. letters and numbers) at baseline and at 12-weeks. Chi square and independent *t*-tests were used to compare baseline characteristics between groups. The effect of the intervention on letter and number recognition was assessed with repeated measures ANOVA. **RESULTS:** There were no significant baseline differences between groups. Mean change scores for letter recognition (INT: 3.5 $\pm$ 6.8, CON: 5.5 $\pm$ 4.9) and number recognition (INT: 0.9 $\pm$ 4.3, CON 1.7 $\pm$ 2.3) were higher in the CON group compared to the INT group. There was not a significant effect of the intervention on pre- to post-scores. **CONCLUSION:** The 12-week PA intervention utilized in this study did not elicit a significant improvement in the letter and number recognition of preschoolers. Further research may be valuable

to examine the benefits of a preschool PA intervention by utilizing longer intervention periods, additional bouts of academically-tailored PA, and more comprehensive measures of preschool cognitive skills.

3115 Board #20 June 2 3:30 PM - 5:00 PM  
**Effect Of A Curriculum-Based Physical Activity Intervention On Classroom Behavior Variables In Preschool-Age Children**

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Few studies have examined the impact of physical activity (PA) programs during the preschool day, with only two rooted in an academic curriculum. PA has been shown to improve components of classroom behavior in preschoolers. Poor classroom behavior can be indicative of early attention-deficit/hyperactivity disorder (ADHD) symptomology, which is seen in children as young as three years old. However, no studies have examined curriculum-based PA to improve classroom behavior. **PURPOSE:** To examine the impact of a curriculum-based PA intervention on classroom behavior variables in preschoolers. **METHODS:** Children (n=52, mean±sd: age=3.6±0.8 years, BMI percentile=50.1±27.1) attending two preschools were randomized to the Preschool Activity, Diet, and Sleep (PADS) intervention or the health tracking (CON) group. PADS consisted of integrating PA lessons into Massachusetts Early Learning Standards. The Strengths and Difficulties Questionnaire (SDQ) behavioral screening tool was used to assess classroom behavior which includes a total difficulties score and subscales encompassing hyperactivity/inattention, emotional problems, conduct problems, peer problems, and prosocial behavior. The SDQ was completed by classroom teachers for each child at baseline, 6 weeks, and 12 weeks. A repeated measures ANOVA was utilized to examine intervention effects on children's classroom behavior variables. **RESULTS:** Children at the CON school exhibited greater hyperactivity/inattention (PADS=2.3±2.5, CON=4.1±3.5), emotional problems (PADS=0.3±0.6, CON=2.6±2.4), conduct problems (PADS=0.8±1.3, CON=2.9±3.2), peer problems (PADS=0.3±1.0, CON=1.2±1.4), and total difficulties (PADS=4.0±3.8, CON=10.9±8.0) at baseline compared to the PADS school. There were no statistically significant effects of time or intervention by time for classroom behavior variables. **CONCLUSION:** These data suggest a curriculum-based PA intervention did not lead to change in teacher-reported classroom behavior variables. Lack of intervention effect in this population could be due to lack of specificity of intervention components targeting classroom behavior. Future studies should incorporate cognitive skills linked to early ADHD symptomology in PA lessons, include objective behavior measures, and utilize a larger sample size.

3116 Board #21 June 2 3:30 PM - 5:00 PM  
**The Impact Of A School-based Lifestyle Intervention On Attitudes And Behaviors In Children**

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A number of healthy eating determinants such as area deprivation, family involvement, knowledge, and attitudes are associated with obesity prevention in children. School-based interventions have achieved improved weight status, health knowledge, attitudes, and behaviors. **PURPOSE:** Therefore, the purpose of this study was to determine immediate and long-term changes in body mass index and psychosocial variables following a 10-week school-based lifestyle intervention designed to improve weight status in children. **METHODS:** One hundred and thirty eight participants (8.67 ± 0.51 years of age, 64 boys and 74 girls) took part in the study. All participants had height, weight, and psychosocial variables assessed at pre-intervention, post-intervention, and 6-months post-intervention. The Pupil Questionnaire which measured healthy eating attitudes, knowledge and behaviors was used. A repeated measures study design was employed such that participants served as their own control and then completed a 10-week intervention consisting of healthy eating and physical activity education, physical activity, parental involvement, and behavior change. Changes in outcome measures within the group across time was assessed using a one-way repeated measures analysis of variance (RMANOVA) with adjustment for covariates where appropriate. **RESULTS:** Results from the RMANOVA revealed no significant within-group main effect for time. Subsequent analysis of the data indicated a significant within group effect of the intervention at different time points such that from pre-intervention to post-intervention, fruit attitudes (CI = -0.056 to -0.002, ES = -0.26, p = 0.02), vegetable attitudes (CI = -0.081 to -0.009, ES = -0.34, p = 0.005), and healthy eating

attitudes (CI = -0.22 to -0.02, ES = -0.29, p = 0.006) improved. From post-intervention to 6-months, vegetable attitudes approached a significant decrease (CI = -2.533E-5 to 0.07, ES = 0.13, p = 0.05) and HE attitudes decreased (CI = 0.005 to 0.19, ES, 0.26, p = 0.03). **CONCLUSION:** Fit for School may be an effective means for improving healthy eating attitudes and behaviors in primary school children in the short-term if the duration of the intervention is increased, but these changes may not be sustained without on-going support.

3117 Board #22 June 2 3:30 PM - 5:00 PM  
**Longitudinal Efficacy of Skiku on Physical Activity and Sleep Quality in Alaska Native Youth**

Kira Leonard, Hannah Wing, Michelle Johannsen, Lars Flora, Robert H. Coker, FACSM. *University of Alaska Fairbanks, Fairbanks, AK.*  
 (No relationships reported)

**PURPOSE:** Increased exposure to Western Civilization has led to an increased incidence of obesity in Alaskan Native villages. Physical activity and sleep patterns may be altered in these rural settings as well. The purpose of this study was to evaluate the efficacy of a novel cross country skiing program (ie., Skiku) on the levels of physical activity and sleep quality of Alaska Native children. **METHODS:** After a year of exposure to the Skiku program that included bi-annual instruction from high school- to Olympic-level coaches, we worked with the tribal elders to configure a culturally appropriate method of assessment devoted to physical activity and sleep quality. In order to gain a longitudinal understanding of the program efficacy, we visited the village during early April of 2014 and 2016. At both times, we requested that the children (age 7 to 15) wear ActiGraph activity monitors for a minimum of four days. Data collected from these time points were evaluated using ActiLife software algorithms to determine activity levels as well as sleep quality. **RESULTS:** The average amount of time spent performing moderate-vigorous activity significantly increased from 161.2±47.3 min/day to 468.0±98.6 min/day from 2014 to 2016, respectively. There was no change in sleep quantity (558.6±43.0 min/day and 552.8±61.9 min/day; 2014 and 2016 respectively) or quality (87.0±5.8% and 85.6±9.3%; 2014 and 2016, respectively) between the two years. **CONCLUSION:** The implementation of this program has significantly increased the activity levels of children involved. The World Health Organization recommends that children between the ages of 5-17 perform a minimum of 60 minutes of moderate to vigorous physical activity per day to maintain optimal metabolic health and psychological resilience. This program has demonstrated its long term efficacy in promoting healthy lifestyle changes by increasing moderate-vigorous activity in children.

3118 Board #23 June 2 3:30 PM - 5:00 PM  
**University-Driven Exercise Programming Event Reduces Student Stress Prior to Final Exams**

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Levels of sedentaryness and stress are at historical highs among college students. These occurrences are not mutually exclusive; a negative correlation exists between physical activity (PA) and mental health. This correlation, paired with evidence linking PA to increased brain activation and memory function gives cause for a PA intervention nearing final exams. Accordingly, UNLV implemented Fitness4Finals (F4F). **PURPOSE:** To determine the effect of F4F on end-of-semester physiological stress (PS), perceived academic stress (PAS) and academic self-efficacy (ASE) in college students, and examine the relationship between PS and PAS. **METHODS:** 24 participants were grouped by intent to participate in F4F (F4F, n=9) or not participate (Non F4F, n=15). PS (salivary amylase) and PAS were measured at three time-points: the Friday prior to study week (Base), the Friday prior to exam week (Post F4F) and prior to student's first final exam (Pre-Exam). Data were analyzed using a mixed-measures ANOVA, at the p<0.05 significance level. **RESULTS:** A significant group difference was found for PAS at Post F4F ( $F_{(1,19)} = 4.403, p = .049$ ). Though not significant, mean scores revealed lower salivary amylase and PAS for the F4F group across time points. F4F group showed lower ASE at baseline, surpassing the Non F4F group at Post F4F and Pre-Exam time points, while Non F4F stayed unchanged (Table 1). Salivary amylase and PAS trended toward significant correlation at Base ( $r = -.388, p = 0.091$ ) but not Post F4F or Pre-Exam. **CONCLUSION:** Participation in F4F eases academic stress, albeit temporarily. F4F participants display lower physiological and psychological stress overall and increase academic self-efficacy as they near exams. Acute physiological stress markers do not appear to correlate with reported academic stress. Overall, an end-of-semester, university-driven exercise program such as F4F is beneficial in combating climatic stress through increases in PA.

**Table 1. Physiological stress, psychological stress and self efficacy across time**

	BASE	POSTF4F	PRE-EXAM
<b>F4F</b>			
Salivary Amylase	155.4±159	226.2±239.2	219.2±188
Academic Stress	77±15.4	67.3±18.2	68.6±9.8
Self Efficacy	68.29±12.9	74.14±18.9	78.14±14.4
<b>NonF4F</b>			
Salivary Amylase	219.2±188	242.3±232.6	233.8±288.5
Academic Stress	81.2±14.8	82.6±14.5	75.4± 16.8
Self Efficacy	69.93±14.6	70.29±17.3	69.93±19.8

3119 Board #24 June 2 3:30 PM - 5:00 PM  
**Examining The Effectiveness Of Spark And Active Video Games On Children’S Health-related Physical Fitness**  
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**Purpose:** Active Video Game (AVG) has potential in increasing children’s physical activity participation. However, it is not clear whether AVG can help improve individuals’ health-related physical fitness. The purpose of this study was to examine the effectiveness of Sports, Play, and Active Recreation for Kids (SPARK) and AVG on children’s health-related fitness.  
**Methods:** A total of 63 third and fourth graders participated in the study. The third graders (n = 29, 10 for boys) experienced the SPARK curriculum taught by a student teacher while the fourth graders (n = 34, 14 for boys) engaged in the AVG group practicing XBOX Kinect™ dance games. All participants completed three, 50-minute exercise sessions per week for six weeks. Health-related fitness was measured using FitnessGram including 15-meter PACER test, curl-ups, and push-ups tests prior to and immediately after the intervention. A one-way MANOVA with repeated measures by controlling for BMI and gender was conducted to assess the effects of time and interventions on fitness variables.  
**Results:** No group difference in the pre-tests was found. There is a significant effect of time (F = 14.2, p < .001, η<sup>2</sup> = .20) and the interaction between time and intervention groups on the performance of the PACER test (F = 72.2, p < .001, η<sup>2</sup> = .56). The participants in both groups increased their PACER test scores with the AVG group demonstrated significantly higher improvement than the SPARK group. No time or intervention effects were found on the muscular strength and endurance tests.  
**Conclusion:** AVG using XBOX Kinect™ seems to be effective in improving children’s aerobic fitness performance. Schools can use AVG as an alternative way to traditional physical activities for children to receive health benefits.

3120 Board #25 June 2 3:30 PM - 5:00 PM  
**Establishing Classification Criteria for an Energy Balance Knowledge Test for Fourth and Fifth Grade Children**  
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**PURPOSE.** Children show knowledge deficiency about energy balance, a key factor underlying body weight fluctuation. We previously developed and validated a written test, which has shown good validity and utility in capturing children’ knowledge about energy balance, but no criteria were established to classify scores for meaningful interpretation. The purpose of this study was to develop criteria to determine the knowledge levels.  
**METHODS.** Six Iowa schools participated in this study, with 570 children completed the pre-test and 587 completed the post-test. An obesity prevention program was implemented between the two assessments. Data were screened for outliers and examined for normal distribution. Cluster analysis was conducted to establish three levels of energy balance knowledge: high, moderate, and low. ANOVA was subsequently used to verify the classification. Thresholds for knowledge levels were determined based upon the maximum and minimum values at each level. Scores measured at pre- and post-tests were evaluated by referencing to the new criteria.  
**RESULTS.** The cluster analysis resulted in three knowledge levels: high (M: 75.3%, 66.7-96.3%; n=392), moderate (M=57.4%, 51.9-63.0%; n=436) and low (M=39.4%, 14.8-48.2%; n=328). Knowledge sum score was significantly different across the three groups (F<sub>(2,1153)</sub> =2700.14, p<0.001). Differences between every two levels were clear (high vs. low: p<0.001; high vs. moderate: p<0.001; moderate vs. low: p<0.001).

The cut-points were 50.0% between low and moderate levels and 64.8% between moderate and high levels. The proportion of children in high, moderate and low levels were 20.9%, 41.9% and 37.2% respectively at pretest and 46.6%, 33.6% and 19.8% respectively at posttest.

**CONCLUSION.** The knowledge classification was found to be empirically sound. The obesity prevention intervention showed preliminary efficacy in knowledge increase, with more children placed in the high knowledge group and less children in the low knowledge group.  
 This study was supported by the Society of Health and Physical Educators, United States of Agriculture, and Iowa State University College of Human Sciences

3121 Board #26 June 2 3:30 PM - 5:00 PM  
**Playground And Garden Activity Levels In Young Children**

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Outdoor time is mandated by most states in early childhood education settings. Most facilities have a playground for children to engage in physical activity (PA) during their outdoor time. However, garden programs are increasing in popularity for children, providing educational opportunities while contributing to children’s daily PA.  
**PURPOSE:** To determine the differences in time spent in PA between two outdoor environments (playground and garden) in preschool children. **METHODS:** Ten children (4.7 ± 0.6 years) enrolled in a university laboratory preschool participated in this study. PA was assessed using an ActiGraph GT3X+ accelerometer that was worn on the right hip. Each child completed four randomly ordered free living conditions (30 min each), which included two bouts of unstructured PA on the playground and two bouts of semi-structured PA in the garden. Accelerometer data were classified as minutes in sedentary behavior and combined PA of varying intensities (light, moderate, and vigorous) using the Pate cut points. Data were combined to make one 60 min bout for each environment. Sessions were combined in order to determine the number of minutes per hour spent in sedentary and PA. This variable is consistent with the Institute of Medicine (IOM) recommendation of 15 minutes of PA per hour in order to determine whether these types of outdoor activity are supportive of meeting PA goals. Paired samples T-Tests were conducted to look at differences in PA (min/hour) between the playground and garden. **RESULTS:** On average, the children spent 35.8 min/hour in PA on the playground and 29.0 min/hour in PA on the garden. The children spent less time in sedentary behaviors (24.2±6.8 vs. 31.0±8.4 min/hour; p=0.025) and more time in moderate PA (15.3±5.1 vs. 10.8±6.1 min/hour; p=0.034) on the playground than in the garden. There were no differences in light (18.0±2.4 vs. 17.0±3.4 min/hour; p=0.365) or vigorous PA (2.6±2.1 vs. 1.2±1.9 min/hour; p=0.131) between the playground and the garden. **CONCLUSIONS:** Children spent less time being sedentary and more time in moderate PA on the playground than the garden. However, the children exceeded IOM activity guidelines in both environments. These results suggest that gardens may be a conducive environment to provide an opportunity for children to meet PA recommendations.

3122 Board #27 June 2 3:30 PM - 5:00 PM  
**Physiological Change During a 13-Week Aerobic Dance Class Among College Age Women**  
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One predictor of lifelong activity participation is increased self-efficacy toward physical activity (PA) (Weiss, O’Loughlin, & Piatt, 2007). Many colleges and universities require PA but little emphasis is placed on whether students experience physiological change. If measurable changes were identified, it could improve self-efficacy and potentially lead to lifelong activity participation. **PURPOSE:** The purpose of this study was to see if a statistical change could be identified in a variety of physiological variables among a group of college age women enrolled in a PA course. **METHODS:** Thirty one women with an average age of 20.53 (±1.11) years participated. Participants were enrolled in either a 13-week aerobic dance fitness (FIT) course (n = 19) or a non-fitness course, which served as the control group (n = 12). Pre-test assessments were completed during the first week of the semester. The assessment included anthropometric measurements, resting systolic blood pressure (rSBP) and heart rate, a submaximal treadmill test, ACSM abdominal curl (ABcurl) and push up tests, ACSM Sit and Reach (SR), and bioelectric impedance for body fat assessment. Post-test assessments were completed during the final week of class. To be included in the study, participants must not have been absent for more than two days during the semester. **RESULTS:** Paired sample t-test statistics were conducted to determine significant changes in each group (p < .05). A significant decrease in rSBP (-4.63 9.11 mm/hg) was observed in the FIT group (t = 2.22, p = .041). Significant increases in SR (0.83 1.51 inches) as well as ABcurl (9.05 14.50) performance (t =

2.39,  $p = .028$ ;  $t = 2.72$ ,  $p = .014$ ) respectively. No significant change was seen in the control group. However, when a Repeated Measures ANOVA analysis was conducted, all significant differences disappeared. This was likely due to the large standard deviations and non-normal distribution of the sample data. **CONCLUSION:** During a 13-week aerobic dance course, this study was unable to find statistically significant differences in a variety of physiological variables among a group of college age women when compared to a control group. More research is needed to determine if a larger sample size might uncover significant changes and whether these changes are sustained among this group. IRB# 1415-0009

3123 Board #28 June 2 3:30 PM - 5:00 PM  
**Effects of Hypoxic/Altitude Training on Bone Health in Obese Adolescents under Weight Loss**

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**PURPOSE:** To explore the effects of short-term stimulated hypoxic training or altitude training on body weight, bone mineral content (BMC), bone mineral density (BMD) and bone area (BA) in obese adolescents undergoing dietary weight loss.

**METHODS:** Forty seven healthy obese adolescents ( $BMI=30.82-35.93 \text{ kg/m}^2$ ) were included in this study. The interventions lasted for four weeks. The plain group (PG,  $n=18$ ) lived in the plain (Shanghai, China) and trained 5 hours every day. The altitude group (AG,  $n=11$ ) lived in real altitude (Duoba, Qinghai, China; 2360m) and trained 5 hours per day. The hypoxic group (HG,  $n=18$ ) slept in simulated 2300m normobaric hypoxia 8-10 hours every night and trained 2 hours in hypoxia and 3 hours in normoxia every day. All groups underwent dietary restriction and the energy intake ranged from 1322 to 2081 kcal/day. Heart rate was monitored every ten minutes during exercise to ensure the intensity was in the target range, which was 40% of the heart rate reserve and determined by the Karvonen equation. BMC, BMD and BA were measured by dual x-ray absorptiometry before and after intervention. A three (PG, AG and HG) by two (Pre and Post) analysis of variance (ANOVA) was used for statistical analysis.

**RESULTS:** Body weight decreased significantly after four weeks in all three groups (all  $p<0.05$ ). There were significantly more weight reductions in the HG and PG groups than in the AG group (10.18% and 9.34% vs. 7.56%, both  $p<0.05$ ). There was no significant group difference between the HG and PG groups. Total BMC increased significantly in the PG group ( $p<0.05$ ) but not in the HG and AG groups. There were no significant group differences in changes of BMC. Total BMD increased significantly in all 3 groups (all  $p<0.05$ ), but no significant group differences were seen on the BMD changes. Total BA did not change over the 4-week intervention in all groups.

**CONCLUSIONS:** Four weeks of diet plus plain training, diet plus stimulated hypoxic training and diet plus altitude training resulted in weight loss and similar improvements in BMD. Future studies are needed to identify the health benefits of hypoxic/altitude training for this population. (Supported by NSFC 31471139 and CISSFRF 16-18)

3124 Board #29 June 2 3:30 PM - 5:00 PM  
**A New Racket Sport That Provokes Similar Heart Rate As Soccer And Basketball In Children**

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Physical inactivity often increases during childhood as does the risk for early-onset of lifestyle-related diseases. The development of new sports, if deemed to be of sufficient intensity, may add diversity to the more traditional options in order to promote healthy lifestyles. **PURPOSE:** To compare children's average and maximum heart rate percentage (HRP) while playing a new racket sport with heart rate while playing two traditional sports. **METHODS:** 22 girls and 32 boys (age=10.4±0.1yr; body fat=23.2±1.5%; ht=147.4±0.9cm) played three sports for 25 minutes in a randomized order on different days: Soccer (SC), Basketball (BK) and Spiribol (SP). SP is played inside a 7m-diameter circle separated into two playing areas. A tennis ball attached to 2m of rope is suspended from a 2.2m-high pole in the middle of the circle. The goal of the game is to hit the ball with a racket and be the first to role the rope up the pole. Four SP familiarization sessions were performed prior to the study due to its novelty. Average and maximum HRP was measured with a Polar H7-Bluetooth 4.0. Body fat was measured with bioelectric impedance. A repeated measures ANOVA was used for analysis. **RESULTS:** Average HRP of the three sports were inside the thresholds for being considered healthy activities, although differences ( $p<0.05$ ) were obtained between all of them (SC 80.9±1.3; BK 84.0±1.3; SP 73.4±1.2). However, average HRP in girls was not different between SC (78.3±2) and SP (73.8±2) but both were lower

than BK (83.6±2). In boys, average HRP for SC (83.4±1.5) and BK (84.4±1.6) was not different but both were higher than SP (73.1±1.5). Maximum HRP was similar for SC and BK (93.5±1.1 and 94.7±1, respectively) and both were higher than SP (85.3±1.2). Similar significant differences were observed when maximum HRP was differentiated by gender. **CONCLUSION:** SC and BK both elicit slightly higher HRP compared to SP. However, SP is a new sport that appears to provide heart rate responses within the healthy threshold of intensity for children so it could be a good alternative to traditional sports. In addition, SP can be played in a smaller area that makes it more practical when space is limited. Further research is needed to determine enjoyment and satisfaction levels when playing SP, as well as if more familiarization results in higher average and maximum HRP.

3125 Board #30 June 2 3:30 PM - 5:00 PM  
**Can a Parental Modeling Physical Activity Intervention Improve Physical Activity and Body Composition in Adults and Young Children**

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**PURPOSE:** This study examined the impact of an 8-week parental modeling physical activity (PA) intervention on parent and child PA and body composition.

**METHODS:** Twenty-six parents participated in an 8-week PA intervention with their 1 - 5 year old child. The adults were randomly placed into an intervention ( $n=19$ ) or control ( $n=7$ ) group. The intervention group received weekly phone calls with a coach. The coach discussed strategies to change parent and child PA. PA (activity monitor) and body composition (height, weight, and circumferences) were assessed before and after the intervention. Body mass index (BMI) and BMI z-scores were calculated. Time spent in sedentary behavior, light, moderate, and vigorous PA was determined using cut points by Freedson et al. (adult), Trost et al. (1 - 2 year old children), and Butte et al. (3 - 5 year old children). Data analyses were conducted using the intention-to-treat method. A series of 2 (group: control/intervention) X 2 (time: pre/post) ANCOVAs were run to examine the effect of the intervention on PA levels in the parents and children adjusting for wear time. A series of 2 (group: control/intervention) X 2 (time: pre/post) ANOVAs were run to examine the effect of the intervention on body composition (weight, BMI, waist circumference) in the parents and children (BMI z-score). Effect sizes (ES) were calculated and significance was set at  $p<0.05$ .

**RESULTS:** Among the parents, group, time, and interaction effects were non-significant for PA levels, weight, BMI, and waist circumference ( $p>.05$ ). ES indicated the intervention group had medium reductions in sedentary behavior (-.57) and increases in vigorous PA (.65), whereas controls had small reductions in sedentary behavior (-.14) and medium reductions in vigorous PA (-.76). Regarding the children's data, the PA levels and BMI z-scores were similar by group and time ( $p>.05$ ). Small decreases in sedentary behavior (-0.18), light (-.21), and mod (-.11) PA were observed in the intervention children, whereas control children had small increases in sedentary behavior (.24), and large decreases in light (-.92) and moderate (-.90) PA.

**CONCLUSIONS:** A parental modeling PA intervention may have positive effects on parent's and children's PA levels. Supported by: Research/Creative Activity Award, East Carolina University

3126 Board #31 June 2 3:30 PM - 5:00 PM  
**The Effects of Different Exercise on Chronic Inflammatory Markers in Obese Youth**

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**PURPOSE:** With the increasing number of overweight and obese individuals around the world, it is not only a mental stress to the one who is overweight or obese, but also economic and social burden to the society. It is known to us that the obesity is a chronic inflammatory status, the purpose of this research is aimed to discuss the effects of aerobic and resistance exercise on chronic inflammatory in obese youth by testing some key chronic inflammatory markers.

**METHODS:** With the diet controlling, 37 volunteers (male-18, female-19) were divided into 2 groups, such as the aerobic exercise (AE, with the intensity of 30%-40% heart rate reserve for 1 hour per day for 4 weeks, 6 days/week by jogging or aerobics) group (male-10, female-10, 21.1±2.0 years, BMI=30.28±2.17) and resistance exercise (RE, with intensity of 80%-90% heart rate for 1 hour per day for 4 weeks, 6 days/week by resistance exercise) group (male-8, female-9, 21.1±1.6 years, BMI=30.10±2.35). The exercise time lasted for 4 weeks and there had three times to take the venous blood samples of the volunteers to test the contents of TNF- $\alpha$  and IL-6 by using ELISA AE the beginning, 4 weeks later and 8 weeks later (the last 4 weeks without diet controlling and exercise).

**RESULTS:** The body weight of AE and RE groups decreased significantly after 4 weeks, and it maintained AE a low level after 8 weeks (AE: 92.13±13.68 kg to

84.08±11.90 kg, then to 83.86±11.59 kg, RE: 86.68±13.91 kg to 79.79±11.82 kg ( $p<0.01$ ) then to 79.72±12.36 kg). In addition, the body fat rate of the subjects also has the same tendency as the body weight (AE: 38.71±5.79% to 34.21±6.91% ( $p<0.01$ ), then to 33.09±7.42%; RE: 38.84±5.54% to 34.65±6.51%,  $p<0.01$ , then to 33.99±7.33%). The level of TNF- $\alpha$  decreased significantly after 8 weeks in both groups (AE: 16.29±2.55 ng/ml to 14.93±2.48 ng/ml, RE: 16.60±2.22 ng/ml to 14.13±1.82 ng/ml,  $p<0.05$ ). The contents of IL-6 decreased significantly after 4 weeks, but increased after 8 weeks later.

**CONCLUSIONS:** Both aerobic and resistance exercise are helpful to lose weight by reducing the body fat. And the chronic inflammatory of the body is inhibited after 4 weeks aerobic and resistance exercise by decreasing the level of TNF- $\alpha$  and IL-6.

3127 Board #32 June 2 3:30 PM - 5:00 PM  
**School Based Pedometer Intervention: Are Standard Reporting Protocols Masking Potential Benefits In Previously Inactive Subpopulations?**

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Intervention outcomes, expressed by mean changes, often overlook variable responsiveness. This may mask some intervention successes. **PURPOSE:** To explore individual variability in children completing a pedometer intervention. **METHODS:** Six schools ( $n=152$ ) were ranked and paired by socio-economic status, with one per pair randomly allocated to a six-week teacher-led pedometer intervention (PI,  $n=81$ ) or control (C,  $n=71$ ). Actigraph GT1M accelerometers assessed physical activity (PA) for 7 days. Evenson cut points identified total daily sedentary (SED), light PA (LPA) and moderate-to-vigorous PA (MVPA) expressed as percentage (%) of total daily wear time. For analysis, a PA return of 480+ mins/d,  $\geq 3$  school days for pre and post-tests was needed. Mean pre daily MVPA mins were used to categorise subgroups; Non-Achievers <30 (NA1), NA 31-44 (NA2), NA 45-59 (NA3), Achievers >60 (ACH). **RESULTS:** From 84 included participants ( $F=60\%$ ,  $9.9\pm 0.3$  yrs), no significant differences were found between PI ( $n=52$ ) and C ( $n=32$ ) for increases in % time in MVPA ( $0.30\pm 0.67$  v  $0.13\pm 0.29$ ), LPA ( $2.03\pm 4.63$  v  $-0.05\pm 4.25$ ) and reducing % of SED time ( $2.33\pm 5.89$  v  $-0.08\pm 5.52$ ). More PI (17 to 27%) than C (16 to 19%) pupils met 60mins/d guidelines. Versus C, two PI groups improved MVPA. The greatest increases were in NA1 (1.52% above C) and  $+2.05\pm 2.34\%$  from pre-test. PI-ACH decreased % time in MVPA from pre to post ( $-2.75\pm 2.85\%$ ). All PI subgroups increased % time spent in LPA versus C, with NA2 improving 3.54% above C and PI-NA1 having the greatest improvement ( $+3.60\pm 6.37\%$ ). All PI groups had more favourable SED results; three reducing SED time. The greatest reduction versus C was NA3 (3.95%). The greatest total reduction was in PI-NA1 ( $-5.65\pm 7.80\%$ ). Greater proportions of participants met the 60mins/d guidelines in three PI groups versus C. The largest increase was seen in NA3 (+31%); both ACH groups showed a decline (PI 100 to 67%; C 100 to 40%). **CONCLUSIONS:** Despite no significant overall PI effects versus C, a greater % of participants met the 60mins/d guidelines. PI found clusters of responsiveness. Pre-PI NA benefited most demonstrating positive changes in eight of nine activity outcomes compared to C, maybe at the expense of the most active. While participant numbers are small, they justify examining sub-population variability in subsequent research.

3128 Board #33 June 2 3:30 PM - 5:00 PM  
**High-intensity Circuit-training Improves Physical Capacity And Cardiometabolic Risk Markers In Overweight Adolescents**

Daniel Gonçalves<sup>1</sup>, Joaquim Fontoura<sup>2</sup>, Cristine Schmidt<sup>1</sup>, Maria João Neuparth<sup>3</sup>, Carolina Canotilho<sup>1</sup>, Francisca Serrão<sup>1</sup>, Marta Sobral<sup>1</sup>, Rita Ferreira<sup>3</sup>, José Oliveira<sup>1</sup>. <sup>1</sup>CIAFEL, Faculty of Sport, Porto, Portugal. <sup>2</sup>João Gonçalves Zarco High School, Matosinhos, Portugal. <sup>3</sup>University of Aveiro, Aveiro, Portugal.

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**Introduction:** Despite the well-known benefits of exercise training of moderate intensity for improving cardiometabolic health in overweight adolescents, it remains to be determined the extent of benefits provided by high intensity exercise.

**Purpose:** to evaluate how much a high-intensity circuit-training (HICT) program would change health related fitness and cardiometabolic risk factors in overweight adolescents.

**Material and Methods:** 18 students (age  $16\pm 0.9$  yrs and BMI  $28.2\pm 0.26$ ) were submitted to HICT program (3 days/week, 1hour/session, for 9 weeks in their school

facilities). Before and after the HICT program, anthropometrics and body composition [body weight (BW), waist circumference (WC), and fat mass (FM) and free fat mass (FFM)], physical fitness (Fitnessgram), blood pressure and fasting biochemical analysis [Glucose (Gluc), low density lipoprotein-cholesterol (LDL-C), triglycerides (TG), alanine aminotransferase (ALT) and aspartate transaminase (AST)] were assessed.

**Results:** HICT induced significant reductions in BW ( $77.15\pm 13.01$  vs.  $75.96\pm 12.35$  Kg), WC ( $93.10\pm 10.43$  vs.  $90.31\pm 11.66$  cm), FM ( $27.80\pm 6.61$  vs.  $24.64\pm 6.29$  Kg) and an increase in FFM ( $49.37\pm 9.33$  vs.  $51.33\pm 9.29$  Kg) ( $P<0.001$ ). Both systolic ( $128\pm 12.7$  vs.  $117\pm 7.2$  mmHg) and diastolic ( $66\pm 7.8$  vs.  $62\pm 4.4$  mmHg) blood pressure were also significantly reduced ( $P<0.001$ ). Regarding physical fitness, the HICT resulted in a significant improvement in the curl-up ( $38.1\pm 25.6$  vs.  $59.5\pm 28.9$  rep), push-up ( $9.7\pm 6.9$  vs.  $16.5\pm 6.4$  rep), horizontal jump ( $131.3\pm 25.6$  vs.  $141.3\pm 28.9$  cm) and 20m shuttle run test ( $29.1\pm 11.9$  vs.  $38.9\pm 6.4$  laps) ( $P<0.001$ ). Finally, Gluc ( $85.9\pm 12.4$  vs.  $76.8\pm 12.3$  mg/dL), LDL-C ( $151.7\pm 25.8$  vs.  $93.9\pm 27.8$  mg/dL), TG ( $66.5\pm 21.4$  vs.  $62.3\pm 23.5$  mg/dL), ALT ( $18.1\pm 5.5$  vs.  $12.0\pm 4.1$  U/L) and AST ( $18.0\pm 6.5$  vs.  $13.9\pm 3.1$  U/L) were all significantly reduced ( $P<0.001$ ) after the HICT program.

**Conclusion:** Our results support the notion that a short-term high-intensity circuit-training program improves physical fitness and modulate positively physiological health markers in overweight adolescents.

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Moreira-Gonçalves, D: FCT (SFRH/BPD/90010/2012).

Schmidt, C: CAPES (BEX 0554/14-6).

3129 Board #34 June 2 3:30 PM - 5:00 PM

**The Effects Of 6-week Agility Ladder Drills During Recess Intervention On SEBT In School Boys**

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(No relationships reported)

**PURPOSE:** The purpose of this study was to examine the effects of 6-week agility ladder drills during recess time on dynamic balance ability in school boys aged 7-13.

**METHODS:** Seventy one school boys ( $9.82 \pm 1.90$  years;  $1.38 \pm 0.13$  m;  $33.28 \pm 9.64$  kg; BMI  $17.25 \pm 3.18$  kg m<sup>-2</sup>) were assigned randomly into a control ( $n = 37$ ) and experimental ( $n = 34$ ) groups. The experimental group performed 3 agility ladder training sessions per week for 6 weeks. Each training session included six sets of the training programme which consisted of 6 exercises in the order of side jump, in and out, hopscotch, left and right leg hop, and icky shuttle, with 30 seconds rest between each set. Both groups were assessed using Star Excursion Balance Test (SEBT) before and after 6-week recess intervention.

**RESULTS:** A statistically significant increase in post-training SEBT scores from 6.2% to 19.1% was seen in all directions for the experimental group, with a score that was better than the control group for both limbs. Repeated measure ANOVA revealed a significant main effect for time was observed on the three normalised reach distances of left limb,  $F(1, 69) = 2.054$ ,  $p = .000$ ; partial  $\eta^2 = .305$ ; three normalised reach distances of right limb,  $F(1, 69) = 2.054$ ,  $p = .000$ ; partial  $\eta^2 = .313$ ; and six normalised reach distances of both right and left limbs,  $F(1, 69) = 2.054$ ,  $p = .000$ ; partial  $\eta^2 = .305$ . There was no statistically significant interaction effect between time and group (control and experimental group) on the three composited distances of left limb,  $F(1, 69) = 2.054$ ,  $p = .156$ ; partial  $\eta^2 = .029$ ; three normalised reach distances of right limb,  $F(1, 69) = 1.825$ ,  $p = .181$ ; partial  $\eta^2 = .026$ ; and six normalised reach distances of both right and left limbs,  $F(1, 69) = 2.054$ ,  $p = .000$ ; partial  $\eta^2 = .305$ .

**CONCLUSIONS:** The dynamic balance ability of the school boys was significantly enhanced in 6-week agility ladder drills training after recess intervention.

3130 Board #35 June 2 3:30 PM - 5:00 PM

**The Influence Of Contextual Factors On Recess Physical Activity Among Elementary School Children**

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**PURPOSE:** Childhood obesity remains a major public health concern in the United States. Physical activity (PA) opportunities, particularly within the school day, can prove particularly potent in attenuating childhood obesity etiology. Given the rapid decline in physical education in elementary schools, school recess has increasingly become a vital unstructured time during the school day that may facilitate positive behavior change and maximize opportunities for PA. However, the child characteristics and contextual/environmental factors that may influence engagement in PA during recess are unclear. Therefore, the aims of the present study were: (1) assess the

relationship between sex, weight status, and PA during recess; and (2) determine the influence of recess duration (15min vs. 30min) and timing (i.e., before lunch vs. after lunch) on recess PA, following adjustment of individual factors.

**METHODS:** Children in fourth and fifth grade (N=151, 91 females) were recruited from two public suburban schools in the Midwest. PA during recess was measured using accelerometry (ActiGraph WGT3x+) over five days. Height and weight measurements were used to determine BMI (kg/m<sup>2</sup>). Recess was offered either prior to or immediately following lunch in each school, for 15 or 30 minutes, respectively.

**RESULTS:** A negative relationship was found between BMI and vigorous PA ( $r=-.207, p=.02$ ), as well as step count ( $r=-.178, p=.05$ ). Further, sex was negatively correlated with MVPA ( $r=-.315, p=.00$  [male=0, female=1]). Significant interaction effects for PA were found between recess timing and recess duration ( $F = 11.68, p = .00$ ) whereby for children who had a longer recess duration, scheduling recess after lunch yielded the greatest MVPA. In contrast, for children in the shorter recess group, MVPA was significantly lower when recess was scheduled after lunch rather than beforehand. These interactions persisted even after adjusting for sex and BMI.

**CONCLUSION:** These findings reveal that individual and contextual factors such as recess timing and duration may influence the level of activity during recess; longer recess periods may yield greater MVPA outcomes when scheduled after lunch. Future experimental research is warranted to determine whether modification of these variables improves children's PA in the school setting.

3131 Board #38 June 2 3:30 PM - 5:00 PM  
**Geographic Variances in Achieved Moderate-to-Vigorous Physical Activity Within a Structured Afterschool Program**

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**PURPOSE:** The afterschool time has been identified as an important opportunity for achieving moderate-to-vigorous physical activity (MVPA) for children. For children's health, afterschool physical activity programs should be structured to yield maximal MVPA minutes. The purpose of this study was to examine the differences in the average MVPA during 30-minute period using a structured program design among children who participated at four different geographic locations. **METHODS:** Data was collected from a total of 2963 children who participated in a 30-minute after-school physical activity program (i.e., Active Science) in multiple YMCAs in the following regions: New England (n=688, male n=285, age M= 9.73 ± 0.63), Mid-Atlantic (n=758, male n=432, age M= 9.04 ± 0.98), Midwest (n=711, male n=339, age M=8.18 ± 0.51) and Southeast (n=806, male n=396, age M= 8.83 ± 1.59). Children wore accelerometers to track their MVPA during the program time. **RESULT:** The average time and standard deviation of MVPA for New England, Mid-Atlantic, Midwest, and Southeast were M=12.97± .39, M=10.605 ± .58 M=13.585 ± .72, M=8.355 ± .60 respectively. ANOVA showed that there were significant differences between the regions,  $F(3,2959)=115.68, p \leq .001$ . Post Hoc Test showed that New England and Midwest were significantly higher in MVPA than the Southeast  $p \leq .001$  and Mid Atlantic  $p < .01$ . There was no significant difference between New England and the Midwest. **CONCLUSION:** Children participating in a standardized afterschool program at different geographic locations can obtain significantly different MVPA. While further research is needed to determine the causation of these geographical differences, the findings emphasize that the quality of program implementation (e.g., program strategies) should be considered in addition to the quantity of the program (e.g., program time). Regardless, afterschool physical activity programs should continue to focus on improving MVPA.

3132 Board #37 June 2 3:30 PM - 5:00 PM  
**The Correlation of Parental Support in Primary School Children Obesity and Physical Activity**

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*(No relationships reported)*

**PURPOSE:** The aim of this study was to determine the correlation of parental support between obesity and physical activity in primary school children. **METHODS:** All data was collected from '2009 Taipei City School Children Physical and Mental Health Survey' in present study. We extracted the data from sixth grade students as analyze sample. The grouping criterion of parental support to exercise is whether the parents take children to exercise outside every week. The differences between two groups are analyzed by age-adjusted ANCOVA, Chi-square test and multivariate logistic regression analysis. Age-adjusted ANCOVA was used to determine the differences of anthropometric data, including weight, height, body mass index (BMI), waist circumference, hip circumference and waist-to-hip ratio (WHR). Chi-square test and age-adjust multivariate logistic regression analysis were used to analyze the proportion differences in children obesity, exercise partner choice preference. The statistical significant level was defined as  $\alpha = 0.05$ .

**RESULTS:** Children in the parent-support group had significantly lower height, weight, BMI, waist circumference, WHR and screen time compared to parent-non-support group ( $p < .05$ ). Compared to the children in parent-support group, the children in parent-non-support group had higher proportion of obesity ( $p=0.6$ ), proportion of finding exercise partner was 11.8% lower ( $p < .05$ ). The proportion of children won't do exercise without partner was also 11.3% higher than those children in parent-support group ( $p < .05$ ). Furthermore, the proportion of accumulating exercise time below 210 minutes per week was 2 % higher in parent-non-support group ( $p < .05$ ). Moreover, the proportion of the obese parents was also noticeably higher in parent-non-support group.

**CONCLUSIONS:** Parental support is an important factor which affects children obesity status and physical activity. More importantly, the parents' obesity prevalence will affect whether they support their children to exercise or not. Our results suggest that parental participation and parental weight management may be included in the strategy of children obesity prevention.

3133 Board #38 June 2 3:30 PM - 5:00 PM  
**Association between Physical Activity Self-efficacy and Physical Activity Engagement in Chinese College Students**

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Physical activity self-efficacy has been considered as an important correlate of physical activity behaviors. However, evidence on association between physical activity-related self-efficacy with different domains and physical activity engagement is still limited. **PURPOSE:** To investigate the association between physical activity self-efficacy for learning efficiency, physical fitness, psychological functioning, and overall health status and physical activity engagement in college students. **METHODS:** This cross-sectional study was comprised of 1,836 college students (1,138 males, 698 females) in China. Physical activity engagement and physical activity self-efficacy were assessed by a self-administered questionnaire. For physical activity engagement assessment, the duration of physical activity in each physical activity participation was divided into four categories as follows: <20, 20–40, 40–60, and >60 minutes; and the frequency of physical activity was divided into six categories as follows: 0, 1, 2, 3, 4, and >5 times/week. Furthermore, physical activity self-efficacy for learning efficiency, physical fitness, psychological functioning, and overall health status was evaluated by five scales (1–5) from "not effective" to "effective". Higher scores indicate higher levels of physical activity self-efficacy. The association between physical activity self-efficacy and physical activity engagement was examined using chi-squared test. **RESULTS:** In male students, participants with higher physical activity self-efficacy for learning efficiency ( $P$  for trend = 0.006), physical fitness ( $P$  for trend = 0.006), psychological functioning ( $P$  for trend < 0.001), and overall health status ( $P$  for trend = 0.023) tended to have higher frequency of physical activity engagement. These findings were also observed in association between physical activity self-efficacy and duration of physical activity engagement ( $P$  for trend < 0.05 for all). Similarly, physical activity self-efficacy was also significantly associated with physical activity engagement in female students. **CONCLUSION:** This study indicates that higher physical activity self-efficacy is associated with higher physical activity engagement in Chinese college students. Prospective studies are warranted to confirm these findings.

3134 Board #39 June 2 3:30 PM - 5:00 PM  
**The Differentiation Effect of College Students' Status on Physical Activity and Psychosocial Perception**

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An increasing number of young adults with physically vulnerable conditions are entering college each year (Maslow et al. 2011). Since only 50.4% of college students meet the physical activity (PA) recommendation, it is essential to find out the differences of college students who are healthy and who are vulnerable. **PURPOSE:** This study is to examine the difference of PA behaviors (i.e. intensity, frequency, and time) and psychosocial perceptions (i.e. attitude, subjective norm, perceived behavioral control, and intention) among college students (healthy group vs. vulnerable group). **METHODS:** A cross-sectional design was used and total 684 college students were recruited from five universities in Shanghai, China. There were 451 students in healthy group (67% were female,  $M_{age} = 19.3 \pm 1.0$ ) and 234 students were in vulnerable group (71% were female,  $M_{age} = 19.47 \pm 1.0$ ). Students were identified as vulnerable by certified physicians [i.e., specific diseases (49.6%), short-term injury (29.9%), physical weaknesses (18.8%), and disabilities (1.7%)]. All participants completed a validated questionnaire assessing their attitude, subjective norm, perceived behavioral control and intention (Hagger et al., 2007), and PA behaviors including intensive, time, frequency and overall PA (Yu et al., 2013).

**RESULTS:** A descriptive discriminant analysis (Hubery, 1994) revealed that the four subgroups (gender x group) differences accounted for 19% of the variance among the eight variables, and males in healthy group were significantly different from the other three subgroups. Among those, intensity (88.9%) and time (27%) in PA behaviors, and intention (15.4%) and attitude (4.7%) in psychosocial perceptions emerged as the promising dominant contributors to the group differences.

**CONCLUSIONS:** Consistently with previous studies, males in healthy group more likely participate in intensive PA and persist longer than other subgroups, and they have more positive attitude and intention to engage in PA. Colleges need to focus on PA interventions among females on both conditions and males with vulnerable conditions.

3135 Board #40 June 2 3:30 PM - 5:00 PM  
**Using Theory of Planned Behavior to Examine Chinese Adolescents' Moderate and Vigorous Physical Activities**

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In China, academic excellence is often considered the most important indicator of success in adolescents, while physical activity (PA) is often discouraged because it drains energy and garn time away from academic study (Yu et al., 2006). However, recent research has indicated vigorous PA (VPA) rather than moderate PA (MPA), emerges as the significant predictor of cardiovascular health, as well as a protective factor against mental health complaints (Gerber et al., 2014). The theory of planned behavior (TPB; Ajzen, 1985) is a prominent theoretical model that examines the antecedents (i.e., attitude, subjective norm, perceived behavioral control, and behavioral intention) of planned behaviors such as PA. As such, research has indicated higher VPA demonstrated higher behavioral intention, while higher MPA demonstrated lower behavioral intention in Western cultures (Rhodes & de Bruijn, 2010). **PURPOSE:** To test the measurement and structural parameters of the TPB among a sample of Chinese adolescents in a MPA and a VPA context. **METHODS:** Participants were 219 ninth grade students (53% female,  $M_{age} = 16.33 \pm .55$ ) from three high schools in Zhengzhou, China. Participants completed validated questionnaires that assessed their attitudes, subjective norms, perceived behavioral control, behavioral intention, and self-reported MPA and VPA behaviors. **RESULTS:** Correlation analyses revealed a pattern of positive relationships among the study variables. Confirmatory factor analyses and structural equation models revealed good-fitting models within both the MPA model ( $\chi^2 [84] = 180.77, p > .01, CFI = .94, RMSEA = .07, SRMR = .06$ ) and VPA model ( $\chi^2 [84] = 189.37, p > .01, CFI = .93, RMSEA = .08, SRMR = .06$ ). Standardized path coefficients indicated attitude ( $\gamma = .15$ ), subjective norm ( $\gamma = .18$ ), and perceived behavioral control ( $\gamma = .46$ ) were significantly positively associated with behavioral intention ( $p < .01$ ). In addition, standardized path coefficients indicated behavioral intention was significantly positively associated with VPA ( $\beta = .23, p < .01$ ), but not MPA ( $\beta = .04, p = .55$ ). **CONCLUSION:** This study further supported the heightened relationship between behavioral intention and VPA in Chinese adolescents. Thus, the findings highlighted the importance of enhancing TPB constructs to foster VPA in Chinese adolescents.

3136 Board #41 June 2 3:30 PM - 5:00 PM  
**The Effects of Resistance Training Programs on the Physical Self-Perceptions of College Females**

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 (No relationships reported)

While it is generally accepted that exercise enhances physical self-perceptions (PSPs), the impact of resistance training programs on females' self-perceptions is unclear. Because exercise is an important public health behavior, and because PSPs have motivational associations, research on this topic may have important implications for exercise promotion. **PURPOSE:** To investigate the effects of two different types of resistance training programs on the PSPs of college age females. **METHODS:** College students with no background in resistance training ( $n = 20$ ) were randomized to a muscular strength (MSTR  $n = 10$ ), or a muscular endurance (MEND  $n = 10$ ) resistance training group. A comparison (COM) group ( $n = 10$ ) was recruited from inactive college students. The resistance training groups followed strength- or endurance-oriented progressive resistance training programs for nine weeks. Participants completed the Physical Self-Perception Profile (PSPP) pre- and post-intervention. Height, weight, skinfolds and circumference measurements were also taken pre and post. **RESULTS:** Analyses utilized ANCOVAs followed by Bonferroni-adjusted ( $p$  set at  $< .017$ ) pairwise comparisons. The only physical change was a significant reduction in the sum of skinfolds in the MSTR group ( $p = 0.013$ ). Analyses of PSPP changes showed significant effects for MSTR on the physical condition subscale ( $p = 0.004$ ),

and on the strength competence subscale ( $p = 0.015$ ) and a near-significant effect on the attractive body adequacy subscale ( $p = 0.018$ ) that may be practically significant. **CONCLUSION:** Strength-oriented resistance training produced improvements in some aspects of college females' physical self-perceptions.

3137 Board #42 June 2 3:30 PM - 5:00 PM  
**Family Factors Associated with Physical Activity and Sedentary Time in Children Living in Puerto Rico**

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**PURPOSE:** The purpose of this study was to examine associations among parental perceptions of their children's skills and participation in physical activity (PA) and parental intentions of changing health behaviors with objectively measured PA in Puerto Rican children. **METHODS:** Seventy-three children (mean±SD; age,  $8.9 \pm 1.3$  yrs; BMI  $33.1 \pm 10.4$  kg·m<sup>-2</sup>) wore an ActiGraph GT3X accelerometer on their right hip for seven days to estimate time spent in sedentary behaviors (SB), light (LPA) and moderate-to-vigorous (MVPA) PA, and total activity counts for the vertical axis (TAC<sub>va</sub>) and vector magnitude (TAC<sub>vm</sub>). Children also completed a motor proficiency test (MPT), a sit-up test (SUT), and sum of skinfolds (SOS) from two sites (triceps and sub-scapular) was obtained. Parents completed questions on their perceptions (PP) of their child's abilities and parental intentions (PI) to modify family health related behaviors. Partial correlations, controlling for accelerometer wear time, were used to examine relationships between PP, PI, MPT, SOS and SUT, with time spent in SB, LPA, MVPA, and TAC<sub>va</sub> and TAC<sub>vm</sub>. **RESULTS:** Significant differences were found between boys and girls for time spent in SB ( $239.3 \pm 74.6$  vs.  $296.2 \pm 128.4$ , respectively,  $p = 0.024$ ), and MVPA ( $126.4 \pm 40.7$  vs.  $85.7 \pm 42.3$ , respectively,  $p < 0.001$ ). In girls, PP of child's speed while running was associated with TAC<sub>va</sub> ( $r = 0.43$ ) and TAC<sub>vm</sub> ( $r = 0.39, p < 0.05$ ). PP of how eating behaviors of the family influence eating habits of their children was correlated with SB ( $r = 0.43$ ), MVPA ( $r = 0.41$ ), TAC<sub>va</sub> ( $r = 0.50$ ), and TAC<sub>vm</sub> ( $r = 0.52$ ; all  $p < 0.01$ ). PI of limiting the amount of sweetened beverages was correlated with SB ( $r = 0.47$ ) and TAC<sub>vm</sub> ( $r = 0.37$ ; all  $p < 0.05$ ). In boys, MVPA and TAC<sub>va</sub> were negatively correlated with SOS ( $r = -0.38$  and  $-0.35$ , respectively;  $p < 0.01$ ). MVPA was positively correlated with PI to engage in 30-min of PA at least 5 d/wk. ( $r = 0.36, p < 0.05$ ). TAC<sub>vm</sub> was positively correlated with parental report of age that their child first walked without support ( $r = 0.36, p < 0.05$ ). **CONCLUSIONS:** Several modifiable factors related to PP and PI are related to time spent in SB and PA in Puerto Rican children. Parents with intentions to positively make changes in behaviors could affect positively impact time spent in PA.

3138 Board #43 June 2 3:30 PM - 5:00 PM  
**Physical Activity Level Increase Follow Up Health Educational Program In Overweight And Obese Children: Pilot Study**

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 (No relationships reported)

**PURPOSE:** This study aimed to investigate the impact of a Health Educational Program for Children at 5 days of Camp and 12 weeks follow up on the physical activity level (PAL) and sedentary behaviour (SB) in overweight and obesity children. **METHODS:** Health Educational Program for Children (HEPchild) designed for children who are overweight or obese and was divided into two phases: The first phase (PHASE 1) consisted of pré assessments and five-day camp (CAMP); and PHASE 2 corresponded to the 3 months follow-up, and a post follow-up assessments. Thus, the sample that attended the PHASE 1 was 20 children ( $9.4 \pm 1.1$  years; 9 boys:  $10.2 \pm 0.9$  years; 11 girls:  $9.2 \pm 1.3$  years), 5-days summer camp on a farmplace to develop educational, with interdisciplinary team (Physical Educator, Endocrinologist, Psychologist, Educator and Nutritionist). The Phase 2 children and family's were followed for 3 months (a weekly meeting for two hours in a total of 12 meetings). The end of the study composed by 12 children (8 girls and 4 boys,  $9.4 \pm 0.96$  years), who completed 75% of the meetings. To check the PAL and the SB was applied the questionnaire proposed by Militão et al. (2013) and analyzed physical activity level at sports, in leisure time during the week, level in leisure time during weekend, moving to and at school, sedentary behavior during the week and weekend. **RESULTS:** After FO 25% of children remained more active ( $> 1500$  and  $< 3000$  METs per week) in comparison to before CAMP. In contrast the amount of sedentary children ( $< 600$  METs week) decreased by 15% and the insufficiently active (600 at 1500 METs per week) increased by 15%. No child was classified as very active ( $> 3000$  METs per week) in any time. The PAL leisure time during the week and during the weekend significant

increase, 26.06% and 14, 1%, respectively, when comparing to pre CAMP and 12 weeks of follow-up. SB during the week and the weekend showed a significant mean reduction of 177.14 and 41.43 minutes respectively.

**CONCLUSIONS:** The Health Educational Program for Children contributed to the increase in physical activity level and reduced sedentary behaviour in overweight and obese children.

3139 Board #44 June 2 3:30 PM - 5:00 PM  
**Feasibility and Acceptability of Implementing Physical Activity Programs at a Residential Center for High-Risk Youth**

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With increased health concerns among youth, establishing a healthy lifestyle at young ages is prudent. Even more, youth exposed to adverse experiences face compounded risks for health concerns; it is essential to equip caregivers and youth with tools to reduce risks. Well-established physical activity (PA) programs may be such a tool. **PURPOSE:** To determine feasibility and acceptability of implementing a group PA program at a care facility for high-risk youth, and success of reaching ACSM's moderate-vigorous physical activity (MVPA) guidelines. **METHODS:** Group exercise programs were implemented at a high-risk care facility for two summers. Activities of appropriate METs from Addendum of PA for Children were employed 3 days/week, 60 min/day, and aimed to keep all youth engaged throughout program duration. MVPA-momentary time sampling, 20-m dash tests for VO<sub>2</sub>max estimation, and staff interviews were conducted. **RESULTS:** MVPA assessments indicated program success in engaging 34 of 37 children in ACSM's recommended PA guidelines throughout the duration of the program. Estimated maximal exercise capacity increased from pre- to post-program ( $9.7 \pm 0.5$  vs  $11.0 \pm 0.5$  MET,  $p = 0.047$ ). Qualitative interviews with staff indicated 100% acceptance rate and desirability of program return, and 80% of staff stated non-elicited, agreed-upon program outcomes for participants: reduced bickering, aggravation of peers, and sedentary time; and increased positive behaviors, state of calm, sleep patterns, desirability of participation in activities, and appetites. Identified components of program success were group- and individual-based mindsets, full participation of staff, and structure and consistency. **CONCLUSION:** Findings endorse feasibility and acceptability of establishing structured group MVPA programs in care facilities for youth, in addition to enhancing well-being outcomes for participants. Rigorous involvement in determining benefit of PA programs among this population is needed to justify work in providing refined, structured exercise programs to residential settings; doing so may provide an impactful tool for the care and well-being of these individuals.

Note: informed assent and consent forms were obtained for each participant. Supported by Washington State University.

3140 Board #45 June 2 3:30 PM - 5:00 PM  
**Examining The Relationship Between High School Physical Education With Current Fitness Outcomes In College Students**

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Physical education during K-12 can positively impact fitness outcomes, though the transition to college often leads to a decline in regular physical activity (PA) participation. The impact of high school PE on fitness outcomes and PA participation in college is unclear. **PURPOSE:** To examine how PE experience in high school was related to fitness and PA outcomes among college students. **METHODS:** Participants were college student volunteers ( $n=537$ ) that completed a fitness assessment and online survey. Aerobic fitness (YMCA cycle ergometer protocol), muscular endurance (push-up and curl-up tests), body composition (BMI and bioelectrical impedance) and blood lipids were assessed. The survey assessed participant demographics, current PA, and PE outcomes (number of semesters of PE in high school, PE enjoyment, taking PE when not required). All analyses were conducted separately for males and females. Pearson correlations examined the relationships between the fitness, behavioral and PE outcomes. Independent t-tests and ANOVAs were examined differences in fitness and behavioral outcomes by PE outcomes. **RESULTS:** The final sample was 56.6% male ( $n=298$ ) and 43.4% female ( $n=227$ ). Among males, PE enjoyment was related to VO<sub>2</sub>max ( $p=.04$ ), curl ups ( $p=.03$ ), and PA ( $p=.02$ ). Number of semesters of PE in high school was negatively associated with triglycerides ( $p=.01$ ) and total cholesterol ( $p=.02$ ) and positively associated with moderate physical activity ( $p=.02$ ). Males who took PE when it wasn't required were more vigorously active ( $p=.02$ ) than those who did not. Among females, number of semesters of PE in high school was negatively associated with triglycerides ( $p=.004$ ) and total cholesterol ( $p=.02$ ). PE enjoyment

was positively associated with VO<sub>2</sub>max ( $p=.04$ ) and push-ups ( $p=.03$ ). Females who took PE when it wasn't required had a higher VO<sub>2</sub>max ( $p=.04$ ) and vigorous physical activity ( $p=.03$ ) compared with those who did not. **CONCLUSIONS:** PE experience in high school is related to fitness and behavioral outcomes during college years, with different relationships for males and females. Enjoyment of PE should be examined further for long-term impact. PE programming and policy has the potential to impact health and behavior in later life stages and has implications for lifelong wellness.

3141 Board #46 June 2 3:30 PM - 5:00 PM  
**Sport And Physical Activity Lesson Participation And Health-related Variables In Low-income Youth**

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Youth sports participation is positively associated with several psychosocial variables. Minimal research is available on associations between sports team and physical activity lesson (S/PA) participation and health-related outcomes. The benefits of S/PA may be particularly salient in low-income youth, who report low levels of physical activity, lower quality of life, and poor diet. **PURPOSE:** To explore the relationship between S/PA participation and physical activity, diet, and health-related quality of life (QoL) in low-income youth. **METHODS:** A sample of students ( $N=754$ ,  $10.4 \pm 1.0$  y; 53% males; 56.2% black, 30.1% multi-racial/other, 13.7% white; 44.0% overweight) completed a survey including the Physical Activity Questionnaire for Children (PAQ-C; 9 items, max 5), KidsScreen-27 (psychological, peer-, and parent-related dimensions, max 100), and School Physical Activity and Nutrition Survey (SPAN; 25 items, max 3 per item). Single items described fruit and vegetable intake, and a junk food index was calculated (6 items, max 18). Participants self-reported S/PA participation (sports teams and/or dance/martial arts class) during the last year. Height and weight were measured to determine body mass index. One-way ANOVA was used to determine if physical activity, diet, or health-related QoL differed among S/PA participants and non-participants. **RESULTS:** Approximately 59% of youth participated in at least one S/PA. Physical activity ( $F(2,751)=15.011$ ,  $p<0.05$ ), fruit intake ( $F(2,746)=4.933$ ,  $p<0.05$ ), parent-related QoL ( $F(2,749)=10.413$ ,  $p<0.05$ ), and peer-related QoL ( $F(2,747)=6.170$ ,  $p<0.05$ ) were higher in S/PA participants compared to non-participants. However, junk food intake was higher in S/PA participants compared to non-participants ( $F(2,746)=6.490$ ,  $p<0.05$ ). **CONCLUSIONS:** In this sample, S/PA participation was associated with higher physical activity, fruit intake, and peer- and parent-related QoL. Our findings support previous research in a similar population of youth sport participants who had healthier dietary behaviors than non-participants. Our finding that junk food intake was higher in S/PA participants could be explained by time constraints and/or the belief that junk food consumption is acceptable as a result of being physically active.

Funded by: Crim Fitness Foundation

3142 Board #47 June 2 3:30 PM - 5:00 PM  
**The Effects of Different Types of Exercise on Chinese College Students' Energy Expenditure**

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**Purpose:** To examine the effect of light physical activity (LPA), moderate PA (MPA), vigorous PA (VPA), and active video games (AVGs) on college students' energy expenditure (EE). Gender differences in EE were also investigated.

**Methods:** Twenty-four college students (12 males;  $M_{EE} = 23.5$ ,  $SD = \pm 1.06$ ) completed four separate 10-minute exercise sessions on LPA (treadmill walking at 3.0 kph), MPA (treadmill walking at 5.0 kph), VPA (treadmill running at 7.0 kph), and AVGs (Xbox 360 Kinect Just Dance play) in a highly controlled laboratory. EE (total calories) was objectively measured by ActiGraph accelerometers.

**Results:** Repeated-measures ANOVA revealed significant differences in EE across different exercise sessions [ $F(1, 23) = 160.1$ ,  $p < .01$ ,  $\eta^2 = 0.88$ ]. In detail, VPA ( $M_{EE} = 75.25$ ,  $SD = 35.12$ ) yielded significantly higher EE than LPA and AVGs ( $p < .01$ ). Similarly, MPA ( $M_{EE} = 70.74$ ,  $SD = 28.77$ ) triggered significantly greater EE than LPA and AVGs ( $p < .01$ ). LPA ( $M_{EE} = 30.04$ ,  $SD = 13.38$ ) generated significantly higher EE than AVGs ( $M_{EE} = 21.16$ ,  $SD = 18.59$ ) ( $p < .01$ ). Notably, no significant EE difference emerged between VPA and MPA ( $p > .05$ ). In addition, independent t-tests indicated that males burned more calories than females in LPA ( $M_{EE}$  38.65 vs. 21.42,  $p < .001$ ), MPA ( $M_{EE}$  84.49 vs. 57.00,  $p < .01$ ), and VPA ( $M_{EE}$  100.74 vs. 49.76,  $p < .001$ ). No significant gender difference in EE during AVGs play ( $M_{EE}$  23.58 vs. 18.74,  $p > .05$ ).

**Conclusion:** Findings suggest that a 10-minute exercise session in treadmill running at 7.0 kph has the highest EE, followed by treadmill walking at 5.0 kph, 3.0 kph, and

AVGs in college students. Additionally, calories burned during treadmill walking at 5.0 kph is roughly equivalent to the energy cost of treadmill running at 7.0 kph. Notably, calories burned during AVGs play has not yet reached the light-intensity physical activity level of slow treadmill walking. It is plausible that the novelty of AVGs led to the low intensity of AVGs play. Lastly, males tend to expend more calories than females during treadmill walking/running but no significant EE difference was observed between genders during AVGs play. Future study may offer AVGs training tutorial prior to experiments to elicit greater EE.

3143 Board #48 June 2 3:30 PM - 5:00 PM

### Physical Activity Self-efficacy As A Predictor Of Achieving MVPA Guidelines In University Students

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Few studies have examined characteristics associated with physical activity levels in university students seeking weight loss treatment, though it has been shown that physical activity is associated with weight loss in interventions with general adult populations. Understanding the characteristics predicting university students' achievement of moderate- to- vigorous physical activity (MVPA) could better inform interventions designed to increase physical activity. **PURPOSE:** To identify predictors of meeting MVPA guidelines among university students enrolled in an intervention aimed at attaining or maintaining a healthy body weight. **METHODS:** At 2 campuses, 128 university students (66% female; mean age=21.6, SD=3.1; mean BMI=31.6 kg/m<sup>2</sup>, SD=3.7) completed demographic questions, the International Physical Activity Questionnaire (IPAQ), and physical activity self-efficacy at baseline. MVPA was calculated for each participant based on the days and minutes of self-reported activity, with meeting guidelines defined as 150 minutes/week of combined MVPA. **RESULTS:** A higher percentage of males met the MVPA guidelines (73%) compared to females (58%) and published national averages (49%). Logistic regressions revealed that PA-SE ( $p < 0.05$ ) was a significant predictor of meeting MVPA guidelines, while age, BMI, gender and race/ethnicity were not significant. No significant male/female differences in PA-SE were found. However, physical activity self-efficacy was a moderately strong predictor of achieving MVPA for both females (OR=2.22,  $p < 0.05$ ) and males (OR=3.99,  $p = 0.15$ ), although not statistically significant for males. **CONCLUSION:** Higher levels of physical activity self-efficacy appear to be substantially associated with the likelihood of whether or not female university students achieved MVPA guidelines, while no other demographic variables usually associated with MVPA levels were significant. Further examination is needed to determine if the effects of physical activity self-efficacy on meeting MVPA guidelines that were found here are causal and could therefore suggest different behavioral treatment strategies for the promotion of MVPA in male and female university students.

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3144 Board #49 June 2 3:30 PM - 5:00 PM

### Household Support for Physical Activity in Adolescent Girls Recruited from Lower SES Neighborhoods

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Tangible (e.g. adult facilitation) and intangible (e.g. encouragement) forms of support for physical activity engagement could be an important contributor of physical activity engagement for adolescent girls from low socioeconomic status (SES) households. However, limited research has examined associations between household support and physical activity in this population. **PURPOSE:** The purpose of this study was to examine the association between the perception of household support and physical activity levels of adolescent girls recruited from low SES neighborhoods. **METHODS:** Thirty-six girls, between the ages of 13-17 years, were recruited from lower SES neighborhoods. A trained researcher took participants' height and weight and administered two questionnaires to assess: (1) household support for physical activity (including support from the adult in the household the participant perceived themselves as being closest with and each additional adult in the household); and (2) minutes per day in moderate-to-vigorous physical activity (using the 3-Day Physical Activity Recall). Participants also reported their perception of barriers and facilitators of physical activity. **RESULTS:** Participants (N=36; 60% non-Hispanic black) had a median age of 14.9 [13.8, 15.9] and median BMI percentile of 90.5 [58.5, 97.0]. Total support ( $r = 0.221$ ;  $p = 0.224$ ), tangible support ( $r = 0.126$ ;  $p = 0.492$ ), and intangible support ( $r = 0.197$ ;  $p = 0.174$ ) from the closest adult in the household

was positively associated with physical activity but these results were not statistically significant (adjusted for age, BMI, and race/ethnicity). There were significant negative associations between BMI and both total adult household support for physical activity ( $r = -0.514$ ;  $p = 0.001$ ) and the support provided by the closest adult in the household ( $r = -0.553$ ;  $p < 0.001$ ). The most frequently reported facilitator of physical activity was support from family and friends ( $n = 15$ ; 42%). **CONCLUSIONS:** While household support for physical activity was not significantly associated with measured physical activity, there was a significant negative association between BMI and household support for physical activity. This suggests adolescents with a higher BMI receive less support for physical activity, which may warrant further investigation.

3145 Board #50 June 2 3:30 PM - 5:00 PM

### Girl Scout Troop Meeting Time-segmented Patterns Of Physical Activity Driven By Task.

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Fewer than half of children are currently meeting recommended physical activity (PA) guidelines of at least 60 minutes of moderate-to-vigorous physical activity (MVPA) per day, with fewer girls than boys meeting guidelines. Girl Scouts (GS) is a potential target setting for increasing PA in girls, though little is known about the time-segmented patterns of PA and the systemic drivers of these patterns during troop meetings. **Purpose:** To determine the microsystem influences on GS troop meeting time-segmented patterns of PA. **Methods:** Girl Scout Troop leaders (troop  $n = 7$ ) were randomized to receive an intervention training on implementing policies to promote physical activity and healthy eating or a standard control. Meetings (7 meetings/troop) were observed and girls in attendance ( $n = 76$ , 9-13 years old, mean  $\pm$  SD = 10.51  $\pm$  1.19 years) wore GTIM accelerometers. Two observers attended each meeting and recorded the start and stop point of time segments based on task (i.e., opening-closing, snack, active recreation [AR], Girl Scout curriculum [GSC]). The time-segmented episode accelerometer data were analyzed using Evenson cut-points. **Results:** A total of 182 time segments were observed (mean/day  $\pm$  SD = 3.77  $\pm$  1.24) with 24 AR (0.47  $\pm$  0.58), 63 GSC (1.31  $\pm$  0.80), 54 opening-closing (1.13  $\pm$  0.94), and 41 snack (0.85  $\pm$  0.58) segments. Mixed random effect models indicated treatment troops had significantly more AR segments per day (mean/day  $\pm$  SD = 0.89  $\pm$  0.12) than control troops (0.18  $\pm$  0.10). A significantly greater ( $p < 0.01$ ) percentage of time was spent in MVPA during AR (mean  $\pm$  SE = 17.19  $\pm$  1.11%) compared to GSC (0.39  $\pm$  0.81%), opening-closing (3.22  $\pm$  1.06%), and snack (0.61  $\pm$  0.87%). A significantly greater percentage of time ( $p < 0.01$ ) was spent in MVPA during opening-closing segments compared to GSC and snack. A significantly greater ( $p < 0.01$ ) percentage of time was spent sedentary/inactive in GSC (67.9  $\pm$  3.6%) compared to AR (32.26  $\pm$  4.1%) and open-closing (55.28  $\pm$  3.66%), and during snack (72.2  $\pm$  3.6%) compared to open-closing and AR. **Conclusion:** Troop meeting time-segmented patterns of physical activity were influenced by task. Intervention leaders devoted more time segments to AR than control leaders. Adding time segments conducive to PA to GS troop meeting could increase the percentage of time spent in MVPA.

3146 Board #51 June 2 3:30 PM - 5:00 PM

### Parental Support for Physical Activity and Sedentary Behavior among Chinese Schoolchildren

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Physical activity is essential for the development of children and adolescents. Among different social and environmental factors, parental support plays important role on influencing young people's physical activity. However, the associations between different kinds of parental support and physical activity among Chinese children and adolescents have not been explored thoroughly with a large size of samples. **PURPOSE:** To explore the roles of different kinds of parental support (encouragement, accompany, financial support and model) on influencing moderate-to-vigorous physical activity (MVPA) and sedentary behavior (SED) among Chinese school-aged children. **METHODS:** The data used in analyses derived from the Physical Activity and Health of Children and Adolescents Survey 2015 in Shanghai, China. 78516 students (grade 1-12) from all 17 districts of Shanghai, representing 5% of the population of schoolchildren, were randomly selected to participate in the self-report questionnaire survey. Finally, the present study contains 61429 participants (girl 49.3%, mean age 11.77 years). Descriptive statistics and logistical regression were used to examine the associations between MVPA, SED and various kinds of parental support by gender. **RESULTS:** Compared to the low parental support groups, young people in high encouragement, accompany, financial support, and model (the highest among four factors) (boy: OR=1.60, 95% CI: 1.52-1.69; girl: OR=1.63,

95% CI: 1.54-1.73) groups are more likely to being at least 1h MVPA daily. On the contrary, compared to the high parental support groups, young people in low accompany and model groups are more likely to being at least 2h SED daily during both weekdays and weekend. **CONCLUSIONS:** Various kinds of parental support have influence in schoolchildren for them to be physically active regardless the gender. Parents as the model and parental accompany have the biggest influence for youth being active. This study suggests that efforts should be focused on parents and their behavior when design and implement interventions aiming to promote young people's physical activity. Supported by Shanghai Shuguang Program (14SG46), Shanghai Pujiang Program (16PJC075), and Science and Technology Commission of Shanghai Municipality (16080503400).

3147 Board #52 June 2 3:30 PM - 5:00 PM  
**Effects Of School-based Intervention Program Of Exercise And Nutritional Counseling On Metabolic Markers (Ghrelin, Leptin, Insulin) In School-aged Obese Adolescents From Monterrey México**

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Studies show that energy imbalances cause the generation of obesity, metabolic markers play a fundamental role in the promotion and inhibition of satiety having as a consequence gain or loss weight, furthermore physical activity (PA) has been associated with endocrin regulation and with positive dietary changes.

**PURPOSE:** To assess the effect of a School-based Exercising and Nutrition Counseling Intervention On metabolic Markers (ghrelin, Leptin, Insulin) In School-aged Obese Adolescents from Monterrey México. **METHODS:** An experimental study with a sample of 51 adolescents (13±2 yrs) randomly distributed in two groups: Control (CG) and experimental (EG). CG had 4 weekly sessions of 60 minutes of PA and one weekly session of nutritional counseling. EG engaged in regular school activities. Metabolic markers were measured in serum and analyzed into LUMINEX platform. **RESULTS:** After pre-post test, results showed in EG at post-test that ghrelin significantly decreased (p=.005) the increase of leptin (p=.008) and insulin (p=0.05). No differences were observed after the comparison in CG. **CONCLUSIONS:** The change in the levels of leptin and ghrelin suggests a possible change in the metabolic behavior, showing that the practice of physical activity combined with nutritional counseling are factors of change in the integrated approach to obesity. In future studies, it is recommended to increase the duration of the program, and to suggest changes on diet.

3148 Board #53 June 2 3:30 PM - 5:00 PM  
**Patterns and Correlates of Sedentary Behaviour in Children Attending Child Care**

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 (No relationships reported)

Public health authorities recommend that young children should not be sedentary for more than 30-60 minutes at a time. **PURPOSE:** 1) describe the frequency and duration of SED bouts, as measured by accelerometry, in a sample of children attending family day care; and 2) explore associations between selected child care policies and practices and patterns of SED. **METHODS:** A random sample of 41 registered family day care programs (FDCPs) participated in the study. Within each FDCP, participating children (N=193) wore an ActiGraph GT1M accelerometer for the duration of child care attendance. A SED bout was defined as ≥ 4 consecutive 15 sec epochs (1 min) with counts less than 25. Non-wear time was quantified by summing the number of consecutive 0 counts accumulated in sequences of 60 min or longer. Children were included in the analyses if they had ≥ 3 days in which wear time was ≥ 75% of the attendance time (N=127, 68 Boys, 59 girls, mean age = 3.5 ± 1.1 y). Provider reports of policies and practices related to SED were obtained using items from the Nutrition and Physical Activity Self-Assessment for Child Care. **RESULTS:** Boys accumulated 36.6 SED bouts daily, with median bout duration of 2.0 min. The daily number of bouts lasting 1-4, 5-9, 10-14 and 15+ min was 30.8, 3.3, 1.0, 0.8, and 1.4, respectively. SED time accrued in each category was 57.2, 22.2, 12.1, and 41.0 min, respectively. Girls accumulated 41.6 SED bouts daily, with median bout duration of 1.8 min. The daily number of bouts lasting 1-4, 5-9, 10-14 and 15+ min was 67.1, 22.9, 11.1, and 34.6, respectively. SED time accrued in each category was 57.2, 22.2, 12.1, and 41.0 min, respectively. Gender differences were statistically significant for the number of bouts and the frequency of SED bouts 1-4 min. Children attending FDCPs meeting child care standards for the provision of outdoor play, prolonged sitting, screen time, portable play equipment, and staff engagement during free play exhibited significantly

fewer SED bouts and accrued significantly less SED in bouts lasting 1-4 mins. **CONCLUSIONS:** SED during child care attendance is accumulated in mostly short bouts. Few children exhibited prolonged SED bouts ≥ 20 mins. Child care practices related to sitting time, screen time, and active play may reduce the frequency of SED bouts.

3149 Board #54 June 2 3:30 PM - 5:00 PM  
**Effects Of A School-based Exercising And Nutrition Counseling Intervention On Sleep Parameters (Sleep Time, Sleep Latency And Number Of Awakenings) And Time In MVPA In School-aged Obese Adolescents From Monterrey México.**

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Obesity has positioned itself as a public health problem worldwide with multifactorial characteristics. Different studies define sleep time as obesogenic factor while others found a correlation with the levels of moderate to vigorous physical activity. (MVPA) **PURPOSE:** To assess the effect of a School-based Exercising and Nutrition Counseling Intervention On sleep parameters (sleep time, sleep latency and number of awakenings) and time in MVPA In School-aged Obese Adolescents from Monterrey México. **METHODS:** An experimental study with a sample of 51 adolescents (13±2 yrs) randomly distributed in two groups: Control (CG) and experimental (EG). CG had 4 weekly sessions of 60 minutes of PA and one weekly session of nutritional counseling. EG engaged in regular school activities. Sleep variables and levels of MVPA were monitored by triaxial accelerometer (ActiGraph wGT3X -BT) for at least 7 consecutive days. **RESULTS:**

Pre-post test comparison showed in de EG significative changes on sleep latency when MPVA increased (P=.006), other differences were observed on the decrease in awakenings on sleep (P<.001). No changes were observed on MPVA. CG increased only sleep latency (P<.001), on the other parameters no changes were found.

**CONCLUSIONS:** The practice of physical shows a significant relationship with sleep parameters which seems to be a favorable factor in the treatment of obesity in adolescents. We suggest further studies to modify the duration of the intervention and use other indirect instruments for analyzing the quality of sleep

3150 Board #55 June 2 3:30 PM - 5:00 PM  
**The Effect of Physical Activity on Attention in Elementary School Students**

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Schools have always incorporated physical activity (PA) into the school day, but of late opportunities for PA have come under pressure. Research suggests that PA, particularly bilateral and coordinated PA, has a positive effect on attention in adolescent children, offering support for the continued inclusion of PA during the school day. **PURPOSE:** The purpose of this investigation is to compare the effects of bilateral and coordinated exercise, typical recess activities, and quiet reading on attention in elementary school children. The d2 test measures processing speed, rule compliance, and quality of performance. Performance on the test is determined by evaluating the total number (TN) of items processed, the number of errors made during the test, and by calculating concentration performance (CP). **METHODS:** 14 fifth grade students (6 girls and 8 boys, Age= 10.6±1 years) and 12 fourth grade students (8 girls and 4 boys, Age = 8.7±1 years) were included in this investigation. Students completed 3 sessions, separated by 7 days. In the first session students completed the d2 attention test after a regular academic class period to act as a control (CON). Subsequently, students were randomly assigned to a sequence of experimental conditions to be completed over the next 2 weeks. Fifth graders completed either 30 minutes of quiet reading (QR), or coordinated exercise (CE), while 4th graders completed either 30 minutes of typical recess (REC) activities or CE. Coordinated exercise consisted of a sequence of bilateral activities requiring gross and fine motor movement using various balls. Ten minutes following the activities, students completed the d2 test again in a quiet classroom. **RESULTS:** TN increased from baseline in each condition in 5th (CON=323±10, QR=416±16, CE=414±20, p<0.001) and 4th graders (CON=287±17, REC=381±19, CE=374±20, p<0.001). CP similarly increased from baseline in each condition in 5th (CON=138±3, QR=177±7, CE=178±10, p<0.001) and 4th graders (CON=131±9, REC=160±6, CE=157±8, p=0.001). **CONCLUSION:** It appears that a break from the concentration required in class is most beneficial to attention. However, the additive positive impact of PA on the reduction of risk for chronic disease supports the continued opportunity for PA during school as a more beneficial strategy to improve attention.

3151 Board #56 June 2 3:30 PM - 5:00 PM

**Effects Of A Sit-stand Desk In A College Class**

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Increased amount of daily sitting time has been linked to increased risk of disease, independent of the amount of daily physical activity. A number of devices have been developed to address prolonged sitting in work and educational settings (e.g., sit-stand desks, treadmill-desks, cycle-desks, stepping desks). However, very little research has investigated the effect of a sit-stand desk on cognitive mood and performance in the college classroom. **PURPOSE:** To determine the effect of using adjustable-height (sit-stand) desks in a college class on attention (AT), stress (ST), musculoskeletal discomfort (MD), anxiety (AN), and academic performance (EXAM). **METHODS:** A total of 18 subjects (12 intervention, mean age 22.1, mean credits 13.9) completed the 13 week intervention (week 3-15 of the semester). Adjustable-height sit-stand desks were placed in the back and one side of the classroom for students to use as they desired. Participants completed a weekly visual analogue scale (VAS) for AT, ST, MD, and AN, and were given space to provide optional comments on why they answered the way they did. Class sessions were video recorded to allow for direct observation of attention (OAT) in weeks 9, 12, and 13. Exams were taken at week 4, 6, 8, 10, 12, 14, and 15. **RESULTS:** The main findings indicated a significant interaction effect for AT ( $F[12, 166] = 2.79, p = 0.002$ ) and ST ( $F[12, 166] = 2.15, p = 0.017$ ), and significantly ( $p=0.002$ ) lower overall MD for the intervention ( $12.81\pm 3.45$ ) vs. control ( $35.12\pm 4.80$ ) group. Exam scores were not different between groups. There was no difference in direct observation of attention (OAT) between groups (total  $n=15$ ; control= $6$ ) at week 9, 12, or 13. Age was correlated with overall observation of attention scores ( $r=0.54, p=0.038$ ), and ST with AN scores all weeks except 5 and 11 ( $r$  range =  $0.61-.95, p<0.05$ ). **CONCLUSION:** A strength of this study is the week to week data collection on various measures of cognitive mood and performance, and overall discomfort levels. Use of a sit-stand desk was associated with lower MD scores and more variability in AT and ST scores. Future studies should utilize increased sample sizes to determine the dose of standing that would result in changes in AT, ST, MD, AN, OAT, and EXAM in a university setting. This research was supported by a SCSU Faculty Research Grant.

3152 Board #57 June 2 3:30 PM - 5:00 PM

**Percentage Of Time Spent In Physical Activity When Indoors Vs. Outdoors In Young Children**

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In the early childhood education setting, there is scheduled time during the day for outdoor physical activity (PA). Similarly, outdoor PA may occur during the day when the children are at home on the weekends. **PURPOSE:** To compare the percentage of waking time spent in PA (combined light, moderate, and vigorous intensities) when young children (ages 3 - 6y) are indoors vs. outdoors, on a school day and a weekend day. **METHODS:** Participants were 20 preschool and kindergarten children ( $4.6\pm 0.8y$ ). PA was assessed using the ActiGraph GT3X+ accelerometer worn on the right hip, over the clothing, during one school day and one weekend day. Accelerometer data were filtered to remove the time period when the children were napping in order to capture only waking hours. Filtered data were analyzed using cut points by Pate et al. (2006) to determine the percentage of time children spent in PA. Environmental condition (indoors vs. outdoors) was determined using the lux values recorded by the Actigraph GT3X+ and a previously validated cut point (240 lux) by Flynn et al. (2014). A 2x2 repeated measures ANOVA was used to examine the percentage of time in PA by environment (indoors vs. outdoors) and by day (school day vs. weekend day). **RESULTS:** Children spent a significantly greater percentage of time engaged in PA when they were outdoors vs. when they were indoors ( $59.2\pm 13.0$  vs  $26.7\pm 7.4\%$ ;  $p<0.001$ ). Additionally, children spent a greater percentage of time in PA on the school day vs. the weekend day ( $50.1\pm 10.7$  vs  $35.8\pm 11.9\%$ ;  $p=0.001$ ). There was no interaction between day and environmental condition. **CONCLUSIONS:** Children engaged in a significantly greater percentage of time in PA when outdoors, and on a school day (as opposed to a weekend day). These results may be due the outdoor environment being more conducive for PA. It appears that spending more time outdoors may help young children to meet guidelines for accumulating at least 120 minutes of PA per day (Active Start, 2009).

3153 Board #58 June 2 3:30 PM - 5:00 PM

**Comparisons Of Heart Rate And Energy Expenditure Across Three Exergaming Consoles In College-age Adults**

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**Purpose:** Exergaming, playing video games that require players to be physically active, has opened up new avenues for increasing energy expenditure (EE). However, little research has compared the physiological benefits of the same game across different consoles. This study investigated: 1) the differences in degree of EE for the same song's dance in the same exergame across three different major gaming consoles each using a different method of recognizing player movement, and 2) whether exergaming could elicit moderate-to-vigorous levels of intensity ( $\geq 40\%$  heart rate reserve [HRR]) based on heart rate average ( $HR_{avg}$ ) measurements. **Methods:** Twenty-five healthy college-aged students (19 females and 6 males) participated in this study. Data collection comprised of baseline testing, a 30-second exergaming familiarization period with each console, and a play session. During gameplay, participants danced to a 3minute and 55second song on each console; they also danced to a non-interactive video of the same song lasting for the same duration. Participants rested for 5 minutes between sessions. Console order was counterbalanced across participants. EE was obtained from a chest-mounted heart rate (HR) monitor. The  $HR_{avg}$  was obtained from the heart rate monitor for each session. **Results:** One-way repeated measures ANOVA ( $\alpha = .05$ ) indicated no significant differences in EE across the three gaming consoles and the control video,  $F(2.74, 65.86) = 0.65, p = .570$ . In terms of  $HR_{avg}$ , a paired-sample  $t$ -test indicated that the  $HR_{avg}$  during exergaming on one console ( $117\pm 18$  bpm) was significantly greater than the control video ( $112\pm 16$  bpm),  $t(24) = -3.03, p = .006$ . About a third (28%-36%) of the participants met moderate levels of exercise intensity while exergaming on all three consoles. **Conclusion:** Exergaming can be incorporated into daily physical activity to work toward meeting the current physical activity guidelines; however exploration on factors (e.g., psychological) influencing the motivational level of individuals engaging in exergaming is necessary to help reach the moderate-intensity. As limitation exists with the estimation of EE via the use of HR monitors, the use portable indirect calorimetry may increase the accuracy of EE measurement.

3154 Board #59 June 2 3:30 PM - 5:00 PM

**Comparison of Accelerometer Step Counts and Total Physical Activity in 2-year Old Child-Parent Dyads**

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Step counts are a simple, practical way to monitor physical activity, and daily steps have been shown to be strongly correlated with accelerometer activity counts in adults and children as young as 3 years of age. However, no such data exists in 2-year-old children. **PURPOSE:** To compare daily step counts with accelerometer measured time spent in physical activity in 2-year olds, and to examine the interrelationships between parents' and children's steps. **METHODS:** Physical activity (PA) and step counts were recorded for one week using hip-worn accelerometers in 2-year-old children and one parent dyads attending an urban Early Head Start program. Data reduction was conducted in MATLAB, and estimates of total physical activity time (TPA) and steps/day were calculated. Costa (2014) and Freedson (1998) cut-points for PA intensity were used for children and parents, respectively. Tudor-Locke (2009) step cut-points were used to calculate adult steps/day. Standard accelerometer wear time procedures were applied to yield sufficient reliability ( $r > 0.70$ ). Descriptive data are presented as Mean (standard deviation;SD), Median (interquartile range;IQR), or Frequencies (%). Spearman correlations were used to test for relationships of interest, with an *a priori* significance level of  $p < 0.05$ . **RESULTS:** Seventeen child-parent dyads meeting wear time reliability were included in the analysis shown in Table 1. There was a strong positive correlation ( $\rho = 0.74, p < 0.01$ ) between TPA steps/day and total PA min/day in children, and a moderate correlation ( $\rho = 0.58, p < 0.02$ ) in parents. There was no significant correlation between children's and parents' average TPA steps/day. **CONCLUSION:** Step counts were highly correlated with TPA time in both 2 year-olds and their parents, suggesting step counts can be used interchangeably with PA counts in 2-year-old children and parents. Parent and child steps were not correlated and, thus, their PA does not appear to be interdependent.

Variable	Child	Parent
Age	31(3) mo.	30(4) yr.
Female n(%)	11(64.7)	17(100)
Median Steps/day	5331(2365)	6491(2418)
Wear Time (hrs/day)	10(2)	14(2)
Wear Days	6(2)	7(1)
Meeting Target Recommendation for PA n(%)	14(82.4)	3(17.7)

3155 Board #60 June 2 3:30 PM - 5:00 PM  
**Discordance Between The Perceived And Actual Activity-supportive Built Environment Among College Students**

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An individual's environment has a major impact on their activities, travel mode, and health. Thus, to improve physical activity (PA), active transportation, and health, it is important to understand a society's awareness of their environment. **PURPOSE:** To evaluate discordance between perceived and actual presence of factors associated with the built environment. **METHODS:** A survey of 170 college students' (19±.89 years) familiarity with their environment for PA and PA participation was conducted in Spring 2015. Objectively measured environmental audits of the environment were conducted simultaneously using an environment audit (WASABE). Variables included for the present study include: presence of trails, presence of parks, sidewalk maintenance, and perceived activity of those in the neighborhood. A continuous discordance score (-4 to 4) was created by summing the frequency by which an individual differed from the audit on each variable. A score of -4 represents always perceiving the presence of a variable when there was not one (negative discordance). A score of 4 represents always perceiving the absence of a variable when there was one (positive discordance). Paired-samples t-tests assessed discrepancies between the perceived and actual environment. Pearson correlations examined the relationship between fitness and discordance. A linear regression identified which factors within the individual (i.e., demographics, PA and environmental) most predicted discordance. P values were set at <.05. **RESULTS:** T-tests indicated significant differences between perceived and actual results for: the presence of bike trails ( $t=10.69$ ), the presence of parks ( $t=5.81$ ), and the presence of people being physically active ( $t=2.49$ ). Positive discordance was correlated with a lack of moderate PA ( $r=-.27$ ). There were no significant correlations with negative discordance. Predictors of discordance in either direction included: not owning a bike ( $\beta=-0.83$ ), rarely using bike trails/routes ( $\beta=-.27$ ), and not living near a park ( $\beta=-1.33$ ). **CONCLUSION:** Students are unfamiliar with their environment, which may influence their activities and travel mode. Those who do not participate in activities that would place them in their neighborhood environment are even more unaware of their surroundings than others.

3156 Board #61 June 2 3:30 PM - 5:00 PM  
**Community Health and Fitness Programs for Children: Outcomes of the Fit Kids Program in Connecticut**

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**PURPOSE:** Obesity prevalence among children has tripled in the past 30 years. The majority of obese 5-10 year-olds have at least one chronic disease risk factor and have a 70% chance of remaining obese as an adult. Community based exercise and nutrition programs that take place in a school setting have the potential to reach up to 95% of children. The purpose of this study is to report the outcomes of the Fit Kids Program (FK) in Connecticut. FK was created collaboratively by a community health department and university and is provided to community schools three times per year. **METHODS:** FK consists of 8-12 weekly sessions comprised of 30 minutes each of physical activity and nutrition education that takes place after school. Sports skills and training such as endurance and agility are combined with nutrition education including food tastings and preparation demonstrations. FK has served over 500 school children. Variables routinely assessed pre and post include BMI, vertical jump (VJ), hand grip strength (HG), physical activity self efficacy (PASE) and content retention (CR). Descriptive and inferential statistics are assessed including mean changes and the level of significance via paired t-tests. For this study, data collected pre and post from 2012-2015 is reported and compared.

**RESULTS:** 215 children between 5 and 12 years of age (mean 8.2) were assessed between 2012 and 2015. Significant changes included consistent improvements in CR over all years. Increases in CR ranged from 13-30% (p value ranges = .000-.028). Significant increases in HG ranging from 6.25-11% (p value ranges = .027-.045) were observed in 2013 and 2014. Significant increases in PASE ranging from 5.3-6.4% (p value ranges = .006-.035) were observed in 2014. The most compelling changes relative to the number of variables were observed in 2015 including an increase of HG by 9% (p = .006), PASE by 25% (p = .000), and CR by 14.5% (p = .000). BMI and BMI percentiles did not change significantly over all years; however observed mean ranges for BMI between 17.3 and 21.00 and BMI percentile ranges between 55 and 63 were within normal limits. VJ did not increase significantly.

**CONCLUSION:**

Compelling and consistent improvements in CR among children in addition to increases in PASE and and HG support continuing a collaborative effort and commitment to the health of children.

3157 Board #62 June 2 3:30 PM - 5:00 PM  
**Associations among Objectively-determined Physical Activity, Cardiorespiratory Fitness and Cognitive Function in Preschool Children**

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**Purpose:** Early childhood years (ages 4-6 years) are deemed a critical period to develop a physically active lifestyle to curb obesity epidemic. Evidence has shown that physical activity (PA) and cardiorespiratory fitness are linked to enhanced cognition in children. However, favorable results toward this linkage are still inconsistent in preschool children. Therefore, this study examined the associations among preschool children's objectively-determined PA, cardiorespiratory fitness and cognitive functioning across time.

**Methods:** Thirty-two preschoolers (16 boys; 59.4% Asian;  $M_{age} = 4.72$ ,  $SD = \pm .73$ ) participated in this study. Children's cognitive function, cardiorespiratory fitness, 5-day moderate-to-vigorous PA (MVPA) was assessed at baseline (Time 1) and 6 months (Time 2) later. Their cognitive function was assessed with the Executive Function Scale for Early Childhood. A modified YMCA 3-Minute Step Test and ActiGraph accelerometers were used for assessing children's cardiorespiratory fitness and MVPA, respectively.

**Results:** Pearson's correlation analyses showed different relation patterns among variables across time. In detail, there was a small positive relationship between MVPA and cognitive function at Time 1 ( $r=0.14$ ,  $p=0.23$ ), but negative relationship emerged between these two variables at Time 2 ( $r=-0.27$ ,  $p=0.08$ ). A small yet positive correlation was seen between fitness and cognitive function over time (Time 1,  $r=0.02$ ,  $p=0.46$ ; Time 2,  $r=0.12$ ,  $p=0.27$ ). Yet, regression results indicated that MVPA (Time 1,  $\beta=0.14$ ,  $p=0.47$ ; Time 2,  $\beta=-0.29$ ,  $p=0.14$ ) and cardiorespiratory fitness (Time 1,  $\beta=0.05$ ,  $p=0.98$ ; Time 2,  $\beta=0.16$ ,  $p=0.39$ ) failed to significantly predict children's cognitive function at both times (Time 1,  $R^2=0.02$ ,  $p=0.77$ ; Time 2,  $R^2=0.10$ ,  $p=0.27$ ).

**Conclusions:** Findings suggest that the associations among preschool children's cognitive function, MVPA, and cardiorespiratory fitness may still be inconclusive. Based upon the regression analysis, many other factors other than PA and cardiorespiratory fitness would explain children's cognitive function. Future studies with a larger sample size and more reliable cognitive function assessment are warranted.

3158 Board #63 June 2 3:30 PM - 5:00 PM  
**Effect Of Wu Qin Xi Exercise On Balance Function In College Students**

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Wu Qin Xi, created by Hua Tuo - a physician of the Eastern Han Dynasty, is a group of physical and breathing exercises imitating the movements of five animals. Previous studies show it has evident effects on improving cardiovascular function and neural function, and increasing bone mineral density in older adults. **Purpose:** The purpose of this study was to examine the effect of a 6-week Wu Qin Xi exercise program on balance function in college students. **Methods:** Twenty four college students (age: 19±1 years, 12 males, 12 females) were randomly divided into two groups (C: control group; E: exercise group) with 12 subjects in each group. Both groups maintained their routine daily activities, except that subjects in the E group participated in a Wu Qin Xi exercise program 30 min each time, 6 times each week, for 6 weeks. Before and after the 6-week period, all subjects were tested for postural

stability (PS), limits of stability (LOS) and fall risk (FR) by using the Biodex Balance System. Paired t-tests were used to determine changes within each group, and independent t-tests were used to determine group differences in changes over the 6-week period. **Results:** All 24 subjects completed the study. Over the 6-week period, there were no significant changes in PS, LOS and FR in the C group; however, there were significant improvements in PS (from  $0.58 \pm 0.17$  to  $0.51 \pm 0.09$ ,  $p < 0.05$ ) and LOS (from  $40.08 \pm 10.95$  to  $47.00 \pm 11.04$ ,  $p < 0.01$ ) in the E group. There was no significant change in FR in the E group. Compared to the C group, the E group had significant improvements in PS (C:  $-0.01 \pm 0.00$  vs. E:  $-0.08 \pm 0.07$ ,  $p < 0.05$ ) and LOS (C:  $-0.83 \pm 0.75$  vs. E:  $6.92 \pm 2.41$ ,  $p < 0.01$ ) from baseline to the post-exercise assessment. There was no significant group difference in changes of FR over the 6-week period. **Conclusion:** A 6-week Wu Qin Xi exercise program significantly improved balance function in college students. Future, larger studies are needed to explore the effect of Wu Qin Xi exercise on fall risk in this population.

3159 Board #64 June 2 3:30 PM - 5:00 PM  
**Parental Support for Moderate and Vigorous Physical Activity In Children and Adiposity as a Mediator.**

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**PURPOSE:** To determine whether the associations between different types of parental support and children's MVPA is mediated by their adiposity. **METHODS:** The sample comprised 138 Portuguese children (mean age  $8.08 \pm 1.32$  years); 29.9% were overweight and 37.2% obese. MVPA was objectively assessed during 7 days using accelerometers ActiGraph GTX3, Body Mass Index (BMI), and percentage of body fat (%BF) through DEXA (dual energy X-ray absorptiometry - model Explorer-Hologic). Parents self-reported their weight and height, and intangible/tangible parental support were assessed by questionnaire. Linear regressions and mediation (Sobel test) analysis were used. **RESULTS:** Children with lower %BF had higher MVPA levels ( $\beta = -1.17$ ,  $p < 0.05$ ) and were more supported by parents with intangible type ( $\beta = -1.11$ ,  $p < 0.05$ ). No associations were found between tangible parental support and children's MVPA. Additionally, children with higher levels of intangible support showed higher levels of MVPA ( $\beta = 3.21$ ,  $p < 0.05$ ), however, significant differences disappeared after controlling for %BF ( $\beta = 1.91$ ,  $p > 0.05$ ). The Sobel test showed that the positive association between intangible parental support and children's MVPA was full mediated by %BF ( $z = 2.09$ ,  $p < 0.05$ ), with a percentage of indirect effect of 40.5%. **CONCLUSION:** Intangible parental support is important predictor of children's MVPA, however this influence is mediated by children's adiposity. Supported by the FCT under grand number SFRH/BD/101410/2014 and UID/DTP/00617/2013

3160 Board #65 June 2 3:30 PM - 5:00 PM  
**Association Between Active Commuting To School And Sleep Duration In Ecuadorian Youth**

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 (No relationships reported)

**PURPOSE:** Active commuting has been associated to longer sleep duration in adolescents, however, the literature is still limited. Thus, the aim of this study was to investigate the association between the mode of commuting to and from school and sleep duration in Ecuadorian youth. **METHODS:** A total of 732 students (13.6 ± 2.1 years, 65.3% boys) belonging to 3 schools from Riobamba (Ecuador) were recruited via convenience sampling in class. Participants completed a self-reported paper-based questionnaire about personal data, usual mode of commuting to and from school and regular sleep-wake schedule at night on normal school days. Via sleep-wake schedule, sleep duration was calculated for each individual. They were classified as active (walk or bike), and passive (motorbike, bus, car or another motorized transport). Participants were also classified into two groups: sleeping at night for at least 8 hours/day or less than 8 hours/day. Binary logistic regression analyses were applied to examine the association between the mode of commuting (active vs passive) to and from school and the sleep duration (<8 hours/day and >8 hours/day) after correction for confounding factors (age, gender). **RESULTS:** The main mode of commuting used by Ecuadorian students was passive (86.4%), whereas active modes were less used (12.6%). The main passive mode chosen was the car (≈40%), followed by public bus (≈21%) and school bus (≈17%). Active commuters were more likely to sleep at least 8 hours/day than passive commuters showing a trend towards an increase in the sleep duration (OR, 95% CI 1.50, 0.945 to 2.409,  $p = 0.085$ ). **CONCLUSIONS:** Active commuting to school

could be associated with sleep duration in youth. The links between lifestyle factors, sleep duration and active commuting to school need to be investigated in greater depth in order to promote public health strategies in youth.

3161 Board #66 June 2 3:30 PM - 5:00 PM  
**School Day Physical Activity and Classroom Behavior in Disadvantaged Children**

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Increased physical activity has been shown to improve classroom behavior in children. No study has examined the relationship between classroom level behavior and school day physical activity in disadvantaged children from low-income schools. **PURPOSE:** The purpose of this study was to examine the cross-sectional relationship between classroom level on-task behavior and average school day physical activity throughout one school week. **METHODS:** A total of 106 classrooms were recruited from five low-income schools from a school district located in the Mountain West Region of the U.S. Classrooms were recruited from the 1<sup>st</sup> through 6<sup>th</sup> grades and class sizes ranged from 16 to 28 students. On-task classroom behavior was assessed at the beginning of the 2015-2016 academic school year using momentary time sampling methods for an observation duration time of 15-minutes. Classrooms were stratified into those that achieved 80% on-task behavior and those that did not. Physical activity was assessed at the student level using Yamax pedometers and Actigraph accelerometers that were worn for the entire school day for one school week. Step counts and time in MVPA were averaged at the classroom level to account for clustering of observations within classrooms. A multivariate analysis of variance (MANOVA) test was used to examine the relationship between a categorical classroom behavior variable and classroom-level physical activity. **RESULTS:** Classrooms that achieved at least 80% classroom behavior displayed higher school day step counts ( $\Delta = 449$  steps,  $p < 0.001$ , Cohen's  $d = 0.26$ ) and time in MVPA ( $\Delta = 3.6$  minutes,  $p < 0.001$ , Cohen's  $d = 0.28$ ) compared to classrooms that displayed lower classroom behavior. **CONCLUSION:** Classrooms that display higher levels of on-task behavior tend to record higher levels of average school day physical activity. The results provide further evidence of the relationships between favorable classroom behavior and physical activity. Future research needs to examine this relationship for potential causation and bi-directionality so that effective interventions can be employed.

3162 Board #67 June 2 3:30 PM - 5:00 PM  
**Parental Barriers And Active Commuting To School: An Association In Spanish Children And Adolescents**

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**PURPOSE:** Active commuting may provide a significant source of physical activity in youth. Parental barriers may be important to promote active mode of transportation. This study analyzes the association between parental barriers and mode of commuting to school in Spanish children and adolescents. **METHODS:** Parents of children (n=628) and parents of adolescents (n=151) from Granada (Spain) completed a paper-based questionnaire about perceived parental barriers to active commuting to school and children's mode of commuting to school. Data were analyzed using the logistic regression analyses to determine the association between parental barriers and mode of commuting. **RESULTS:** Concerning the association between number of barriers and mode of commuting to school, the parents of children with higher number of barriers were associated with passive modes of commuting (Odds Ratio (OR): 1.128; 95% Confidence Interval (CI): 1.06-1.20;  $p = 0.010$ ), but there were not significant associations for the parents of adolescents ( $p = 0.087$ ). Regarding parents of children, the following barriers were associated with children's passive modes of commuting: crime (OR: 0.634; 95% CI: 0.42-0.94;  $p = 0.025$ ), distance (OR: 2.95; 95% CI: 1.98-4.39;  $p = 0.000$ ) and parents' convenience (OR: 5.83; 95% CI: 1.24-27.40;  $p = 0.026$ ). Children were passive when their parents perceived distance and convenience as barriers for active commuting to school and did not perceive crime as a barrier. In parents of adolescents, traffic speed (OR: 1.928; 95% CI: 0.08-0.90;  $p = 0.034$ ), absence of policeman (OR: 2.872; 95% CI: 1.02-8.08;  $p = 0.046$ ) and distance (OR: 3.544; 95% CI: 1.64-7.67;  $p = 0.001$ ) were associated with adolescents' passive modes of commuting. **CONCLUSION:** Parental barriers have a negatively effect on active modes of commuting to school in children but not in adolescents because they might be frequently more autonomous. Intervention programs to promote active commuting must be focused on parental barriers as parents' convenience for children and presence of police for adolescents and perception of distance for both of them.

3163 Board #68 June 2 3:30 PM - 5:00 PM  
**Building Resilience In Pre-adolescents, Through Physical & Artistic Recreation**  
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**Abstract:**

**Purpose:** The present study aimed to compare the effect of recreational programs in the overall value of resilience and each of its dimensions, according to measurement, group and sex of the population.

**Methods:** The intervention was carried out by performing 14 sessions of two types of recreational programs, one based on physical recreation and another on artistic recreation. Each treatment lasted 32 hours in total, with one session per week. The research design was quasi-experimental. Eighty-six (86) sixth grade students, ages 11 to 14, from a primary school in social vulnerability participated in the study. The sampling was non-probabilistic. School Resilience Scale (E.R.E) for children between 9 and 14 years old was used. A three-way analysis of variance 2x3x2 (ANOVA) for repeated measures in a factor (measurements \* group \* sex) was performed.

**Results:** There was significant interaction ( $p < .01$ ) between measurements \* group in the overall value of resilience. Bonferroni Post hoc analysis showed that physical recreation and artistic recreation treatment significantly improved ( $p < .05$ ) the value of the overall resilience. In addition, the effect on resilience did not differ significantly by type of program, in the post-test measurement.

**Conclusions:** The findings support the use of recreational programs as a useful and effective way to build resilience in pre-adolescent students in areas of a social vulnerability context.

3164 Board #69 June 2 3:30 PM - 5:00 PM  
**Are Parental Barriers Related To Youths' Gender And Mode Of Commuting To School?**  
 Francisco Javier Huertas-Delgado<sup>1</sup>, Manuel Herrador-Colmenero<sup>2</sup>, Emilio Villa-González<sup>3</sup>, María Jesús Aranda-Balboa<sup>4</sup>, María Victoria Caceres<sup>4</sup>, Sandra Mandic<sup>5</sup>, Palma Chillón<sup>2</sup>. <sup>1</sup>*Centro de Magisterio La Inmaculada. Universidad de Granada, Granada, Spain.* <sup>2</sup>*Facultad de Ciencias de la Actividad Física y el Deporte. Universidad de Granada., Granada, Spain.* <sup>3</sup>*Facultad de Educación. Universidad de Almería, Almería, Spain.* <sup>4</sup>*Facultad de Ciencias de la Actividad Física y el Deporte. Universidad de Granada, Granada, Spain.* <sup>5</sup>*School of Physical Education, Sport and Exercise Sciences. University of Otago, Dunedin, New Zealand.*  
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**PURPOSE:** Understanding parental barriers is crucial to promote active commuting to school (ACS). This study examines parental barriers for ACS among Spanish youths (aged 9-16) and their association with gender and usual mode of commuting of their children. **METHODS:** Parents of children (n=628) and parents of adolescents (n=151) from Granada (Spain) completed a paper-based questionnaire about perceived parental barriers for ACS and their children's mode of commuting to school. Data were analyzed using the Chi-square test. **RESULTS:** The most common barriers reported by parents of children were traffic volume (48.7%) and dangerous intersection (45.0%), whereas the most frequent barriers reported by parents of adolescents were distance to school (50.3%) and dangerous intersections (39.6%). Compared to parents of children, a greater proportion of parents of adolescents reported distance to school (children 37.1%; adolescents 50.3%;  $p=0.003$ ) and crime (children 28.6%; adolescents 36.9%;  $p=0.047$ ) and smaller proportion reported traffic volume (children 48.7%; adolescents 32.9%;  $p=0.000$ ) as barriers to ACS. Among parents of children, crime was more reported as a barrier by parents of girls than parents of boys (girls 33.2%; boys 24.2%;  $p=0.013$ ). In children, parents of non-active commuters to school more frequently reported absence of a policeman on crosswalks (passive 20.8%; active 14.5%;  $p=0.044$ ), absence of adults to walk with (passive 28.9%; active 19.9%;  $p=0.44$ ), no sidewalks or bike lines (passive 44.8%; active 36.6%;  $p=0.041$ ), distance to school (passive 44.8%; active 36.6%;  $p=0.000$ ), time required to ACS (passive 17.5%; active 9.1%;  $p=0.002$ ) and weather conditions (passive 36.4%; active 27.7%;  $p=0.023$ ) as barriers for ACS compared to parents of active commuters. In adolescents, parents of active commuters reported less importance to absence of a policeman on crosswalks (passive 30.1%; active 16.0%;  $p=0.041$ ) and distance to school (passive 64.4%; active 37.3%;  $p=0.001$ ) than their counterparts. **CONCLUSION:** The main parental barriers for ACS in children were traffic volume and intersection safety whereas for adolescents were distance and intersection safety. Among Spanish parents, parental barriers for ACS were influenced by children's age, gender and usual mode of commuting to school.

3165 Board #70 June 2 3:30 PM - 5:00 PM  
**Eating Behaviour Correlates in Children Referred to a Telehealth Program for Overweight and Obesity Treatment**  
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**PURPOSE:** To describe the relationships between emotional eating behaviours and demographic, anthropometric, and behavioural characteristics of children referred to a comprehensive telehealth program for the treatment of overweight and obesity.

**METHODS:** Correlational analyses were conducted using baseline scores from self-reports on the Dutch Eating Behavior Questionnaire for Children (DEBQ-C), the Dutch Eating Behavior Questionnaire (DEBQ), the Godin Leisure-Time Exercise Questionnaire (GLTEQ), and physician-reported anthropometric/demographic measures obtained from referrals to the program.

**RESULTS:** Data from girls ( $n = 20$ ), age 8-17 yr, revealed a significant positive correlation between the Emotional Eating subscale of the DEBQ-C and DEBQ and age ( $r = 0.70, p = 0.0006$ ), a non-significant negative correlation with standardized BMI score ( $r = -0.19, p = 0.4$ ), and a significant negative correlation with total physical activity ( $r = -0.54, p = 0.01$ ), as reported through the GLTEQ. Data from boys ( $n = 21$ ), age 8-18 yr, revealed a significant positive correlation between the Emotional Eating subscale of the DEBQ-C and DEBQ and age ( $r = 0.62, p = 0.003$ ), a non-significant negative correlation with standardized BMI score ( $r = -0.08, p = 0.7$ ), and a significant negative correlation with total physical activity ( $r = -0.60, p = 0.004$ ), as reported through the GLTEQ.

**CONCLUSION:** In both boys and girls, emotional eating behaviors were reported to increase with age, decrease with higher levels of physical activity, and show no significant correlation with standardized BMI scores. This provides further evidence for the protective effect of physical activity in children. This research has important implications for the future treatment of children with overweight and obesity.

**Funding was provided by the Childhood Obesity Foundation and the Provincial Health Services Authority.**

**F-53 Free Communication/Poster - Cancer**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
 Room: Hall F

3166 Board #71 June 2 2:00 PM - 3:30 PM  
**Dual Energy X-ray Absorptiometry Is Comparable To Computed Tomography For Visceral Adiposity Measurement In Cancer Patients And Survivors**  
 Adriana M. Coletta, Ann H. Klopp, David Fogelman, Yisheng Li, Naveen Garg, Karen Basen-Engquist. *MD Anderson Cancer Center, Houston, TX.*  
 (No relationships reported)

**PURPOSE** New software to measure visceral adipose tissue area with dual energy x-ray absorptiometry (DXA) was developed and proposed as an alternative method to abdominal computer tomography (CT) scan. The DXA software has previously been validated in apparently healthy populations; however it is yet to be determined if visceral adiposity measurement by DXA is comparable to CT in a cancer patient population. Use of DXA instead of CT may provide various benefits to cancer patients, notably less radiation exposure. Therefore the purpose of this study was to determine the level of agreement between DXA and CT when measuring visceral adipose tissue area in cancer patients and survivors.

**METHODS** Patients seen in the gastrointestinal and diagnostic imaging clinics were pre-screened for eligibility and approached during their regularly scheduled visit. Interested patients underwent a CT scan at L<sub>4</sub>-L<sub>5</sub> as part of their medical care, and a whole-body DXA scan within 48 hours of their CT scan. Bland-Altman analysis evaluated the difference between paired measurements against their mean, and the 95% confidence limits of the mean difference between CT and DXA measurements. Linear regression was also used to assess the correlation between methods. All analyses were conducted for the total sample and by sex.

**RESULTS** A total of 99 patients (62±12 years, 28.5±7.4 kg/m<sup>2</sup>), 53 female (61±13 years, 28.3±8.5 kg/m<sup>2</sup>) and 46 male (62±11 years, 28.6±5.9 kg/m<sup>2</sup>), participated in the study. The majority of patients were non-Hispanic (90%), Caucasian (89%), diagnosed with adenocarcinoma (76%) at the site of the pancreas (46%) or colon (20%), and had stage 4 cancer (46%). Compared to CT, DXA underestimated visceral adipose

tissue area by 6.0 cm<sup>2</sup> (95%CI -4.8, 16.8) or 4.4%. A significant positive correlation was observed for visceral adiposity measured by DXA and CT ( $r=0.90$ ,  $p<0.001$ ). For women, DXA overestimated visceral adipose tissue area by 10.3cm<sup>2</sup> (95%CI -20.4, 0.2) or 9.6%. For men, DXA underestimated visceral adipose tissue area by 24.8 cm<sup>2</sup> (95%CI 7.2, 42.5) or 14.7%. Significant positive correlations between methods were observed for women ( $r=0.90$ ,  $p<0.001$ ) and men ( $r=0.90$ ,  $p<0.001$ ).

**CONCLUSIONS** DXA scan has the potential to serve as an alternative to CT scan for measurement of visceral adipose tissue area in cancer patients and survivors.

3167 Board #72 June 2 2:00 PM - 3:30 PM

### Cardiac Rehabilitation In Men With And Without Prostate Cancer: A Retrospective, Case-control Analysis

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(No relationships reported)

**Background:** Prostate cancer (PCa) is the leading cancer diagnosis among men, second only to skin cancer. Advancements in detection and treatments have led to significant improvements in survival. Deleterious changes to metabolic health that often accompany PCa treatment paradigms have unfortunately increased cardiac morbidity in this population. Accordingly, men with PCa may be referred to cardiac rehabilitation (CR) programs following a significant cardiac event. While evidence supporting the role of exercise for cancer survivors is abundant, the differential effect of a CR program on men with and without a history of PCa is unknown. **Purpose:** To compare the effect of CR on cardiorespiratory fitness (measured via VO<sub>2</sub>peak) and measures of body composition (body fat percent and body mass index) in men with and without a history of PCa. **Methods:** A retrospective, case-control analysis of men that have completed CR was performed. Cases (i.e. men with PCa) and controls (no PCa) were matched on age and cardiovascular morbidity requiring CR. All men completed the same program consisting of aerobic exercise (5 times per week) and resistance training (2-3 times per week) for a total of 26 weeks. Baseline comparisons between PCa and non-PCa CR participants were conducted by independent-samples t-test. The effect of PCa on CR outcomes was assessed using repeated-measures analysis of covariance comparing PCa and non-PCa participants using baseline outcome measures as covariates. **Results:** Twenty-seven (n=27) cases were matched with (n = 27) controls during CR participation that completed the program between January 2004 and January 2011. VO<sub>2</sub>peak increased in both groups (PCa: 16.4 ± 4.2 to 20.2 ± 5.8 mL·kg<sup>-1</sup>·min<sup>-1</sup>,  $p=0.001$ ; non-PCa: 16.9 ± 5.1 to 19.6 ± 6.2 mL·kg<sup>-1</sup>·min<sup>-1</sup>;  $p=0.001$ ). There were no changes in body composition in either group following participation in CR. There were no statistically significant differences between groups in change in any of the outcomes ( $p>0.05$ ). **Conclusions:** Men with and without PCa that participate in CR experience comparable improvements in VO<sub>2</sub>peak.

3168 Board #73 June 2 2:00 PM - 3:30 PM

### A Home-based Walking Program Is Feasible For Cancer Patients Prior To Undergoing Bone Marrow Transplant.

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Previous research has shown that patients with low fitness level prior to stem cell transplant have higher incidence of post-transplant complications. **PURPOSE:** To examine the feasibility of a home-based walking intervention in Brazilian patients with hematological cancers prior to undergoing a stem cell transplant in the Sistema Unico de Saude (SUS). Pre to post intervention physical function and patient reported outcomes (PROs) were also evaluated. **METHODS:** This single arm study enrolled 11 patients who scored >50 on the Karnofsky performance status scale, presented no contra-indication for participating in light to moderate regular walking, and were cleared by their oncologist to participate in the study. The home-based walking intervention initiated with patients undergoing 20 minutes of moderate intensity (10-12 on the Original Borg Scale) per week progressing up to 150 minutes by week 7. After week 7, patients were asked to maintain the 150 minutes of walking at moderate intensity until transplant day. Feasibility was determined by the number of patients approached to participate in the study (>90%) and the number of patients (>60%) that were able to achieve at least 70% of the planned intervention. Physical function (6 minutes walk test (6MWT) and TUG test) and PROs (Depression (Beck Depression Scale), fatigue (Piper Fatigue Scale), and quality of life (QOL) (SF-36) were assessed prior and after the walking intervention. **RESULTS:** All (100%) eligible

patients enrolled in the study. Out of the 11 patients, 1 patient was excluded because stopped chemotherapy treatment. Out of 10 patients, only 1 was not able to adhere to the study intervention. All other patients completed at least 70% of the planned walking intervention with some (66%) engaged in more than 150 minutes per week. Significant improvements from pre to post intervention in the 6MWT (344.4 ± 117.8 and 490.6 ± 111.2 meters,  $p=0.001$ ) and PROs (Depression, 12.11 ± 7.08 and 7.89 ± 4.65,  $p=0.006$ ; Fatigue, 62.00 ± 25.98 and 26.22 ± 10,  $p=0.002$ ; overall QOL 23.11 ± 4.34 and 26.33 ± 2.45) were observed. **CONCLUSION:** Brazilian patients enrolled in the SUS not only were able to participate in the home-based walking intervention, but improvements in physical function and PROs were observed.

3169 Board #74 June 2 2:00 PM - 3:30 PM

### Smartphone Application to Home-based Exercise on Psychological Wellbeing and Physical Functioning for Breast Cancer Survivors

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(No relationships reported)

Mobile technology has become an increasingly essential instrument for those who are responsible for healthcare and facilitating the interactions between health professionals and patients. **PURPOSE:** the purpose of this study is to design a smartphone application to self-monitoring resistance and exercise prescription, health knowledge, daily physical activity and compare this application to traditional intervention on psychological wellbeing (PW) and physical functioning (PF) in breast cancer survivor. **METHODS:** Thirty patients with breast cancer (age = 46 ± 7 year) were randomly assigned into control (CON) or intervention (INT) groups with 15 patients in each group. INT was provided a smartphone equipped with a mobile health application for self-monitoring of biometrics and performed a resistance and aerobic exercise prescription 5 times/week and 30 minutes/time. PW and PF measures were taken at baseline and 12th week. Fourteen patients in each group completed the study. Data were analyzed by means of independent t test. **RESULTS:** Result indicated that the INT had significant improvements than the CON on PW outcomes: anxiety ( $t=2.93$ ,  $P<0.05$ ) and depression ( $t=3.34$ ,  $P<0.05$ ) and on PF measures: 6 min walking ( $t=3.57$ ,  $P<0.00$ , arm curl ( $t=2.45$ ,  $P<0.05$ ) sit and reach test ( $t=2.75$ ,  $P<0.05$ ). The body composition ( $t=0.89$ ,  $P=0.45$ ), weight ( $t=1.08$ ,  $P=0.14$ ), BMI ( $t=0.99$ ,  $P=0.74$ ), blood pressure ( $t=0.61$ ,  $P=0.87$ ) were not significantly different between groups, but the pain ( $t=3.64$ ,  $P<0.00$ ), fatigue ( $t=3.98$ ,  $P<0.00$ ) and sleep disturbance ( $t=4.57$ ,  $P<0.00$ ) decreased significantly between CON and INT during twelve weeks excises. **CONCLUSIONS:** This study suggested that the smartphone application significantly improve PB and may be the effective way to decrease depression and anxiety and enhance PF in breast cancer survivors. Future study should determine whether home-based smartphone system can promote them to maintain long-term exercise effect. The work presented in this article was supported by grant from the Ministry of Science and Technology of China (2015FY111600)

3170 Board #75 June 2 2:00 PM - 3:30 PM

### Translation Of An Aging-in-place Intervention To Reduce Disability And Sedentarism Among Rural Cancer Survivors

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(No relationships reported)

**PURPOSE:** Rural-dwelling cancer survivors face multiple socioeconomic, behavioral, and environmental barriers to achieving recommended levels of physical activity. Many older cancer survivors also report that symptoms of cancer and other chronic conditions interfere with functioning, leading to more time spent sitting or lying down. These prolonged periods of inactivity negatively-impact overall health and cancer rehabilitation. Common symptoms such as fatigue, impaired sleep, and pain can also interfere with activities of daily life. Reducing sedentarism (conceptually distinct from promoting activity) may be a more achievable goal for rural-dwelling cancer survivors experiencing symptom-related disability. Therefore, we adapted an aging-in-place intervention originally developed for urban-dwelling disabled older adults, to meet the needs of rural-dwelling older cancer survivors living in the Northeast U.S. **METHODS:** Drawing on translational methods outlined by Dr. Anna Marie Napoles, we established the infrastructure for a translation partnership, identified clinician and community stakeholders and methodological experts, and sought their input via semi-structured interviews. Direct and interpretive content analysis methods, as described by Hsieh and Shannon, were used to code and interpret the interview data relevant to answering two primary questions: (1) What are the critical needs of cancer survivors

living in the region with relation to promoting activity and reducing disability?; and (2) How should the original intervention be adapted to meet those needs in a way that is feasible, acceptable, and sustainable? **RESULTS:** Participants indicated a need for an intervention that could be tailored to individual goals and was accessible in the community, outside of clinical settings. This presentation highlights cancer survivor, clinician, and multi-disciplinary perspectives on critical components of the adapted intervention and associated study protocols. **CONCLUSIONS:** Stakeholder input is essential to the design and translation of sustainable clinical interventions. This work lays the foundation for a phase 1 pilot study of the adapted approach.

3171 Board #78 June 2 2:00 PM - 3:30 PM  
**Does Supervised Exercise Programming At Diagnosis Impact Future Physical Activity Levels In Breast Cancer Survivors?**

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**Purpose:** Low physical activity levels are associated with increased risk of breast cancer recurrence and reduced survival. Only 32% of breast cancer survivors engage in ACSM's 150 mins of moderate to vigorous activity per week recommended guidelines. Women who engaged in regular physical activity post diagnosis had a 20-50% lower mortality risk from breast cancer than those who did not. The purpose of this analysis is to identify whether breast cancer survivors participating in the Nutrition and Exercise during adjuvant Treatment (NEXT) trial had changes in their physical activity levels during and 1-year post treatment.

**Methods:** Stage I-III female breast cancer survivors (51 ± 11 yrs.), participated in the NEXT trial. Six-month physical activity recall measured at baseline, end of study (EOS) (average length = 45 weeks) and one year follow up via Minnesota Leisure Time Physical Activity Questionnaire, scored as average weekly minutes of moderate to vigorous physical activity (MVPA). Due to non-normal distribution of physical activity, a generalized estimating equation with a gamma log link, with pairwise contrasts to determine changes in individual levels of activity between time points. Data are estimated marginal mean ± standard error.

**Results:** 73 women were assessed at baseline, 59 at end of study and 35 at one year follow up. MVPA did not statistically change from baseline to EOS (176 ± 23 to 192.23 ± 12.6 mins). There were statistically significant differences in MVPA between EOS and one year follow up (288 ± 50 min, p=0.04), and between baseline and one year follow up, (p<0.01). At baseline, 43% of participants did not meet the ACSM recommended 150 mins/week of MVPA, however this improved to 63% of participants at both end of study and one year follow up.

**Conclusion:** Breast cancer survivors enrolled in a supervised exercise program concurrent to and immediately after adjuvant treatment maintained MVPA levels. Furthermore, there was an increase in those meeting the current physical activity guidelines at both end of study and one year follow up.

3172 Board #77 June 2 2:00 PM - 3:30 PM  
**Hydration Status In Cancer Patients: Exercise Is Not A Palliative Care**

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(No relationships reported)

**PURPOSE:** Hydration is a controversial area in cancer, associated to a compartmentalization of body fluids an increased mortality. Sedentary and cells toxicity contributes to this imbalance. The water's amount swings out of the reference ranges with a predominant percentage in the extracellular site. The role of aerobic and resistance exercise to reduce edema in a short - mid time in cancer is not well investigated. The study aims to evaluate the eventual efficacy of a mixed and individualized medium-long term exercise program in the improvement of the patients' hydration status. **METHODS:** From a large cohort of 145 cancer patients, a subgroup composed of 35 subjects (7 male and 28 female, 58±10 yrs, 72.6±16.3 kg, 26.7±5.9 BMI) affected by colon and breast cancer and clinically stable, were enrolled for the Exercises prescription program, aerobic and resistance, following the ACSM guidelines, for at least 12 months. Hydration status was evaluated by Bioelectrical Impedance Analysis (BIA) using 101, Akern-RJL Systems, at T0, T6, and T12. **RESULTS:** Significant changes were detected for what concerns the redistribution of body water. There was a significant improvement of Intra Cellular Water % at T6 (T0: 51.61±4.43 vs T6: 52.93±4.11; p<0.01) and at T12 (T0: 51.61±4.43 vs T12: 54.24±3.41; p<0.001). While it appears evident a significant reduction of Extra Cellular Water % at T6 (T0: 48.38±4.43 vs T6: 47.06±4.11; p<0.01) and at T12 (T0: 48.38±4.43 vs T12: 45.75±3.41; p<0.001) despite the absence of a significant variations of the Total Body water%. A significant (p<.005) improvement of Fatty Free Mass

(FFM) was also observed. **CONCLUSIONS:** Like a poplilip, a mixed moderate intensity exercise contributes to a correct water distribution in the active intracellular compartments in cancer patients. Those results appear to be already relevant after 6 months and they become even more evident after 12 months.

3173 Board #78 June 2 2:00 PM - 3:30 PM  
**Strength Training Following Hematopoietic Stem Cell Transplantation: Designing Interventions for Eventual Translation into Clinical Practice**

Eileen D. Hacker, Tara Peters, Ruby Erdmann, Eileen Collins. *University of Illinois at Chicago, Chicago, IL.*

(No relationships reported)

**PURPOSE:** Intensive cancer therapy followed by hematopoietic stem cell transplantation (HCT) results in highly distressing symptoms, impaired functional ability and diminished quality of life. These problems are amendable to exercise interventions but dependent upon participant uptake for eventual translation into clinical practice. This study reports subject attrition, compliance, adherence, and progression from the strength training arm (n = 37) of our intervention study, Strength Training to Enhance Early Recovery (STEER) after HCT.

**METHODS:** This single-blind controlled study randomized subjects to STEER versus usual care plus attention control with health education. STEER consisted of a progressive resistance program using elastic resistance bands tailored to the individual's capabilities and integrated seamlessly into existing clinical practice. Subjects received instruction and began active range of motion two times per week while hospitalized for HCT followed by a six-week moderate intensity program (three sessions per week/18 sessions total) post hospital discharge. STEER employed a combined supervised/unsupervised approach.

**RESULTS:** Four subjects died during the course of the study, unrelated to the STEER intervention (attrition rate 10%). Post-hospitalization, subject compliance with STEER was high (83%, SD = 22) as well as adherence to the exercise prescription (89%, SD = 25). Most subjects (90%) were able to progressively increase their prescription by adding repetitions, sets, number of exercises or band resistance.

**CONCLUSIONS:** STEER was tested in a challenging group of patients during a period of complex, frequently changing needs. Our study took advantage of common clinical situations following HCT, such as frequent clinic visits during the first six weeks following hospital discharge and downtime in clinic when subjects wait to see their healthcare provider. Using downtime in clinic to exercise is an efficient use of subjects' time. The intervention was specifically designed to minimize subject burden and maximize benefits. Subjects had high compliance and adherence to the STEER intervention which (1) reflects a patient-centered approach; (2) demonstrates effective tailoring to HCT subject's capability; and, (3) facilitates eventual translation into practice.

3174 Board #79 June 2 2:00 PM - 3:30 PM  
**Self-reported Ltpa Versus Expected Ltpa In Rural Cancer Survivors: Missing The Mark**

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(No relationships reported)

The evidence of the benefits of exercise for those diagnosed with Cancer has grown significantly indicating that leisure time physical activity is associated with lower risks of many types of cancer. As part of an ongoing study of rural cancer survivors in West Central Pennsylvania we sampled subjects regarding their levels of leisure time physical activity and compared those levels to ACSM recommendations. **Purpose:** To describe the levels of self-reported total lifetime leisure time physical activity hours vs ACSM recommended expected hours. **Methods:** A sample of 39 rural cancer survivors completed questionnaires which included a modified Historical Leisure Activity Questionnaire. Grouped by age (13-17, 18-22, 23-34, 35-50, 51-65, and 66-80), Total MET Hours were calculated and compared to ACSM recommendations of 2.5 hours of moderate intensity activity per week. The comparator of a 5 MET activity was used in the calculation of the benchmark Total MET Hours value. This study was approved by the Saint Francis University IRB. **Results:** Thirty-three (33) questionnaires were returned and 27 were analyzed. Participants were predominantly white, non-Hispanic, with a mean age of 60 years (27 to 77 years). The mean age of Cancer diagnosis was 51 years, (9 to 70 years). Breast Cancer (n=11) and Prostate (n=4) were primary Cancers reported. Significant differences (p<0.05) from actual to expected Total MET hours were found for each age group, except for the 13-17 group. The following groups demonstrated significantly lower Total MET Hours than expected: 18-22 (p<.017), 23-34, (p<.016), 35-50 (p<.000), 51-65 (p<.001), and 66-80 (p<.043). Average percent difference ages 13-50 is 636% actual to expected MET Hours. **Conclusion:** This pilot data supports the evidence that reduced physical activity is associated with a cancer diagnosis, and suggests that lifetime physical activity levels may play a role in the incidence of Cancer in a rural population. Support was provided in part, by the Department of Physical Therapy.

3175 Board #80 June 2 2:00 PM - 3:30 PM

**Breast Cancer Survivors Speak about Triathlon and Dragon Boat Team Training**

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(No relationships reported)

Motivations for Breast Cancer Survivors (BCS) to exercise after cancer treatment are not well understood and many BCS do not exercise at recommended levels. Goal-oriented team exercise training, such as triathlon training and dragon boating, may improve exercise activity. **PURPOSE:** The overall objective of this study was to determine the motivations to participate in goal-oriented team triathlon training among a group of BCS dragon boat racers. **METHODS:** Female breast cancer survivors (age=63.5(SD 4.1)) yr, BMI =25.8(SD 4.4)) who were members of a BCS dragon boat team (membership length=6(SD 4.1) seasons) were recruited to participate in a focus group after completing a 14 wk individualized triathlon training program. Training comprised two supervised group sessions and three home-based sessions per week. The training program culminated with participation in a sprint triathlon (Athleta Iron Girl, 0.5 mi swim, 12 mi bike, 3.1 mi run). Dragon boat training occurred twice weekly during triathlon training. Common themes related to dragon boat and triathlon training participation were analyzed. **RESULTS:** Four women participated in the focus group from which the following themes emerged: (1) Champion for Exercise from personal contacts, (2) Team motivation to join another team, (3) Sharing Life Experiences while not focusing on cancer helped in supporting each other, (4) Having Fun and not focusing on cancer was important, and (5) Integrating New and Renewed types of exercise into daily lives. Overall, survivors recognized their improved activity levels during triathlon training. They also expressed a desire for future volunteer participation to encourage others in the program. **CONCLUSIONS:** Goal-oriented team triathlon training for BCS dragon boat racers can improve exercise activity. Structured exercise as a part of a team with a common goal may have facilitated successful participation. Thus, goal-oriented team training could lead to better health for BCS. **FUNDING ACKNOWLEDGEMENT:** Aurora Research Institute/Aurora Health Care

3176 Board #81 June 2 2:00 PM - 3:30 PM

**Effects Of Resistance Plus Aerobic Training On Body Composition In Breast Cancer Survivors On Aromatase Inhibitors**

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(No relationships reported)

Background: Treatment for breast cancer is multi-modal and often includes estrogen blockade that can alter body composition. Aerobic training can reduce body fat, while resistance training improves lean mass and, bone mineral density (BMD); however, it is unclear whether exercise retains its efficacy during aromatase inhibition. Our study determined the influence of combined aerobic + resistance training on body composition of breast cancer survivors (BCS) that use aromatase inhibitors. Methods: Women cancer survivors are randomized to 9 months of exercise [Resistance + aerobic training] (EX): n= 18 or stretching group (SG): n=18]. Body composition was measured by DXA (total body and trunk fat mass % body fat (BF); lean body mass (LBM); spine and total hip BMD at baseline, 3, 6 and 9 months. The exercise group performed by 40 minutes with 7 resistance exercises on machines followed by 30 minutes of treadmill (aerobic) training 3x/wk. Separate 2 x 3 repeated measure ANOVAs were used to compare groups. Results: Retention in the study was 94% in EX and 72% in SG. Adherence to training was 78.2%. Significant group x time interactions were found for total and trunk fat mass, and % body fat, (p<0.001), where women in EX lost fat compared to slight gains among women in SG. There were no significant group x time interactions for LBM, total hip or spine BMD.

Table 1. Mean score changes in EX and SG groups from baseline to 9 months

	EX M (SD)	SG M (SD)	*p value
Total Fat Mass (kg)	-2.43 (1.77)	0.26 (0.78)	<b>0.03</b>
Trunk Fat Mass (kg)	-1.26 (1.06)	0.66 (0.69)	<b>0.01</b>
Body Fat (%)	-2.23 (1.63)	0.65 (1.53)	<b>0.01</b>
Lean Mass (kg)	0.63 (1.02)	-0.51 (1.96)	0.12
Spine BMD (g/cm <sup>2</sup> )	-0.03 (0.06)	-0.02 (0.03)	0.94
Total Hip BMD (g/cm <sup>2</sup> )	-0.002 (0.04)	0.007 (0.01)	0.22

Conclusion: This study demonstrated the potential efficacy of combined training to decrease total and trunk fat mass, an indicator of central adiposity, in breast cancer survivors on aromatase inhibitor therapy, in which fat mass is considered risk factor for recurrence of cancer, metastasis and other chronic disease. A combined modality program did not slow bone loss in this population, thus modifications to the program to include specific osteogenic training may need to be considered to target this health outcome.

3177 Board #82 June 2 2:00 PM - 3:30 PM

**Exercise Effects on Symptom Cluster, Cortisol, Heart Rate Variability and QOL in Breast Cancer Survivors**

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(No relationships reported)

Exercise may mitigate a cluster of related symptoms in Breast Cancer Survivors (BCS). This cluster includes fatigue, sleep disturbances, pain, depression, and cognitive changes. In addition, Cortisol Awakening Response (CAR), a function of stress, Heart Rate Variability (HRv), an indication of cardiac autonomic balance, and quality of life (QOL) may relate to this symptom cluster.

**PURPOSE:** To examine the effect of triathlon training on a BCS symptom cluster and to determine the relationships between the symptom cluster and CAR, HRv and QOL. **METHODS:** Female BCS (N = 26; age = 49 (8) yr) participated in a 14 wk. sprint triathlon training program. Training consisted of 2 supervised and 3 unsupervised sessions per week. Pre- and Post- training measures included CAR, HRv, and QOL (FACT-B), along with fatigue (FACIT-F), and PROMIS questionnaires for cognition (Applied Cognition-General Concerns-Short Form), depression (Emotional Distress-Depression), pain (Pain Interference-SF), and sleep (Sleep Disturbance-SF). Except for QOL and FACIT-F, higher questionnaire scores represent worse function. **RESULTS:** Data are mean (SD). After training, CAR decreased, (pre= 12.8 (6.8), post= 8.5 (7.3) nmol/L, p= 0.03) and HRv increased, (pre= 44.8 (28.2), post= 68.6 (55.4) ms, p= 0.04). Further, QOL (pre= 117.4 (14), post= 125.1 (11), p< 0.01), fatigue, (pre= 41.0 (9.1), post= 47.2 (4.1), p< 0.01), cognition (pre= 16.4 (8.4), post= 13.1 (5.8), p= 0.02), depression, (pre= 10.7 (4.6), post= 9.2 (2.5), p= 0.04), and pain improved (pre=10.6 (3.9), post= 8.9 (2.2), p= 0.03). Sleep did not change. No training variables were associated with CAR or HRv. Before training, QOL correlated with depression (rs= - 0.70), cognition (rs= -0.64) and fatigue (rs= 0.80). Further, sleep correlated with pain (rs= 0.37) and depression correlated with cognition (rs= 0.54). Similar correlations were observed after training.

**CONCLUSIONS:** Triathlon training for BCS improved all symptoms in a cluster except sleep. QOL was related to cognition, depression and fatigue. CAR and HRv were not related to any of the symptoms studied. However, the decreased CAR and increased HRv from exercise in BCS could have positive health implications. Funding was provided by Vince Lombardi Cancer Research Foundation/Aurora Health Care

3178 Board #83 June 2 2:00 PM - 3:30 PM

**Investigating Physical Activity Levels And Distance-delivered Interventions Amongst Survivors Of Childhood Cancer**

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(No relationships reported)

Purpose: This study aimed to assess physical activity levels in childhood cancer survivors (CCS), compare these to recommended guidelines, and investigated the feasibility of distance-delivered physical activity interventions amongst CCS.

Methods: CCS (aged $\geq$ 16) and parents (survivors aged $<$ 16) from 11 hospitals in Australia and New Zealand participated in this study. Participants self-reported their moderate-vigorous physical activity (MVPA). This was compared to American Cancer Society's physical activity guidelines (150 min/week for adults, 300 min/week for children). A systematic review and meta-analysis were conducted to determine the feasibility (adherence, retention and recruitment) and effect of distance-delivered interventions on physical activity levels, physical and psychological function after intensive treatment.

Results: 329 CCS (age=27.7 $\pm$ 7.2years, 20.3 $\pm$ 8.3years since diagnosis) and 254 parents of CCS (age=14.0 $\pm$ 2.8years, 10.9 $\pm$ 2.9years since diagnosis) participated. Adult CCS reported mean MVPA of 115.9 $\pm$ 129.8 min/week and children had MVPA of 231.3 $\pm$ 227.8 min/week, which was in both cases lower than recommended guidelines (both  $p<0.001$ ). Only 31.3% of adults and 29.1% of children achieved recommended MVPA guidelines. Our systematic review included 13 studies (n=270 participants), while 4 (n=102 participants) were included in the meta-analysis. Distance-delivered physical activity interventions were feasible in CCS (mean recruitment rate=64%, retention rate=85%, adherence rate=88%), but did not increase physical activity levels from baseline to post intervention ( $p=0.09$ ). Participation in physical activity interventions displayed a positive effect on physical function ( $p=0.002$ ) and psychological outcomes ( $p=0.001$ ).

Conclusion: Over two-thirds of child and adult CCS are not achieving recommended physical activity levels. Strategies including education and early monitoring are needed to increase MVPA levels to lower the risk of cardiovascular and metabolic co-morbidity. CCS may experience barriers including fatigue, access to facilities or lack of guidance, but our investigation into distance-delivered interventions to increase physical activity levels suggests that such interventions could represent a viable option to tackle this important issue.

3179 Board #84 June 2 2:00 PM - 3:30 PM

#### Exploring Prostate Cancer Survivors' Exercise Motivation, Facilitators And Barriers Following Participation In The TrueNTH Program

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The TrueNTH Lifestyle Management program is an international program aimed to improve the survivorship and wellness of men with prostate cancer. As part of the national network, an initial 12-week exercise program, 3 days per week, was carried out at a university-based location in Edmonton Canada.

**PURPOSE:** To better understand the motivation, facilitators and barriers to exercise following participation in the TrueNTH exercise program.

**METHODS:** An optional post-program satisfaction questionnaire was administered and a focus group session conducted with 16 of the 22 program participants (mean age: 65.5 years). Quantitative data from the patient satisfaction questionnaire were analyzed descriptively and qualitative data from the focus group were used to clarify and further describe quantitative results.

**RESULTS:** Main findings included high satisfaction with the program (100%) and mean improvements in 8 repetition maximum strength of 8.5 lbs for bench press and 31.6 lbs for the leg press. Results from the Behavioral Regulation in Exercise Questionnaire (Version 3) showed high scores for intrinsic (3.28) and identified integration (3.25), and low scores for amotivation (0.083) and external regulation (1.18). Qualitatively participants reported benefits for body image, muscular strength as well as psychosocial wellbeing. Facilitators of exercise included supervised exercise, social support of other prostate cancer survivors, and a positive exercise environment. Survivors reported feeling "safe" and "at home" at the centre despite incontinence, use of a catheter, and issues with body image. Barriers included limited options for class times and transportation issues.

**CONCLUSION:** Prostate survivors taking part in the TrueNTH program were highly motivated, enjoyed, and valued the benefits of the exercise program. This examination of site-specific exercise facilitators and barriers allows for adaptation of programming to the local context.

3180 Board #85 June 2 2:00 PM - 3:30 PM

#### Effects of Exercise Training on Circulating Level of Sclerostin in Breast Cancer Survivors

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(No relationships reported)

Wingless and integration site growth factor (Wnt) signaling is a tumorigenesis-related signaling pathway. Sclerostin is one of endogenous negative regulators of Wnt/ $\beta$ -catenin signaling. Accumulating evidences indicate that higher serum level of sclerostin is associated with osteoporosis and bone metastasis in breast cancer patients.

**PURPOSE:** To investigate whether exercise training elicits changes in the serum level of sclerostin in breast cancer survivors. **METHODS:** Thirty-nine breast cancer survivors after anti-cancer treatment and forty healthy women volunteers participated in this study. Breast cancer survivors were randomized to either an exercise group or a control group for 12 weeks. All participants completed health-related fitness tests and measurements of anthropometric and serological biomarker variables. Independent *t*-test and Wilcoxon signed-rank test were performed to analyze the changes of variables between- and within-groups, respectively. **RESULTS:** Breast cancer survivors showed higher levels of serum sclerostin compared to age-matched healthy women at baseline (115.6  $\pm$  58.8 vs. 86.5  $\pm$  53.2 pg/mL,  $p=0.016$ ). Exercise training for 12 weeks remarkably improved muscle strength, endurance and flexibility, and reduced body fat percentage, waist circumference and visceral fat area in breast cancer survivors. The exercise training reduced the serum levels of insulin, leptin and interleukin-8 as well (all  $p<0.05$ ). Moreover, circulating sclerostin levels were significantly decreased by the exercise training (124.4  $\pm$  17.0 vs. 106.3  $\pm$  42.6 pg/mL,  $p=0.021$ ), but there were no differences observed in control group during this clinical trial periods (116.3  $\pm$  42.6 vs. 114.2  $\pm$  66.9 pg/mL,  $p=0.295$ ). **CONCLUSION:** These findings suggest that sclerostin may be a notable serological parameter reflecting the beneficial effects of exercise training in breast cancer survivors.

#### F-54 Free Communication/Poster - Cardiorespiratory Responses to Acute Exercise

Friday, June 2, 2017, 1:00 PM - 6:00 PM

Room: Hall F

3181 Board #86 June 2 2:00 PM - 3:30 PM

#### Assessment of Heart Rate Variability After Maximal Exercise in Trained Postmenopausal Women

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(No relationships reported)

The increased parasympathetic tone achieved with endurance training may provide important cardioprotection after menopause. Inability to restore autonomic balance postexercise is a risk factor for sudden cardiac death as sympathetic stimulation has an arrhythmic effect. Until recently, most of the studies on recovery heart rate variability (HRV) have focused on young men. **PURPOSE:** The purpose of this study was to compare the HRV response from rest through maximal exercise and recovery in postmenopausal women (PNW) who trained at moderate (MOD) or vigorous (VIG) intensities. **METHODS:** Thirty-six PMW women volunteers who self-reported exercising at either MOD (3-5.9 METS; n = 18; 58.9  $\pm$  4.4 yr, 59.2  $\pm$  6.8 kg, 160.9  $\pm$  10.0 cm, 32.4  $\pm$  5.7 ml/kg/min), or VIG intensities (>6 METS; n = 18; 59.7  $\pm$  5.2 yr, 68.3  $\pm$  10.2 kg, 167.0  $\pm$  7.4 cm, 34.5  $\pm$  5.1 ml/kg/min) participated. HRV and cardiorespiratory fitness (Bruce protocol) were measured in the laboratory. The HRV was measured with a heart rate monitor at rest for 5 minutes in the supine position with the participant breathing normally. HRV was also measured in the last minute of the  $\dot{V}O_{2max}$  test and after 2 minutes of active recovery. Comparison of HRV in MOD and VIG was performed using a factorial ANOVA with repeated measures on time. HRV values were log transformed due to skewness. An alpha of .05 was considered statistically significant. Data are presented mean  $\pm$  SD. **RESULTS:** The two groups (MOD, VIG) responded similarly over the three time periods for selected HRV indices of root mean square of sequential deviations (rMSSD), and high (HF) and low frequency (LF) power values ( $p>.05$ ). There were significant main effects for rMSSD, HF and LF. Specifically, maximal exercise significantly lowered rMSSD (3.3  $\pm$  0.08 vs. 1.2  $\pm$  0.06) and lnLF (4.1  $\pm$  0.05 vs. 3.3  $\pm$  0.13) and increased lnHF (3.3  $\pm$  0.14 vs. 4.0  $\pm$  0.10;  $p<.01$ ) from resting. However, two minutes of active recovery significantly restored lnHF (3.3  $\pm$  0.11) and lnLF (4.1  $\pm$  0.08) from maximal values ( $p<.01$ ). **CONCLUSION:** Our findings suggest that both moderate and vigorous exercise

training enhance HRV recovery in the immediate postexercise period following one bout of maximal exercise in older women. These data further document the benefits of regular aerobic exercise in the improvement of cardiac electrical stability.

3182 Board #87 June 2 2:00 PM - 3:30 PM  
**Effects of Submaximal Downhill Running on Plasma Cytokine Expression in Young, Endurance Trained Individuals**  
 Jennifer Macko, Ryan M. Sapp, Rian Q. Landers-Ramos, Jack T. Skelton, James M. Hagberg. *University of Maryland, College Park, MD.*  
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*(No relationships reported)*

Strenuous exercise has been shown to dramatically alter levels of anti- and proinflammatory cytokines; proteins involved in regulation of systemic inflammation. **PURPOSE:** To determine if a single bout of submaximal downhill running will elicit a change in expression of specific circulating cytokines. **METHODS:** Healthy endurance-trained men (n=5) and women (n=3) aged 18-35 were screened for exercise contraindications using a health history questionnaire, blood chemistry, and body composition. A  $VO_{2max}$  test and downhill running familiarization were completed to determine experimental running speed at 70%  $VO_{2max}$ . After abstaining from exercise, caffeine, alcohol, NSAIDs, and other drugs for 48 hours, subjects ran on a 15% decline for 30 minutes at 70%  $VO_{2max}$  and ~70% HRR. Fasting blood samples were obtained immediately before and after the run, as well as after 30 minutes, 60 minutes, and 24 hours of rest. Plasma was immediately separated, aliquoted, and stored at -80°C. ELISA kits specific to each cytokine were used to measure cytokine levels at each time point. Samples were run in duplicate. **RESULTS:** There were no significant changes in IL-15 or Myostatin at any time point. Compared to baseline, IL-1ra showed an increase of 46.9% (p=0.009), 60.9% (p=0.001), and 38.8% pg/ml (p=0.028) at 0 minutes, 60 minutes and 24 hours after exercise, respectively. For IL-10, there was an increase of 19.6% (p=0.01), 28% (p=0.003), and 37.1% (p=0.0009) at 30 minutes, 60 minutes, and 24 hours after exercise, compared to baseline. **CONCLUSION:** In endurance trained subjects, a 30 minute submaximal bout of downhill running caused an increase in the anti-inflammatory cytokines IL-1ra and IL-10 for up to one day, and no significant change in the inflammatory cytokines IL-15 or myostatin. IL-1ra exhibited the greatest increase 60 minutes after exercise, while IL-10 was increased significantly at 30 minutes, 60 minutes, and 24 hours, with the greatest effect seen the day after exercise. This increase in systemic anti-inflammatory cytokines is consistent with literature investigating cytokine levels immediately after eccentric exercise. Further, IL-15 levels were highly variable, and divided subjects into two groups that were not explained by any demographics studied. This result has not been previously reported and deserves further study.

3183 Board #88 June 2 2:00 PM - 3:30 PM  
**Similar Oxygen Consumption and Metabolic Cost of Thermo-Neutral and Hot Yoga.**  
 Rachael K. Nelson<sup>1</sup>, Corinne N. Boyd<sup>1</sup>, Stephanie M. Lannan<sup>1</sup>, Ricardo Mora-Rodriguez<sup>2</sup>, Micah N. Zuhl<sup>1</sup>. <sup>1</sup>Central Michigan University, Mount Pleasant, MI. <sup>2</sup>University of Castilla-La Mancha, Toledo, Spain.  
*(No relationships reported)*

Hot yoga has gained enormous popularity in recent years due, at least in part, to increased environmental challenge associated with hot compared to traditional (thermo-neutral) yoga. However, it is not clear that hot yoga is more intense than traditional yoga and whether it meets current physical activity guidelines. **PURPOSE:** To examine energy expenditure as well as objective (i.e., % $VO_{2max}$ ) and subjective (i.e., RPE) measures of exercise intensity during identical yoga sessions performed in a hot and thermo-neutral environment in healthy adults. **METHODS:** Using a cross-over, randomized order design, 14 participants completed two identical 20-minute yoga sessions in a hot ("H"; 35.3 ± 0.8°C; humidity: 20.5 ± 1.4%) and thermo-neutral ("TN"; 22.1 ± 0.2 °C; humidity: 27.8 ± 1.6%) environment performed one week apart. Oxygen consumption ( $VO_2$ ) was measured during steady-state yoga to determine exercise intensity (% $VO_{2max}$ ) and to determine energy expenditure (kcal/min). Heart rate and rate of perceived exertion (RPE) were also collected during steady-state yoga to determine exercise intensity (%HRmax) and participant perception of intensity using the Borg Scale (6-20). **RESULTS:** There were no differences in exercise intensity based on % $VO_{2max}$  during hot vs. thermo-neutral yoga (30.9 ± 2.3 vs. 30.5 ± 1.8%, p=0.68) or energy expenditure (5.12 ± 0.50 vs. 4.97 ± 0.39 kcal/min, p=0.42). However, exercise intensity was significantly higher during hot vs. thermo-neutral yoga based on %HRmax (67.0 ± 2.3 vs. 60.8 ± 1.9%, p=0.01) and RPE (11.8 ± 0.9 vs. 10.7 ± 0.8, p=0.04). Furthermore, hot yoga would be classified as "light" intensity exercise based on % $VO_2$  but "moderate" intensity exercise based on %HRmax and RPE while thermo-neutral yoga would be classified as "light" intensity exercise based on % $VO_{2max}$ , %HRmax, and RPE (according to established ACSM guidelines). **CONCLUSION:** Despite the added hemodynamic stress and perception that exercise

in a hot environment is more difficult than in a thermo-neutral room, we observed parallel responses in oxygen consumption during hot vs. thermo-neutral yoga resulting in relatively modest but equal objective measures of exercise intensity and energy expenditure.

3184 Board #89 June 2 2:00 PM - 3:30 PM  
**Different Types Of Stability Balls Impact On Heart Rate And VO2 Responses To Arm Ergometry**  
 Charles R.C. Marks, Michelle Nguyen. *Oakland University, Rochester, MI.* (Sponsor: Steven Keteyian, FACSM)  
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*(No relationships reported)*

Prior studies have demonstrated that sitting on a stability ball during arm ergometry elevates oxygen consumption about 10%; however, the influence that the characteristics of the stability ball has on this response has not been examined. **PURPOSE:** The purpose of this study was to determine if the type of material or size of a stability ball affects the heart rate or oxygen consumption levels during aerobic arm exercise. **MEHODS:** Ten apparently healthy young adults that were at least moderately active underwent two three minute stages of arm ergometry (increase heart rate by 20-40 b/min each stage) sitting on three different stability balls: 75 cm D made of stiff material (SB), 75 cm D made of elastic material (EB), and 65 cm D made of elastic material (SE) with the order randomized.  $VO_2$  and heart rate (HR) were continuously monitored. **RESULTS:** Repeated measures ANOVA revealed that the type of stability ball did not significantly (p = .417) affect heart rate. However,  $VO_2$  was significantly (p = .005) affected by ball type. The EB was 6 to 7% higher than the SB.

	Stage 1 $VO_2$ L/min	Stage 2 $VO_2$ L/min	Stage 1 HR min <sup>-1</sup>	Stage 2 HR min <sup>-1</sup>
SB Mean + SD	0.613 + 0.306	0.829 + 0.406	118 + 12	143 + 12
EB Mean + SD	0.653 + 0.322	0.877 + 0.437	121 + 18	145 + 18
SE Mean + SD	0.622 + 0.286	0.851 + 0.413	117 + 18	141 + 16

**CONCLUSION:** It is concluded that a more elastic material making up a stability ball can elevate the metabolic response to arm exercise but might be attenuated by a smaller ball. In addition, the type of stability ball might not affect exercise training heart rates.

3185 Board #90 June 2 2:00 PM - 3:30 PM  
**The Effect Of Exercise On Inter-arm Systolic Blood Pressure Difference**  
 Michael E. Holmstrup<sup>1</sup>, Melanie M. Clarke<sup>1</sup>, Cailin R. Conner<sup>1</sup>, Yen-Kuan Lin<sup>2</sup>, Brock T. Jensen<sup>1</sup>. <sup>1</sup>Slippery Rock University, Slippery Rock, PA. <sup>2</sup>Taiwan Medical University, Taipei, Taiwan.  
*(No relationships reported)*

Clinically, when a difference of ≥10 mmHg in systolic blood pressure (SBP) between arms exists, it is identified as inter-arm systolic blood pressure difference (ISBPD). At rest, ISBPD is linked with hypertension, peripheral vascular disease, and increased premature mortality. It is well known that exercise reveals underlying cardiovascular pathologies absent at rest. However, there have been no investigations to examine the effect of exercise on ISBPD. **PURPOSE:** To determine if exercise may alter ISBPD when measured at rest, or reveal ISBPD when not observed in the resting condition. **METHODS:** An experienced investigator sequentially measured SBP using standard auscultation in each arm (alternating order). ISBPD was quantified at rest (REST). Participants then completed a three-stage protocol on a cycle ergometer. A cadence of 50 rpm was maintained at a workload of 3 (EX-3; light) and 6 METS (EX-6; moderate) and during an active recovery (AR). At each stage, SBP was measured upon achieving steady-state heart rate. A logistic regression analysis was used to determine the change in odds ratio of ISBPD when exposed to exercise. **RESULTS:** Eighty-five healthy individuals (18-45y) completed the study. Thirteen percent (n=11) presented with ISBPD during REST. In these individuals, the difference in SBP between arms was lower at AR than at REST (3.81 mmHg; P<0.05). In individuals who did not present with ISBPD during REST (n=74), progression from EX-3 to EX-6 significantly increased the odds of ISBPD (4.31; P<0.05). **CONCLUSIONS:** In individuals with ISBPD at rest, active recovery from exercise attenuated the difference between inter-arm SBP. Moderate-intensity exercise resulted in ISBPD not otherwise present at rest.

3186 Board #91 June 2 2:00 PM - 3:30 PM

**The Relationship Between Changes In Rmssd And Rectus Femoris Cross-sectional Area Following Exercise**

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(No relationships reported)

**PURPOSE:** The natural log transformation of the root mean square of successive R-R differences (lnRMSSD) is a parasympathetic measure of heart rate variability. The extent to the relationship between lnRMSSD and localized muscle damage following exercise is unknown. The purpose of this study was to examine the relationship between lnRMSSD and Rectus femoris CSA (CSA-RF) following an exhaustive bout of exercise over 72 hours. **METHODS:** Twelve participants were measured for pre-exercise lnRMSSD for five minutes in a seated position, followed by a CSA-RF measurement with musculoskeletal ultrasound 15 cm above the superior pole of the participant's right patella. Next participants completed an exhaustive exercise protocol. Finally, participants repeated the lnRMSSD and CSA-RF measures immediately following exercise termination with follow-up testing at 24-hours, 48-hours, and 72-hours. **RESULTS:** Repeated measures ANOVA revealed significant differences in lnRMSSD between pre-exercise and post-exercise measures ( $p = .002$ , Table 1), but no other significant differences. Likewise, there were significant differences in CSA-RF from pre-exercise to post-exercise ( $p < .001$ , Table 1), but no other differences were noted. There was a large near-significant correlation between the changes in lnRMSSD and CSA-RF from pre-exercise to post-exercise ( $r = -.57$ ,  $p = .055$ ), and large statistically significant correlation between the changes in lnRMSSD and CSA-RF from pre-exercise measures to 24-hour follow-up ( $r = -.64$ ,  $p = .025$ ). **CONCLUSIONS:** In this study lnRMSSD declined as CSA-RF increased immediately following exercise up to 24 hours. This inverse relationship is likely the result of vagal tone suppression and increased sympathetic outflow in cardiac control during and immediately following exercise. Tracking lnRMSSD following exercise may give practitioners further insight to the mechanisms of recovery.

Repeated Measures ANOVA Table					
	Pre-Ex	Post-Ex	24H-Post-Ex	48H-Post-Ex	72H-Post-Ex
lnRMSSD	3.99	2.60*	3.91	3.92	3.89
CSA-RF	7.12	7.73*	7.17	7.06	7.35

3187 Board #92 June 2 2:00 PM - 3:30 PM

**Heart Rate Variability Following a Short and Long Bout of High-Intensity Functional Training**

Emily Bechke, Allyson Box, Wade Hoffstetter, Paul Serafini, Cassie Williamson, Yuri Feito, FACSM, Brian Kliszczewicz. Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSM)

(No relationships reported)

Depression of Heart Rate Variability (HRV) occurs following exercise and is influenced by the intensity and duration of the activity. High-Intensity Functional Training (HIFT) is a style of training performed using various modalities and durations. **Purpose:** To examine the effect of a short (< 5-min) and a long (15-min) bout of HIFT on HRV recovery. **Methods:** Ten apparently healthy males ( $28 \pm 5$  yrs) participated in this study. Two HIFT sessions were performed in a crossover fashion. Each visit consisted of three HRV recordings: at rest (PRE; 10-min), post exercise (P; 45-min), and two-hours post (P2HR; 10-min). The short bout (SHORT) consisted of 30 power clean-and-jerks (61 kg) for time, while the long bout (LONG) was a 15-min circuit of 250m row, 20 kettlebell swings (24 kg), and 15 dumbbell squat presses (16 kg). The HRV marker used was the Root Mean Square of Successive Differences (RMSSD) and was analyzed in 5-min segments: the last 5-minutes of PRE, eight segments during P (P1-P8) starting at the 5<sup>th</sup> minute, and the last 5-mins of P2HR. **Results:** Normality was violated and data underwent a natural log transformation (lnRMSSD). Repeated Measures ANOVA did not reveal any significant differences in lnRMSSD between the SHORT and LONG trials ( $p = 0.822$ ). A significant time effect ( $p = 0.023$ ) was observed in both trials, with lnRMSSD depression occurring from P1-P8 ( $p < 0.05$ ) and recovering by P2HR ( $p = 0.141$ ). **Conclusion:** This study indicates that SHORT and LONG bouts of HIFT result in similar HRV depression and recovery. Future research is needed to better understand various bouts of HIFT and its relationship with HRV.

3188 Board #93 June 2 2:00 PM - 3:30 PM

**Effects of Prior Aerobic Exercise and Prolonged Sitting on Postprandial Plasma Glucose and Triglyceride Responses**

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(No relationships reported)

Sedentary behavior, particularly prolonged sitting, is common in modern society and is associated with numerous cardiovascular disease (CVD) risk factors, including impaired glucose metabolism and higher blood triglycerides. **PURPOSE:** The purpose of this study was to determine the effects of a single bout of aerobic exercise performed prior to a prolonged sitting challenge on postprandial plasma glucose and triglyceride responses. **METHODS:** Ten healthy men [ $21.2 \pm 0.6$  y; maximal oxygen consumption ( $VO_{2max}$ ) =  $49.6 \pm 1.7$  ml/kg/min (mean $\pm$ SE)] participated in a randomized, cross-over study in which they completed a single bout of continuous treadmill exercise (45 min at 65%  $VO_{2max}$ ) or 45 min of seated rest. A carbohydrate-rich snack [190 kcal; 29/7/3g (carb/fat/pro)] was ingested by participants 30 min before and 30 min following exercise (or seated rest). Plasma glucose and triglycerides were measured after an overnight fast (Pre), 1 hr following exercise (or seated rest) (Post), and at 1 hr intervals during a 3 hr prolonged sitting challenge. Study personnel monitored participants during the sitting challenge to ensure minimal lower extremity movement. Repeated-measures ANOVA and Bonferroni post-hoc tests were used to evaluate differences within and between trials. **RESULTS:** Treadmill exercise was completed at  $65.4 \pm 1.3\%$   $VO_{2max}$  (range = 60.9-72.6%). A main effect due to time ( $P < 0.001$ ) was observed for plasma glucose. Relative to Pre, plasma glucose concentrations in the exercise trial increased at Post by 12.1% ( $P = 0.05$ ) and were 8.6% and 14.5% lower ( $P \leq 0.02$ ) at 1 and 3 hr of prolonged sitting, respectively. Plasma glucose concentrations in the seated rest trial increased at Post by 15.0% ( $P < 0.01$ ) and returned to levels no different than Pre by 1 hr of prolonged sitting. Plasma triglycerides showed no time or treatment effects. **CONCLUSION:** These preliminary findings suggest that acute aerobic exercise performed prior to 3 hr of prolonged sitting lowers postprandial plasma glucose responses induced by a carbohydrate-rich snack in healthy men. Future studies should investigate individuals at increased CVD risk and utilize a larger postprandial challenge to further elucidate potential deleterious effects of prolonged sitting.

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3189 Board #94 June 2 2:00 PM - 3:30 PM

**Effect Of Vitamin D At Rest And In Response To Maximal Exercise**

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(No relationships reported)

Conflicting evidence suggests insufficient vitamin D (VitD) levels are associated with high resting blood pressure (BP). However the relationship between VitD and the peak systolic BP (SBP) response to exercise, a predictor of future hypertension, has yet to be investigated. **PURPOSE:** We sought to examine the relationship among serum 25-hydroxy VitD (25[OH]D), resting BP, and the peak SBP response to a graded exercise stress test among a large sample ( $n=417$ ) of healthy men (49%) and women (51%) over a broad age range (20-76 yr; mean age  $44.1 \pm 0.8$  y). We hypothesized that individuals with clinically sub-optimal VitD would have higher resting BP and a peak SBP response to a graded exercise stress test compared to individuals with optimal VitD levels. **METHODS:** Fasting serum VitD, anthropometrics, resting BP, and peak exercise SBP were obtained at the baseline visit of a larger clinical trial (STOMP; NCT01140308). **RESULTS:** Mean VitD levels were  $36.1 \pm 0.7$  ng/mL, with 41.2% of individuals classified as sub-optimal ( $< 32$  ng/mL). Average resting BP was  $118.9 \pm 0.6/75.3 \pm 0.5$  mmHg, with 41% of individuals having high BP ( $n=174$ ) consisting of those with pre-hypertension (32.5%) and established hypertension (8.5%). Individuals with optimal VitD had higher resting SBP ( $120.6 \pm 13.4$  mmHg vs.  $116.4 \pm 12.7$  mmHg;  $p=0.002$ ) and DBP ( $76.0 \pm 9.9$  mmHg vs.  $74.1 \pm 9.1$  mmHg;  $p=0.048$ ) than individuals with sub-optimal VitD, respectively. Similarly, individuals with optimal VitD tended to have a greater peak exercise SBP response than individuals with sub-optimal VitD ( $p=0.114$ ). **CONCLUSION:** In contrast to our hypothesis, VitD was positively associated with resting BP levels, but was not associated with peak SBP under maximal exercise conditions. Additional studies are needed to confirm our findings and to provide insight into mechanisms underlying these associations among individuals with high BP. TRIAL REGISTRATION: NCT01140308

3190 Board #95 June 2 2:00 PM - 3:30 PM  
**Skeletal Muscle Force Production and Bioenergetics During All-out Exercise: Influence of Group III/IV Muscle Afferents**

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 (No relationships reported)

**PURPOSE:** To investigate the influence of group III/IV muscle afferent feedback on skeletal muscle force production and bioenergetics during all-out exercise. **METHODS:** Phosphorous magnetic resonance spectroscopy was performed during a 5-min all-out intermittent isometric single-leg knee-extensor exercise, consisting of 60 maximal voluntary contractions (MVC), with intrathecal fentanyl (FENT), to attenuate group III/IV leg muscle afferents, and control (CTRL) conditions in 8 healthy men (age: 28 ± 5 yrs, stature: 178 ± 4 cm, and body mass: 77 ± 8 kg). Peak, integrated, and mean forces were determined per MVC and critical force (CF) was determined as the mean force of the final 6 MVCs. The intramuscular metabolic perturbation and adenosine triphosphate (ATP) synthesis rates were determined from intramuscular concentrations of phosphocreatine (PCr), inorganic phosphate (Pi), diprotonated phosphate ( $H_2PO_4^-$ ), ATP, and pH. **RESULTS:** Peak force (FENT: 595 ± 113 vs. CTRL: 568 ± 126 N) and end-test force (FENT: 224 ± 50 vs. CTRL: 209 ± 52) were not significantly different between conditions. The cumulative integrated force was significantly greater for FENT than CTRL over the 1<sup>st</sup> min (17557 ± 2581 vs. 16154 ± 2825 N), but not thereafter (Figure 1). End-exercise [PCr] was not significantly different between conditions, while [Pi] and [ $H_2PO_4^-$ ] were significantly greater for FENT. The estimated total ATP synthesis rate was significantly greater for FENT than CTRL over the 1<sup>st</sup> min (66 ± 16 vs. 57 ± 13 mM), but not thereafter (Figure 1). The estimated total ATP synthesis rate at CF arose from a significantly greater oxidative ATP synthesis (FENT: 77 ± 15 vs. CTRL: 83 ± 13 %) than anaerobic ATP synthesis (FENT: 23 ± 15 vs. CTRL 17 ± 13 %). **CONCLUSION:** Attenuation of group III/IV muscle afferent feedback augmented force production during the 1<sup>st</sup> min of all-out exercise, for which the increased energy demand was met, *en masse*, by the creatine kinase reaction, glycolysis, and oxidative metabolism.

3191 Board #96 June 2 2:00 PM - 3:30 PM  
**Mechanisms By Which Isometric Handgrip Training May Improve Endothelial Dilator Function In Young Healthy Men.**

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 (No relationships reported)

Isometric (IHG) handgrip training can reduce arterial blood pressure (ABP), especially in hypertensives, but the mechanisms remain unclear (1). We recently showed that IHG for 4-5weeks in healthy young White European (WE) and South Asian (SA) men augmented peak exercise hyperaemia and reactive hyperaemia in the *contralateral* arm by ~30% in WEs, but only ~15% in SAs (2,3). This suggested that IHG training of one arm improves endothelial dilator function systemically even in young men, but the effects are greater in WEs. **PURPOSE:** To determine the changes induced in forearm blood flow (FBF) in the contralateral arm (CA) during a single bout of IHG training, which might serve as a stimulus for improving endothelial function, and to test whether endothelium-dependent cyclooxygenase (COX) products contribute. **METHODS:** In 10 WEs and 10 SAs (19-23 yrs), FBF was recorded by venous occlusion plethysmography in the CA during IHG contractions of the dominant arm at 30% maximum voluntary contraction (5 x 3min at 5 min intervals) on 2 different days in the absence or presence of the COX inhibitor aspirin (600mg p.o.). **RESULTS:** Mean arterial pressure (MABP), recorded by finger photoplethysmography, increased similarly in WEs and SAs from 79.3±2.1 to 90.0±2.4mmHg in the 1<sup>st</sup> IHG and from 78.4±1.7 to 82.6±1.8mmHg in SAs. COX inhibition had no effect on baseline or IHG values of MABP. Concomitantly, FBF in the CA increased during each IHG in both WEs and SAs, but the changes were greater in WEs than SAs, for example by an average of 30.1±2.6 vs 18.5±2.6\* ml/min/100g respectively in IHG 2 and by 37.0±2.8 vs 30.6±3.2\*ml/min/100g in IHG 5 (\*; RMANOVA, WEs vs SAs: P<0.05). After COX inhibition, the increases in FBF were attenuated in WEs (to 11.7±1.9 and 11.6 ± 1.9§ ml/min/100g in IHGs 2 and 5), but *augmented* in SAs (to 26.8 ± 2.9§ and 39.4 ± 3.5§ml/min/100g in IHGs 2 and 5, §; before vs after aspirin: P<0.05). **CONCLUSIONS:** We propose that increased FBF and increased shear stress in the CA during IHG training may act as a stimulus to improve endothelium-dependent dilator function in young WE and SA men. Further, dilator COX products contribute to the increased FBF in WEs, whereas vasoconstrictor COX products limit the increased FBF in SAs, thereby limiting the effectiveness of IHG training on endothelial function. Supported by Alexander S. Onassis Public Foundation

3192 Board #97 June 2 2:00 PM - 3:30 PM  
**Blood Pressure Responses To Wearing An Abdominal Belt When Performing Differing Static Exercises**

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Many people wear abdominal belts when exercising to aid in stabilization of their core. Static exercise has been shown to raise blood pressure; however minimal is known about how wearing an abdominal belt impacts blood pressure during static exercise. **PURPOSE:** The purpose of this study was to investigate the impact of wearing an abdominal belt on blood pressure when subjects performed 3 static exercise positions. **METHODS:** n = 16, 13 males & 3 females (age=21.5±1.3 years, ht=179.2±6.4 cm, wt=79.3±12.6 kg) served as subjects. Resting blood pressure was initially measured in a seated position. Subjects then participated in three static exercises including a Wall-Sit, Side Plank, and Static Back Extension. Subjects completed each exercise position once with an abdominal belt and once without. Test order of belt/no belt and exercise positions was randomized. Blood pressure was measured at the 45 second point for each exercise. Subjects were given recovery time between exercises for blood pressure to return to normal. A 2 x 3 Factorial ANOVA was performed on systolic (SBP) and diastolic blood pressure (DBP) data. It was determined a priori that appropriate post-hoc follow up tests would be performed as needed. **RESULTS:** Results for SBP are presented in table below. For SBP no significant interaction (p>.05) was found with the 2 x 3 ANOVA. When main results were investigated no significant difference (p>.05) was found between positions. A significant difference (p<.01) was found for the main effect of With Belt vs. No Belt. No significant (p>.05) results were found with all testing of DBP.

	Wall Sit	Side Plank	Static Back Extension	Total
No Belt	146.7 (7.0)	144.8 (5.6)	144.8 (6.1)	145.4 (6.2)
W/ Belt	151.7 (9.4)	150.3 (6.6)	151.6 (5.5)	151.2 (7.2)*
Combined	149.2 (8.5)	147.5 (6.6)	148.2 (6.7)	

\*p<.01  
**CONCLUSIONS:** The results indicate that wearing an abdominal belt when performing static exercises has minimal impact on DBP between wearing a belt and not. However, wearing an abdominal belt while performing static exercises appears to increase SBP irrelevant of body position compared to no abdominal belt. Subjects should be conscious/aware of this response when performing static exercises.

3193 Board #98 June 2 2:00 PM - 3:30 PM  
**Post-Exercise Blood Pressure In 8-10 Year Old Boys**

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**INTRODUCTION:** Adults often see a period of post-exercise hypotension (PEH) following moderate intensity exercise. It is not established if children experience PEH after aerobic exercise. **PURPOSE:** To investigate the changes in blood pressure (BP) occurring after a bout of exercise in prepubescent boys ages 8-10. **METHODS:** Ten boys visited the lab on four separate occasions. The first visit was to assess anthropometric measurements (height, weight and body composition via skinfolds) as well as perform a graded exercise test to exhaustion on an electronically braked cycle ergometer in order to establish aerobic capacity and peak power output (PPO). The subsequent visits (two exercise and one control) were randomized and counterbalanced and separated by at least 48hrs. The exercise visits were identical in protocol and required participants to arrive at the lab after an overnight fast. Resting BP measurements were obtained during 30 minutes of semi-recumbent seating. After the resting period, the child then performed 20 minutes of continuous cycling at 50% of their PPO. Upon cessation of the exercise test the child resumed the semi-recumbent position and BP measurements were obtained for minutes 5, 10, 15, 20, 30, 40, 50 and 60 post-exercise. Participants remained in the semi-recumbent position for the control visit; BP measurements were taken the same as the exercise visits. **RESULTS:** Data from exercise tests were averaged. When cycling at 50% of PPO the boys averaged 62% of their VO2peak. Resting systolic BP (110.7±14.2mmHg) did not significantly (p>0.05) differ when compared to post-exercise measurements at minutes 5 (125.3±23.0mmHg), 10 (113.0±16.1mmHg), 15 (111.0±15.7mmHg), 20 (108.7±14.3mmHg), 30 (108.9±16.1mmHg), 40 (106.4±16.1mmHg), 50 (107.3±15.2mmHg), 60 (104.8±16.1mmHg) or any measurements from the control visit. Furthermore, resting diastolic BP (61.0±3.9mmHg) did not significantly (p>0.05) differ when compared to post-exercise measurements at minutes 5 (58.1±5.1mmHg), 10 (61.7±1.8), 15 (61.1±4.3), 20 (59.2±3.9), 30 (60.2±5.7), 40 (60.6±5.0), 50 (63.3±5.2), 60 (61.2±5.4) or any measurements from the control visit. **CONCLUSIONS:** PEH was not observed in 8-10 yr old boys following a 20-minute exercise at 62% of VO2peak. It is unknown if a greater exercise intensity would elicit a PEH response.

3194 Board #99 June 2 2:00 PM - 3:30 PM  
**The Effect of Acute Exercise on Coagulation Factors and the Mechanical Properties of Fibrin Fibers**  
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**PURPOSE:** The objective of this study was to investigate the effect of acute exercise on coagulation factors and fibrin fiber properties in both younger healthy subjects and older subjects with cardiovascular disease (CVD). In addition, it was of interest to examine relationships between coagulation factors and fibrin fiber properties during acute exercise. **METHODS:** 5 male subjects were recruited to the younger, healthy (YH) group and 5 male subjects were recruited to the older group with CVD (OD). Each participant performed a single session of an acute exercise protocol, having blood drawn pre-exercise and post-exercise. Repeated measures ANOVA and Pearson's correlations were used to analyze the results. Effect sizes ( $\eta^2$ ) were used to combat the small sample size and avoid type II errors. **RESULTS:** 2-way repeated measures ANOVA revealed only one significant interaction: VIII ( $p = .001$ ,  $\eta^2 = .778$ ). Paired sample t-tests showed the YH group had a significant increase in VIII from pre-exercise to post-exercise ( $p = .002$ ) but the OD did not. Between group differences (YH vs. OD) were seen during exercise when measuring alpha-2-antiplasmin ( $p = .018$ ,  $\eta^2 = .552$ ), antithrombin ( $p = .026$ ,  $\eta^2 = .481$ ), and fibrin fiber extensibility ( $p = .003$ ,  $\eta^2 = .691$ ). A significant increase in platelet levels was seen within groups from pre- to post-exercise ( $p = .048$ ,  $\eta^2 = .507$ ). Pearson's correlations revealed significant inverse correlations between VIII and fibrin fiber extensibility post-exercise ( $r = -.804$ ), and between platelets and fibrin fiber extensibility post-exercise ( $r = -.711$ ). Significant inverse relationships were also seen between pre-exercise alpha-2-antiplasmin and post-exercise fibrin extensibility ( $r = -.788$ ), and between pre-exercise antithrombin and post-exercise fibrin extensibility ( $r = -.646$ ). **CONCLUSION:** Coagulation factors including VIII, alpha-2-antiplasmin, and antithrombin all appear to be affected by acute exercise. Furthermore, acute exercise appears to cause an increase in fibrin fiber extensibility in the OD group but not in the YH group. The four significant inverse correlations provide evidence fibrin fiber extensibility may decrease in response to exercise, by altering levels of pre-exercise VIII and platelets, and post-exercise alpha-2-antiplasmin and antithrombin.

3195 Board #100 June 2 2:00 PM - 3:30 PM  
**The Age-related Decline In Vo2max: Role Of Peripheral Oxygen Transport And Utilization**  
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 (No relationships reported)

**PURPOSE:** Determine if decrements in peripheral factors, such as skeletal muscle oxygen delivery, oxygen diffusion and mitochondrial oxygen consumption, contribute to the well-established, age-related decline in aerobic capacity (*i.e.*  $VO_{2max}$ ). **METHODS:** Eight young ( $25 \pm 1$  yrs) and eight old ( $74 \pm 3$  yrs) males matched for physical activity, and body mass index, performed a graded cycling exercise test to determine whole-body  $VO_{2max}$  (Body  $VO_{2max}$ , Indirect Calorimetry). To determine the capacity of peripheral factors free from central constraints, participants also performed maximal single leg knee extension (KE), while single-leg  $VO_{2max}$  ( $KE VO_{2max}$ ), oxygen delivery ( $KE QO_{2max}$ ) and muscle oxygen diffusion ( $KE D_m O_{2max}$ ) were determined with arterial-venous blood draws and Doppler Ultrasound (*i.e.* Direct Fick). Maximal skeletal muscle mitochondrial respiratory capacity ( $KE VO_{2max}$ ) was assessed with mitochondrial respirometry of biopsied fibers from the vastus lateralis. **RESULTS:** Consistent with previous reports, during cycling exercise older individuals exhibited a 25-30% reduction in maximum power (Young:  $244 \pm 9$  W, Old:  $182 \pm 16$  W,  $P < 0.05$ ) and Body  $VO_{2max}$  (Young:  $37 \pm 2$  ml/kg/min, Old:  $26 \pm 2$  ml/kg/min,  $P < 0.05$ ). Interestingly, during KE, which is free from central constraints, older individuals exhibited similar capacities in terms of KE power,  $KE VO_{2max}$ ,  $KE QO_{2max}$  and  $KE D_m O_{2max}$  to the young (See Figure). Additionally, rather than being attenuated,  $KE VO_{2max}$  was actually slightly greater in the old ( $P < 0.05$ ). **CONCLUSION:** Despite exhibiting a lower  $VO_{2max}$  during whole-body exercise, the capacity for peripheral oxygen transport and utilization appears to be preserved in physical-activity matched, older adults. Thus, when physical activity is maintained the age-associated decline in aerobic capacity during whole-body exercise is likely dependent upon limited central factors, such as cardiac output, and not peripheral oxygen transport and utilization.

3196 Board #101 June 2 2:00 PM - 3:30 PM  
**Acute Effects of Elevation Training Mask on Heart Rate Variability in Healthy Subjects**  
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 (No relationships reported)

Elevation training mask (ETM) is purportedly designed for providing simulated altitude training, which claims that increasing respiratory resistance during exercise could provide benefits in respiratory functions and aerobic fitness. We assumed that this changed respiratory resistance may alter the autonomic cardiac regulation especially Heart Rate Variability (HRV). **PURPOSE:** The purpose of this study was to examine the acute effect of an elevation training mask on HRV during cycling. **METHODS:** This study was conducted with randomized and crossover design. Fifteen healthy male ( $N=9$ ) and female ( $N=6$ ) collegiate students ( $27.0 \pm 4.42$  yrs) completed two trials with mask (Mask) vs without mask (CON). The 40-minute protocol included (1) rest, (2) 50% and (3) 70% of  $VO_{2max}$  cycling, and (4) recovery, each 10-minute phases. HRV variables including high frequency (HF), low frequency (LF), LF/HF ratio, were collected for 5 minutes at each phase with Activwave-Cardio (CamNtech, UK). A 2x4 repeated measures (RM) MANOVA was used to analyze the data. Significant level was set at .05. **RESULTS:** A RM MANOVA result showed that there was no significant interaction effect on HRV. However, there were significant trial (Pillai's  $F[3,12] = 4.488$ ,  $p = .025$ ) and time (Pillai's  $F[9,126] = 5.383$ ,  $p < .001$ ) effects on HRV. Follow-up univariate tests revealed that HF was significantly greater in Mask than CON trial ( $F[1,14] = 7.484$ , G-G  $p = .016$ ). Both HF ( $F[1.05,14.74] = 24.221$ , G-G  $p < .001$ ) and LF ( $F[1.29,18.05] = 28.759$ , G-G  $p < .001$ ) were decreased as cycling intensity increased. **CONCLUSIONS:** In summary, acute wearing of ETM does not alter the HRV during cycling. However, a greater HF response was observed in Mask than CON trial. Future studies are needed to confirm the effects of long-term training with ETM on HRV.

3197 Board #102 June 2 2:00 PM - 3:30 PM  
**Effects Of Acute Aerobic Repetition Exercise On The Vascular Endothelial Function**  
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**PURPOSE:** High-intensity interval exercise leads to greater improvements in the vascular endothelial function than continuous exercise at moderate intensity. However, few studies have been performed on the effects of repetition exercise consisting of high-intensity exercise and followed by complete rest of the arterial function. Therefore, the purpose of this study was to investigate the effects of repetition exercise on the vascular endothelial function determined by flow-mediated vasodilation (FMD). **METHODS:** Seven healthy male subjects completed two exercise sessions on a cycle ergometer in a counterbalanced order. The exercise sessions were (i) 20 min cycling at 50%  $VO_{2max}$  (CE) and (ii) 20 x 20-sec intervals at 100%  $VO_{2max}$  interspersed with 40-sec intervals at complete rest (RE). Before and after each protocol, the brachial systolic and diastolic blood pressure were measured in the supine position. The vascular endothelial function of the right brachial artery was also assessed by flow-mediated vasodilation (%FMD), and then the normalized FMD (nFMD) was calculated from the adjusted peak shear rate. **RESULTS:** In the CE trial, the nFMD (au) increased after exercise and returned to the baseline level after 60 min of recovery ( $0.9 \pm 0.1$  at baseline,  $1.4 \pm 0.2$  at 30min after the trial,  $1.2 \pm 0.2$  at 60 min after the trial). In the RE trial, the change in the nFMD (au) resembled those in the CE trial ( $0.9 \pm 0.2$  at baseline,  $2.0 \pm 0.3$  at 30 min after the trial,  $1.3 \pm 0.3$  at 60 min after the trial). The exercise-by-time interaction effect was not significant; in addition, the main effect of exercise was not significant. However, there was a significant main effect of time present ( $P < 0.05$ ), indicating that the nFMD changed over time. **CONCLUSION:** Acute repetition exercise increases the systemic vascular endothelial function just as continuous exercises dose. These results suggest that repetition training might be useful for the prevention of cardiovascular disease.

3198 Board #103 June 2 2:00 PM - 3:30 PM

**Burn Injury Reduces Cardiac Output and Stroke Volume During Submaximal Aerobic Exercise in Children**

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**PURPOSE:** Burn trauma causes a hypermetabolic-cardiac stress response that impairs resting cardiac function. It is currently unknown how burn trauma affects cardiovascular responses to submaximal exercise in children. We tested the hypothesis that burned children have reduced cardiac output and stroke volume during submaximal exercise at 6-12 months post-burn.

**METHODS:** Values are expressed as means  $\pm$  SD with significance set at  $P < 0.05$ . Five children with 49 $\pm$ 4% total body surface area (BSA) burned (2 female, 11.7 $\pm$ 1y, 40.4 $\pm$ 18kg, 141.1 $\pm$ 9cm) and nine similar ( $P > 0.05$ ) non-burned controls (6 female, 12.5 $\pm$ 2y, 59.0 $\pm$ 16kg, 150.1 $\pm$ 12cm) with comparable exercise capacity ( $VO_{2peak}$ : 31.8 $\pm$ 11 vs 37.7 $\pm$ 8 mlO<sub>2</sub>·kg<sup>-1</sup>·min,  $P = 0.27$ ) participated. Burn children had a reduced growth BMI-for-age percentile compared to non-burn (54.6 $\pm$ 36 vs 93.2 $\pm$ 6 %tile;  $P = 0.008$ ) at 9.4 $\pm$ 3 mo post-burn injury. Oxygen consumption ( $VO_2$ ), heart rate (HR), cardiac output (Q, via non-rebreathing), stroke volume (SV, Q/HR), and arteriovenous O<sub>2</sub> difference ((a-v) O<sub>2</sub> diff, Q/VO<sub>2</sub>) were measured during a submaximal exercise protocol that entailed a pre-exercise (pre-EX) rest period followed by 3-minute exercise stages at 50% and 75% of their peak  $VO_2$ .

**RESULTS:** Utilizing a 2-way factorial ANOVA (group (G) x exercise (EX)), Q at 50% and 75%  $VO_{2peak}$  were reduced by ~27% in burned (5.6 $\pm$ 1, 6.9 $\pm$ 1.6 L·min) compared to non-burn group (7.9 $\pm$ 2, 9.1 $\pm$ 3 L·min) (G x EX interaction,  $P = 0.012$ ). SV did not differ from preEX to 50-75%  $VO_{2peak}$  in burn children (preEX: 41.7 $\pm$ 15 to 50-75%: 43.8 $\pm$ 8ml·beat) but, increased by ~21% in non-burned group (preEX: 47.7 $\pm$ 16 to 50-75%: 60.7 $\pm$ 16 ml·beat; main effect for EX,  $P = 0.046$ ). (a-v) O<sub>2</sub> diff and  $VO_2$  at preEX, 50-75%  $VO_{2peak}$  was not different ( $P > 0.05$ ) between groups but HR response to exercise was reduced (G x EX interaction,  $P = 0.02$ ). When normalized to BSA, SV(index) was similar between groups; however, Q(index) response to exercise remained attenuated in the burned (G x EX interaction,  $P = 0.007$ ).

**CONCLUSIONS:** These preliminary data indicate that burn children have an attenuated cardiovascular response to submaximal exercise compared to non-burned children due to impaired cardiac function. Further examination of hemodynamic function during exercise will offer insight for cardiovascular rehabilitation medicine in burned children.

3199 Board #104 June 2 2:00 PM - 3:30 PM

**Microvascular and Nitric Oxide Responses to Acute Exercise with Resveratrol or Estradiol in Postmenopausal Women**

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**PURPOSE:** Microvascular function measured via the reactive hyperaemic velocity time integral (VTI) has been shown to be more closely related to cardiovascular disease risk factors than macrovascular endothelial function, and is an independent predictor of cardiovascular events. Estrogen (E2)-deficient postmenopausal women have diminished endothelial adaptations to exercise training compared to age-matched men and E2-treated postmenopausal women. The polyphenol resveratrol, is an E2 receptor agonist that has been shown in animal models to enhance exercise training effects on cardiovascular function. No study has examined the effects of acute endurance exercise with E2 or resveratrol treatment on microvascular function or circulating nitric oxide (NO). Accordingly, the purpose of this study was to determine whether pre-treatment with acute E2 or resveratrol modulates microvascular function and NO responses to an acute bout of endurance exercise in postmenopausal women.

**METHODS:** VTI and circulating NO (via Griess assay) were examined before and following (120 minute) acute treadmill exercise (40 minutes at 60-75% of maximal heart rate) in 13 sedentary E2-deficient postmenopausal women (58 $\pm$ 3 years; mean $\pm$ SD) randomized, to either E2 (transdermal patch 0.05 mg/d starting 2 days before exercise visit), resveratrol (one 250 mg oral tablet 45 minutes before exercise) or placebo (inactive patch and tablet).

**RESULTS:** There were no significant differences in pre-exercise VTI and NO between placebo and resveratrol conditions or with E2 conditions. There were no significant differences in post exercise between group changes in VTI and NO.

	VTI (cm)			NO (µM)		
	Placebo	Resveratrol	E2	Placebo	Resveratrol	E2
Pre	81.1 $\pm$ 25.2	94.6 $\pm$ 21.7	91.1 $\pm$ 23.5	123.7 $\pm$ 60.6	142.8 $\pm$ 65.6	119.5 $\pm$ 51.2
120 min change	-9.5 $\pm$ 17.4	-11.4 $\pm$ 16.6	-4.8 $\pm$ 22.7	-4.9 $\pm$ 30.7	-18.5 $\pm$ 64.1	-5.0 $\pm$ 19.7

**CONCLUSIONS:** Acute E2 or resveratrol did not significantly alter basal microvascular function or circulating NO, nor did they modulate the response to an acute bout of moderate intensity treadmill exercise. Whether resveratrol would modulate vascular adaptations to chronic exercise training needs future exploration.

3200 Board #105 June 2 2:00 PM - 3:30 PM

**Performance Related Hemodynamic Responses to an Aerobic Exercise Across Different Stages of the Menstrual Cycle**

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(No relationships reported)

**PURPOSE:** To examine the physiological changes, especially body water and hemodynamic measures that occur in females across their respective menstrual cycles in response to aerobic performance. **METHODS:** Eleven females (age = 21.2  $\pm$  1.4 yrs) performed four sessions of aerobic activity at 75% of their calculated  $VO_{2max}$  as determined by the Bruce Protocol. The speed for each subject's aerobic activity was then calculated using the ACSM metabolic running equation. The four sessions of aerobic activity were identical in format and performed on days 1, 7, 14, and 21 of each subject's menstrual cycle. Sessions began with measurements of body weight, body fat, heart rate (HR), and blood pressure (BP). Extracellular fluid (ECF), intracellular fluid (ICF), and fat-free mass (FFM) was also recorded via single-frequency and multiple-frequency bio-electrical impedance analysis (BIA) prior to aerobic activity. Subjects then completed 30 minutes of aerobic exercise at the calculated speed to yield an intensity of 75%  $VO_{2max}$ . Following the aerobic event, all measures taken pre-exercise, as well as RPE, were measured again at three separate time points post-exercise (post-0min, post-15min, and post-30min) while HR was monitored continuously. **RESULTS:** Day one systolic BP significantly correlated with day one  $\Delta$ ECF at multiple time points ( $r = -0.619$  to  $-0.680$ ,  $p < 0.05$ ). HR also had significant correlations on day one with  $\Delta$ ECF and  $\Delta$ ICF ( $r = -0.610$ ,  $p < 0.05$ ;  $r = 0.609$ ,  $p < 0.05$ ). Day 7 had significant correlations between BP (systolic and diastolic) and ICF ( $r = -0.610$  to  $-0.672$ ,  $p < 0.05$ ) at multiple time points. **CONCLUSIONS:** The results showed that hemodynamic variables had notable correlations throughout most performance-related measures and across the different days of the menstrual cycle. From Day 1 to 7 there is an observable shift in correlation from BP and ECF to BP and ICF. This apparent shift in fluid may be due to the physiological responses associated with progressing through one's cycle from the menstrual to luteal phase in which a significant amount of body water is lost. These results demonstrate that there may be different responses to aerobic performance throughout the different phases of the menstrual cycle, but further investigation is required to make any kind of recommendations.

3201 Board #106 June 2 2:00 PM - 3:30 PM

**Sex Differences in Acute Effect of Exercise on Endothelial Function in Older Adults**

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(No relationships reported)

There is growing evidence of sex differences in the chronic effect of aerobic exercise on endothelial function (flow-mediated dilation; FMD) in older adults. However, whether sex differences also exist in the acute effect of aerobic exercise on FMD in older adults is unknown. **PURPOSE:** To test the hypothesis that the FMD response to acute aerobic exercise will be different in older men compared with postmenopausal women and that exercise intensity will influence the FMD response. **METHODS:** Thirteen older men and fifteen postmenopausal women, free of major clinical disease, participated in this randomized crossover study (67 $\pm$ 1 vs. 65 $\pm$ 2 yrs, mean $\pm$ SE,  $P = 0.4$ ). Subjects completed a single bout of low-intensity continuous training (LIC; 47 min 50% peak heart rate (HRpeak)), moderate-intensity continuous training (MICT; 47 min 70% HRpeak) and high-intensity interval training (HIIT; 40 min: alternating intensities of 90% and 70% HRpeak) on the treadmill in a counterbalanced order. Brachial artery FMD was assessed at rest, at end of exercise and following 60-minute recovery. **RESULTS:** In older men, FMD was attenuated by 45% following HIIT (5.95 $\pm$ 0.85 vs. 3.27 $\pm$ 0.52%,  $P = 0.003$ ) and by 37% following MICT (5.97 $\pm$ 0.87 vs. 3.73 $\pm$ 0.47%,  $P = 0.03$ ;  $P = 0.9$  for FMD response to HIIT vs. MICT) and was normalized following 60-min recovery ( $P = 0.99$ ). In postmenopausal women, FMD did not

significantly change in response to HIIT ( $4.93 \pm 0.55$  vs.  $6.31 \pm 0.57\%$ ,  $P=0.14$ ) and MICT ( $5.32 \pm 0.62$  vs.  $5.60 \pm 0.68\%$ ,  $P=0.99$ ). In response to LICT, FMD did not change in postmenopausal women nor older men ( $5.21 \pm 0.64$  vs.  $6.02 \pm 0.73\%$ ,  $P=0.7$  and  $5.70 \pm 0.80$  vs.  $5.55 \pm 0.67\%$ ,  $P=0.99$ ). **CONCLUSIONS:** Sex and exercise intensity significantly impact the FMD response to acute aerobic exercise in older adults. In older men, FMD is attenuated following acute HIIT and MICT but not LICT, whereas in postmenopausal women FMD is unaffected.

3202 Board #107 June 2 2:00 PM - 3:30 PM  
**The Acute Cardiorespiratory Responses to High versus Low Volume Interval Cycling Exercise in Healthy Adults**

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**PURPOSE:** High intensity interval training (IT) is an increasingly popular exercise mode with possible health risks and benefits. Therefore the purpose was to compare acute responses to two volumes of IT in healthy untrained males.

**METHODS:** Ten males (aged  $19.5 \pm 1.13$  years) completed two IT trials on a cycle ergometer in a counter-balanced repeated measures study, at least 48 hours apart. Low volume (LVIT) consisted of three 20 s sprints (3x20) at self-selected maximal cadence with 7% of body mass as resistance and 160 s active rest. High volume (HVIT) consisted of ten 60 s sprints (10x60) at self-selected maximal cadence with 3.5% of body mass as resistance and 60 s active rest. Oxygen uptake ( $\text{VO}_2$ ), heart rate (HR) and power (W) were recorded continuously. In addition to these measures blood lactate [La] and systolic blood pressure (SBP) were recorded pre, post and every ten minutes post-exercise for 30 minutes. Oxygen pulse ( $\text{O}_2$  pulse), % predicted peak heart rate ( $\%HR_{\text{peak}}$ ), elevated post-exercise oxygen consumption (EPOC), energy expenditure (EE), fatigue index and rate-pressure product (RPP) were calculated. Repeated measures ANOVA and effect sizes were applied.

**RESULTS:** 10x60 caused a significantly greater  $\text{VO}_2$  ( $1548 \pm 708$  mL·kg<sup>-1</sup>·min<sup>-1</sup> vs  $1155 \pm 476$  mL·kg<sup>-1</sup>·min<sup>-1</sup>;  $p<0.001$ ),  $\text{O}_2$  pulse ( $9.6 \pm 5.5$  mL·beat<sup>-1</sup>·min<sup>-1</sup>, vs  $7.5 \pm 3.3$  mL·beat<sup>-1</sup>·min<sup>-1</sup>;  $p<0.001$ ),  $\%HR_{\text{peak}}$  ( $95 \pm 4\%$  vs  $91 \pm 5\%$ ;  $p=0.010$ ), EPOC magnitude ( $35.3 \pm 5.8$  L vs  $28.3 \pm 7.1$  L;  $p=0.018$ ) and EE ( $500 \pm 53$  kcal vs  $235 \pm 29$  kcal;  $p<0.001$ ) than 3x20. EPOC duration was not significantly different (10x60:  $16.51 \pm 12.32$  minutes vs 3x20:  $10.84 \pm 6.19$  minutes;  $p=0.140$ ). There were no significant differences in mean SBP (10x60:  $136.3 \pm 2.6$  mmHg vs 3x20:  $134.6 \pm 2.4$  mmHg;  $p>0.050$ ) or RPP (10x60:  $16179 \pm 462$  vs 3x20:  $15957 \pm 481$ ;  $p=0.668$ ) between trials, however there was a clinically significant reduction in SBP 30 minutes following 3x20 ( $122 \pm 15$  mmHg) compared to pre-exercise ( $135 \pm 8$  mmHg) ( $p=0.053$ ,  $d=1.10$ ), but not following 10x60 (pre  $131 \pm 12$  mmHg; post  $126 \pm 9$  mmHg;  $p=0.303$ ). 3x20 caused significantly greater fatigue index ( $36.5 \pm 11.3\%$  vs  $23.0 \pm 10.1\%$ ;  $p=0.009$ ) and [La] ( $11.56 \pm 2.13$  mmol·L<sup>-1</sup> vs  $7.79 \pm 2.47$  mmol·L<sup>-1</sup>;  $p=0.010$ ;  $d=1.63$ ) 10 minutes post exercise.

**CONCLUSIONS:** 10x60 elicited significantly greater cardiorespiratory responses, whereas 3x20 produced a greater [La] and fatigue index.

3203 Board #108 June 2 2:00 PM - 3:30 PM  
**Acute Effects of Heated Water Based Exercise on Ambulatory Blood Pressure and Heart Rate Variability in Long Term Treated Elderly Hypertensive Patients**

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 (No relationships reported)

**PURPOSE:** Although heated water-based exercise (HEx) training has shown to largely reduce blood pressure (BP) in patients with resistant hypertension, the effect of a single exercise bout on ambulatory BP (ABP) in elderly subjects is unknown. Our purpose was to evaluate the acute effect of HEx versus land-based exercise (LEx) on ABP and heart rate variability (HRV) in long-term treated elderly hypertensive patients.

**METHODS:** Twelve sedentary elderly hypertensive patients (6 women) aged  $60 \pm 10$  yr, under drug therapy for 15±3 yr, underwent a 30 min of HEx (walking inside the pool), LEx (walking on a treadmill) and nonexercise control session (CON) in random order (2-5 days between interventions). HEx and LEx intensity was set at 11-13 in the 6-20 RPE scale. HRV was analyzed before and after each intervention, and twenty-four hour (24-h) ABP monitoring was performed after each intervention.

**RESULTS:** There was a tendency toward ( $P = 0.06$ ) increase in low-frequency (pre =  $43 \pm 7.3$  n.u.; post =  $57.9 \pm 5.5$  n.u.) and decrease in high-frequency (pre =  $56.7 \pm 7.3$  n.u.; post =  $42 \pm 5.5$  n.u.) HRV after LEx, but no changes were observed after HEx and CON. However, 24-h (-6 mmHg), daytime (-6 mmHg) and nighttime (-6 mmHg) systolic ABP were significant lower ( $P < 0.05$ ) after HEx than after LEx and CON. Although daytime (-3 mmHg) and nighttime (-4 mmHg) diastolic ABP was lower after HEx than after LEx and CON, this reduction was not statistically significant.

**CONCLUSIONS:** Although there was an improvement in HRV after LEx, 24-h, daytime and nighttime systolic ABP reduced only after HEx. This result suggest that HEx may be superior than LEx to manage BP hypertension in long-term treated elderly hypertensive patients.

3204 Board #109 June 2 2:00 PM - 3:30 PM  
**Effect of Acute Antioxidant Therapy on Cardiac Baroreflex Sensitivity in Young Healthy Men**

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 (No relationships reported)

There is an emerging body of evidence in animals indicating that elevated oxidative stress impairs baroreflex sensitivity (BRS) function, however studies in healthy humans have yielded equivocal results. One potential reason for this discrepancy is that previous studies have used individual antioxidant treatments (e.g., Vitamin C only) to investigate the effect of oxidative stress on BRS. Recent studies in healthy humans have demonstrated significant reductions in reactive oxygen species using an antioxidant cocktail (AOC; Vitamin C, Vitamin E, and Co-enzyme Q10) suggesting the effectiveness of this treatment. Whether this AOC induced reduction in oxidative species affects BRS in young, healthy adults remains unknown. **PURPOSE:** We tested the hypothesis that AOC will improve cardiac BRS in young healthy adults. **METHODS:** Five young men were studied on two separate days: placebo (sugar pills) and AOC (2000 mg Vitamin C, 150 IU Vitamin E and 100 mg Co-enzyme Q10) performed in random order. Resting heart rate (ECG) and arterial blood pressure (automated sphygmomanometer and finger photoplethysmography) were measured 90 minutes after AOC or placebo (a time period this AOC has been shown to have peak effects on oxidative stress). Spontaneous cardiac BRS was determined for all sequences combined (overall BRS), and also separately for up (increase systolic blood pressure: increase R-R interval) and down (decrease systolic blood pressure: decrease R-R interval) sequences. **RESULTS:** Systolic blood pressure on AOC day tended to be lower relative to the placebo day ( $127 \pm 4$  vs.  $131 \pm 5$ ;  $p=0.098$ ). However, no differences in overall cardiac BRS were found between placebo and AOC ( $18.0 \pm 2.7$  vs.  $17.3 \pm 2.6$  ms/mmHg;  $p=0.59$ ). Likewise, up sequences ( $17.02 \pm 2.9$  vs  $14.04 \pm 4.0$  ms/mmHg;  $p=0.51$ ) and down sequences ( $18.0 \pm 2.7$  placebo vs.  $18.0 \pm 2.6$  ms/mmHg AOC;  $p=0.98$ ) were not different between conditions. Equal number of sequences were found between the placebo and AOC days. **CONCLUSION:** These preliminary data suggest that antioxidant treatment does not affect resting cardiac BRS in young, healthy men. Supported by UTA College of Nursing and Health Innovation

F-55 Free Communication/Poster - Clinically-related Exercise Responses

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
 Room: Hall F

3205 Board #110 June 2 3:30 PM - 5:00 PM  
**The Effect of Acute Aerobic Exercise on Hemostasis in Obstructive Sleep Apnea**

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Obstructive Sleep Apnea (OSA) is a prevalent sleep disorder affecting 2 – 4% of the middle-aged population. Individuals with OSA have an altered hemostatic balance favoring coagulation that may predispose them to cardiovascular disease and/or myocardial events. Although the resting hemostatic balance is well understood, the exercise response is less described.

**Purpose:** To determine the hemostatic response after acute aerobic exercise in Obstructive Sleep Apnea.

**Methods:** Eighteen males (nine OSA vs. nine Controls) aged  $41 \pm 13$  yrs. and  $28.4 \pm 3.5$  BMI were recruited from the university and local community without evidence of cardiovascular, pulmonary, or metabolic disease. Apnea-Hypopnea Index (AHI)  $> 5$  was criteria for OSA. Subjects performed a treadmill exercise test at 35% and 70% predicted  $\text{VO}_2$  reserve during the morning hours. Pre exercise blood samples were obtained after 15 minutes supine rest and within 2 minutes following exercise. Repeated Measures ANOVA were performed for Factor VIII antigen, tPA antigen, tPA activity, and PAI-1 activity. Correlational analysis compared resting and post exercise hemostatic factors with age, BMI, and AHI.

**Results:** Mean AHI was  $13.00 \pm 12.6$ . No exercise x condition interactions were observed for hemostatic markers. There was a main effect for exercise in Factor VIII,

tPA antigen, and tPA activity in both groups. PAI-1 activity tended to be elevated in OSA (145%) compared to controls which remained after exercise (205%) ( $P = 0.05$ ). Post exercise FVIII:Ag correlated with BMI ( $r = 0.52$ ), while resting tPA:Ag correlated with AHI ( $r = 0.49$ ), and age ( $r = 0.50$ ).

**Conclusion:** The hemostatic response after acute aerobic exercise is unaffected in mild OSA although PAI-1 activity seems to be elevated. BMI is correlated with FVIII:Ag, while tPA:Ag is associated with AHI and age.

3206 Board #111 June 2 3:30 PM - 5:00 PM

### Reliability of Pulse Waveform Separation Analysis Responses to an Orthostatic Challenge

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**Purpose:** Cardiovascular autonomic nervous system function can be assessed by recording arterial wave reflection responses to an orthostatic challenge. Using pulse wave analysis, arterial wave reflection can be estimated using pulse wave separation analysis, whereby a triangular or a physiologic flow waveform is assumed and the aortic wave is separated into its *forward* and timing-independent *reflected* (Pb) components. This study sought to determine the measurement precision (between-day reliability) of Pb responses to a modified tilt-table test. **Methods:** Twenty healthy adults (26.4 y (SD 5.2), 55% F, 24.7 kg/m<sup>2</sup> (SD 3.8)) were tested on three different mornings in the fasted state, separated by a maximum of seven days. Oscillometric pressure waveforms were recorded on the left upper arm, and aortic waveforms were generated using a generalized transfer function. The criterion for acceptable reliability was an intra-class correlation coefficient (ICC) of 0.75. To express the percentage change that must occur at a group and individual level, the standard error of measurement (%SEM) and smallest detectable change (%SDC) were calculated. **Results:** The criterion ICC (0.75) was exceeded at baseline (0.79), following 5 min tilt (0.75), and following 5 min recovery from tilt (0.75). The %SEM and %SDC for the 5 min tilt response were 7% and 19%, respectively. **Conclusion:** Arterial wave reflection responses to an orthostatic challenge can be assessed with acceptable between-day reliability using oscillometric pulse wave analysis.

3207 Board #112 June 2 3:30 PM - 5:00 PM

### Effect of Moderate Versus High Intensity Interval Exercise Training on Heart Rate Variability Parameters in Inactive Latin-American Adults: A Randomized Clinical Trial

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**PURPOSE:** Decreased heart rate variability (HRV) is associated with a higher risk of mortality and exercise training is effective to its increase in inactive adults. We investigated the effect of moderate versus high intensity interval exercise training on HRV indices in physically inactive adults. **METHODS:** Twenty inactive adults were randomly allocated to receive either moderate intensity training (MCT group) or high intensity interval training (HIT group). The MCT group performed aerobic training at an intensity of 55-75% of the walking on a treadmill at 60-80% heart rate max (HRmax) until expenditure of 300 kcal until the end of training. The HIT group performed running on a treadmill during 4 minutes at 85-95% peak HRmax and had a recovery of 4 minutes at 65% peak HRmax until expenditure of 300 kcal until the end of training. Supine resting HRV indices (time domain: SDNN, standard deviation of normal-to-normal intervals; rMSSD, Root mean square successive difference of RR intervals and frequency domain: HF<sub>ln</sub>, high frequency spectral power; LF, low frequency spectral power; and HF/LF ratio) and were measured at baseline and 12-weeks thereafter.

**RESULTS:** SDNN changes were 3.4 (8.9) ms in the MCT group, 29.1 (7.6) ms in the HIT group (difference between groups 32.6 [95% CI, 24.9 to 40.4 ( $P = 0.01$ )]). LF/HF<sub>ln</sub> ratio change in the MCT group 0.19 (0.03) ms and in HIT group 0.13 (0.01) ms ( $P$  between groups = 0.016). No significant group differences were observed in rMSSD, HF, and LF parameters. Finally, we observed stronger correlation between Ln rMSSD and to-R-R interval in HIT group ( $r_s = 0.834$ ;  $p < 0.001$ ) Figure 1A, and not significant correlation between Ln rMSSD and to-R-R interval in MCT group ( $r_s = 0.396$ ;  $p = 0.290$ ), Figure 1B. **CONCLUSIONS:** In inactive adults, this study showed that a 12-week HIT training program can increase short-term HRV, mostly in vagal mediated indices such as SDNN and HF/LF<sub>ln</sub> ratio power. **Trial registration.** ClinicalTrials.gov NCT02738385

3208 Board #113 June 2 3:30 PM - 5:00 PM

### Blood Pressure Cuff Selection: Does One Size Fit All?

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Blood pressure (BP) is one of the most commonly measured vital signs. Historically, tremendous focus has been dedicated to increasing the reliability of BP measurement by standardizing protocols and reducing error to the smallest possible increment. Errors in BP measurement may result in misdiagnosis, cardiovascular complications during exercise, and improper prescription of antihypertensives. 'Miscuffing' is a common and significant source of error in BP measurement. The '80% rule' (i.e. cuff  $\geq 80\%$  of an individual's arm circumference) is the gold standard method for BP cuff size selection as recommended by the American Heart Association. Interestingly, BP cuff manufacturers routinely print their own cuff size recommendation, based on an arm circumference range, on their products and this method often differs in the suggested cuff size from the '80% rule'. **PURPOSE:** The current study examined the occurrence of 'miscuffing' and the outcome of BP measurement using the '80% rule' cuff selection method versus the manufacturer's recommendations. **METHODS:** Forty-four individuals had their upper arm circumference measured, and appropriate cuff(s) selected using the two sizing methods. An automated oscillometric device was used to measure BP in duplicate with a 1-minute interval in between measurements, and 2-minute interval between cuffs if necessary. If different cuffs were selected, the order of measurement was randomized. A dependent t-test was used to ascertain potential BP measurement differences between sizing methods. **RESULTS:** 'Miscuffing' as the result of method discrepancies between the '80% rule' and the manufacturer's recommendation, occurred in over two-thirds (70%, n=31) of the sample. In these individuals, there was a significant difference in systolic BP between recommended cuffs (7.9 mmHg;  $p < 0.05$ ). Approximately 1 in 3 individuals, with two cuffs recommended (35%, n=11), had a smaller cuff suggested by the manufacturer, and were misclassified with a significantly elevated systolic BP (average increase 12.5 mmHg;  $p < 0.05$ ). **CONCLUSIONS:** BP cuff-selection methods are not universal and contribute to reliability concerns. 'Miscuffing' was a common observation when utilizing the manufacturer's method for cuff selection and resulted in BP measurement error and misclassification.

3209 Board #114 June 2 3:30 PM - 5:00 PM

### Whole Body Vibration Training To Prevent Weight Gain In College Students: Early Findings From A Randomized Controlled Trial.

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At least 44 percent of adult Americans will be obese by 2030. When young adults go off to college and leave the structured environment of a household, they often adopt unhealthy behaviors, such as unhealthy eating and getting less exercise, leading to the risk of weight gain, popularly referred to as the "Freshman Fifteen". Unless interrupted, this pattern of weight gain in early adulthood can lead to obesity in later adulthood. Whole-body vibration training (WBVT) is a novel alternative approach to structured exercise for improving body composition for physically limited, time constrained, and/or unmotivated persons, but has not been studied yet in college students. **PURPOSE:** To determine if WBVT is a feasible and effective method of preventing weight gain in physically inactive students enrolled in undergraduate nursing or other 4-year programs. **METHODS:** Male (n=5) and female (n=28) undergraduate students were randomized to control (n=14, age=28.1 + 7.1, BMI=28.1 + 5.3) or WBVT groups (n=19, age= 28.5 + 9.0, BMI=27.5 + -3.8). The WBVT group completed three training sessions per week, progressing from low to high frequencies (30-50 Hz) and amplitudes (2-4mm), for six months. Control subjects were asked to maintain their usual diet and exercise habits. A 2 x 3 RM-ANOVA was used to detect

significant group x time interactions for weight and waist circumference measured at baseline, 3 and 6 months. **RESULTS:** Retention in the study was 75% and adherence to training was 60%. Weight differed significantly over time between groups at 6-months ( $p < 0.02$ , mean difference = 4.48 lbs, SE = 1.79), but not so for WC ( $P = 0.131$ , mean difference = 2.71 cm, SE = 1.75). **CONCLUSION:** Our preliminary findings suggest that WBVT may be both a feasible and effective method for preventing weight gain among inactive undergraduate students. Future studies should assess the effectiveness of self-monitored WBVT in the college recreation center setting.

3210 Board #115 June 2 3:30 PM - 5:00 PM  
**Iron Homeostasis In Elite Athletes and Ultramarathon Runners**

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**PURPOSE:** The present study was aimed at determining the effect of two different types of exercise (elite athletes (EA) playing football and ultramarathon runners (UR)) on iron metabolism, and especially the role of hepcidin in iron homeostasis. **METHODS:** In our study two different groups of athletes were investigated. The first group consisted of 19 male elite football athletes and the second group of 41 ultramarathon runners. In both cases, blood samples were taken pre-race (t1), immediately post-race (t2), and 24 hours post-race for EA athletes and 36-48 hours post-race for UR athletes (t3). **RESULTS:** The iron levels in time t3 were found to have statistically significant decreases compared with the iron levels in pre-race and post-race period. Moreover, in both cases, ferritin levels were increased significantly in time t2 and t3. Hepcidin levels increased in time t2 after the race, in football players (from 27.45 ± 12.98 to 37.42 ± 13.74 ng/mL) and in time t3 decreased again. However, in ultramarathon runners, hepcidin levels significantly increased in time t2 (from 29.16 ± 10.92 to 58.81 ± 16.97 ng/mL) and remained increased in time t3 as well (37.69 ± 16.38 ng/mL), despite a trend for its decrease. In football players, sTfR levels did not change, contrary to ultramarathon runners where sTfR levels were found decreased after the race and in time t3. **CONCLUSIONS:** Iron metabolism in athletes can be impacted by the type of exercise. Ferritin is not a reliable marker for iron balance, because in the present study, it is more likely an acute phase protein. The main regulator of iron homeostasis, hepcidin increases, showing the body's response to inflammation, by trapping iron in the macrophages and by altering iron absorption. Finally, a strenuous and prolonged exercise can lead to sports' anaemia.

3211 Board #116 June 2 3:30 PM - 5:00 PM  
**Comparison Of Progressive High-intensity Aerobic Exercise And High-intensity Interval Training (HIIT) In Older HIV+ Adults**

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 (No relationships reported)

HIV+ adults have 40% lower  $VO_{2\text{peak}}$  ( $VO_2$ ) than age-matched healthy adults. High intensity aerobic exercise (AEX) increases  $VO_2$  in older adults. A growing body of evidence demonstrates that HIIT can serve as an effective alternative to AEX. However, data in older HIV+ adults for both modalities is very limited even though a quarter of HIV+ Americans are over 50 years old. **PURPOSE:** To examine the effects of progressive AEX+RT and HIIT+RT on  $VO_2$  and strength in HIV+ older adults vs. sedentary controls.

**METHODS:** Sedentary HIV+ men 50+ years of age were randomized to AEX+RT or delayed entry control groups. AEX+RT group received 16-weeks (48 sessions) of supervised center-based training with progression to a target of 45 minutes of continuous exercise at 70-80%  $HR_{\text{reserve}}$ . The RT protocol consisted of 6 exercises progressed to 80% of baseline 1-RM. Control participants remained sedentary. Both groups were tested at baseline and 16-weeks. The control group participants then started 16 weeks of HIIT in a cross over design. The HIIT group received the same duration of supervised training and identical RT protocol with repeated testing at 32 weeks. The HIIT protocol was performed using 4 intervals of 4 minutes of work (90-95%  $HR_{\text{max}}$ ) separated by 3 minutes of active rest (50-60%  $HR_{\text{max}}$ ) for a total time of 28 minutes. Paired t-test or Wilcoxon signed rank sum were used to test pre/post differences. Results are presented as mean ± SE or median (range).

**RESULTS:** To date 8 patients have been enrolled and randomized to AEX+RT or Control with 16 week testing complete in all 8 and post-HIIT testing completed in 3. AEX+RT increased  $VO_{2\text{peak}}$  (0.29 ± 0.03 L/min,  $p = 0.03$ ) and lower body strength (+37% 1-RM,  $p = 0.05$ ). Post-hoc comparison showed that HIIT+RT training had comparable increases in  $VO_{2\text{peak}}$  (0.32 ± 0.09 L/min,  $p = 0.07$ ) and lower body strength (+31% 1-RM,  $p = 0.05$ ). There was a trend for increased lean mass (LM) measured

by DXA after AEX+RT (1.2 kg (-1.8 to 6.1)) and HIIT+RT (1.5 kg (1.2 to 6.1)) and decreased LM after the sedentary control period (-1.7kg (-4.1 to 1.6)). Changes in cross-sectional area of the thigh support these findings.

**CONCLUSIONS:** Progressive high-intensity AEX+RT was well tolerated and effective in older HIV+ men. HIIT may be a more time efficient option that can equally improve  $VO_2$  and strength in the growing population of older adults with HIV.

3212 Board #117 June 2 3:30 PM - 5:00 PM  
**Resting And Post Exercise Autonomic Function In Active And Insufficiently Active People Living With HIV**

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 (No relationships reported)

Autonomic dysfunction has been associated with cardiovascular disease (CVD) morbidity and mortality, and may be prevalent in people living with HIV/AIDS (PLWHA). Physical activity (PA) is associated with better autonomic function in healthy and cardiometabolic disease populations. However, there are few data on the resting and autonomic responses to exercise in PLWHA. **PURPOSE:** To determine whether physically active (Act) PLWHA have better autonomic responses compared with insufficiently active (IA) PLWHA.

**METHODS:** 23 participants (13 Active PLWHA and 10 age and gender matched IA PLWHA) were recruited. Active PLWHA performed ≥150 of moderate to vigorous aerobic PA, while IA PLWHA performed ≤30 minutes on ≤2 days per week of aerobic PA. Resting heart rate variability (HRV) was measured for 10 minutes before exercise from which high frequency power in normalized units (HF<sub>n.u.</sub>), low frequency power in normalized units (LF<sub>n.u.</sub>) and low frequency/high frequency (LF/HF) ratio were determined. Participants performed a maximal cardiopulmonary exercise test on a cycle ergometer. Heart rate recovery (HRR) was measured at 30, 60 and 120 seconds (sec.) after exercise. Parasympathetic reactivation was measured as Root Mean Square of Successive Differences (RMSSD) at 30 sec. and 10 minutes (min.) after the test. **RESULTS:** Active PLWHA showed significant parasympathetic reactivation (RMSSD) from 30 sec. to 10 min. after peak exercise while this did not occur in IA PLWHA. HRR over 120 sec. after exercise was not different between the study groups. Measures of parasympathetic modulation (HF<sub>n.u.</sub> and LF/HF ratio) and sympathetic modulation (LF<sub>n.u.</sub>) were enhanced in Active PLWHA, compared with IA PLWHA. **CONCLUSIONS:** Regular aerobic exercise is associated with enhanced autonomic function at rest and during the 10 minutes of recovery after exercise in PLWHA. These findings suggest a possible mechanism to support lower risk of CVD with exercise in PLWHA.

	HIV+ Act	HIV+ IA
Resting HRV Measure		
HF (n.u.)	41.0 ± 15.6*	25.2 ± 9.7
LF (n.u.)	55.6 ± 15.8*	79.3 ± 17.5
LF/HF ratio	1.6 ± 0.9*	3.4 ± 1.8
Post Exercise HRV		
RMSSD (ms) 30sec.	4.38 ± 1.92**	9.08 ± 3.8
RMSSD (ms) 10min.	11.7 ± 2.96	13.13 ± 2.1
Heart Rate Recovery		
HRR 30 sec. (bpm)	20.22 ± 6.29	23.22 ± 6.9
HRR 60 sec. (bpm)	33.9 ± 11.95	35.33 ± 9.26
HRR 120 sec. (bpm)	44.89 ± 13.06	44.89 ± 14.08
*Significant ( $p < 0.05$ ) differences between HIV+ IA and HIV+Act groups. ** Significant ( $p < 0.05$ ) differences from 30 sec to 10 min.		

3213 Board #118 June 2 3:30 PM - 5:00 PM  
**Alterations In Intraocular Pressure And Corneal Thickness Immediately Following A 161-km Foot Race**

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**Introduction:** Significant visual impairment is estimated to occur in 3% of participants in 161-km ultramarathons. Initial research indicates this is most often due to a transient corneal edema. The normal physiological changes of the eye in response to prolonged exercise have not been previously reported.

**Purpose:** To determine the effect of prolonged exercise (14 to 30 hours) on intraocular pressure and corneal thickness.

**Methods:** Entries of the 2013 161-km Western States Endurance Run were invited to participate in our study via pre-race email. During the 2 days prior to the race, informed consent was obtained and pre-race testing was performed. Pre- and immediate post-race, binocular and monocular visual acuity was measured using an illuminated Snellen eye chart and intraocular pressure was measured in both eyes with Tonopen XL (Reichert Technologies, Depew, NY). Pre- and immediate post-race corneal thickness was measured three times in rapid succession using an ultrasonic pachymeter (Corneo-Gage Plus, Sonogage, Cleveland, OH) after corneal anesthetization with 0.5% proparacaine hydrochloride.

**Results:** Eight entrants completed the study among which, six reported a prior history of ultramarathon-associated visual impairment. Three had a history of bilateral refractive surgery. One participant reported a period of "tunnel vision" during the race. Beyond this, there were no reports of visual impairment during this race which had a temperature range of 5.0 to 39.0°C. Pre- and post-race visual acuity measurements were essentially unchanged. Pre- and post-race corneal thickness did not change ( $p=.3$ ) with a mean ( $\pm$ SD) of 661 ( $\pm$ 82) mm pre-race and 667 ( $\pm$ 84) mm post-race. Post-race intraocular pressure decreased from pre-race values in 10 of 16 eyes, was unchanged in 2 and higher in 4, with mean ( $\pm$ SD) pressure being 12.3 ( $\pm$ 3.6) and 11.4 ( $\pm$ 3.5) pre-race and post-race, respectively ( $p=0.5$ ).

**Conclusions:** Within this small sample, visual acuity, corneal thickness and intraocular pressure were not significantly altered by completion of a 161-km foot race. These findings offer some reassurance to athletes who might have concern about elevating intraocular pressure from ultramarathon running.

3214 Board #119 June 2 3:30 PM - 5:00 PM

**Strength Testing In Athletes Post ACL (Anterior Cruciate Ligament) Reconstruction: Does Graft Type Matter?**

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**PURPOSE:**

To evaluate hamstring and quadriceps strength after ACL (Anterior Cruciate Ligament) reconstructive surgery depending on type of graft used by determining if there is any deficit in knee extension with the use of a patellar tendon graft and knee flexion deficit with the use of a hamstring graft.

**METHODS:**

Chart review of athletes from 2010-2016 who met the following inclusion criteria's: age of subjects 15-50 yrs., isokinetic testing (CYBEX) performed  $\leq$  1 yr. after surgery, completion of a structured rehabilitation program before the CYBEX test, no clinical signs of instability on evaluation, and having full painless knee range of motion. Graft type (Patellar Tendon and Hamstring) and CYBEX results (extension and flexion at 60°/sec and 180°/sec at peak torque) were compared for each athlete.

**RESULTS:**

A total of 40 subjects met inclusion criteria's, of which 31 had hamstring graft and 9 had patellar tendon graft. 35% of subjects with hamstring graft had weakness in the extensor mechanism of the knee, 13 had weakness in flexors and extensors (29% greater in extensors and 13% greater in flexors), 13% presented weakness in flexors and 10% had weakness in the extensors of the non-surgical knee. 9 subjects had a patellar tendon graft, of which 56% had weakness in extensors and 44% demonstrated weakness in both extensors and flexors (greater in extensors).

**CONCLUSIONS:**

Overall, our subject's demonstrated increased weakness in the extensor mechanism of the knee in both patellar tendon and hamstring graft groups.

3215 Board #120 June 2 3:30 PM - 5:00 PM

**Diminished Ventilatory Responses During Post-Exertional Malaise Contributes to Exercise Intolerance in Myalgic Encephalomyelitis/Chronic Fatigue Syndrome**

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(No relationships reported)

Reduced functional capacity and post-exertional malaise following physical activity are hallmark symptoms of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). The mechanisms producing exercise intolerance in the post-exertional state have not been adequately described. **PURPOSE:** To compare the ventilatory response

to repeated exercise stress in control and ME/CFS subjects. **METHODS:** 40 female subjects were recruited for the study, 20 ME/CFS patients and 20 age and weight matched controls. All underwent two maximal exercise tests 24 hours apart. Oxygen consumption, minute ventilation ( $V_E$ ), tidal volume (TV), respiratory rate (RR), end-tidal oxygen and carbon dioxide ( $ET_{O_2}/ET_{CO_2}$ ) were measured at rest, at the anaerobic threshold, and at maximal exercise. Multivariate analyses were performed for group (ME/CFS vs control), test (exercise test 1 vs test 2), and condition (rest vs anaerobic threshold vs maximal exertion) with univariate follow up. **RESULTS:** 15 ME/CFS subjects and 18 control subject reached criteria for maximal effort. The overall multivariate analysis was significant for group and condition. Follow-up univariate and post-hoc showed  $VO_{2E}$ ,  $V_E$  and TV were lower in the ME/CFS group only on exercise test 2. Post hoc for condition was significant for ventilation at maximal exercise only. Respiratory rate,  $ET_{O_2}$ , and  $ET_{CO_2}$  were not different between tests or groups. **CONCLUSION:** In the absence of a second exercise test, the lack of any significant differences for the first test would appear to suggest no exercise intolerance in ME/CFS patients. However, the results from the second test indicate the presence of exercise intolerance and post-exertional malaise. Diminished ventilatory responses accompany reductions in work output and oxygen consumption during post exertional malaise in ME/CFS patients.

3216 Board #121 June 2 3:30 PM - 5:00 PM

**Leg Blood Flow and Fatigability In People With Type 2 Diabetes**

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(No relationships reported)

We have previously demonstrated that people with type 2 diabetes mellitus (T2D) have greater fatigability of the knee extensor muscles during a dynamic fatiguing contraction due to impairments within the skeletal muscle; however, the precise mechanism(s) are unknown. **PURPOSE:** To determine if impairments in leg blood flow are associated with greater fatigability of the knee extensor muscles during a dynamic fatiguing contraction in men and women with T2D.

**METHODS:** 5 individuals with non-insulin dependent T2D (60 - 70 years; 3 women) with no signs of diabetic neuropathy were matched based on age, BMI and physical activity with four non-diabetic controls (CON) (60 - 68 years; 2 women). Physical activity was assessed over four days with a tri-axial accelerometer. To assess fatigability, participants performed a 6-minute single-limb dynamic fatiguing contractions with the knee extensors while seated at 90° of hip and knee flexion. 120 maximal voluntary concentric contractions (MVCCs) were performed with a load equivalent to 20% maximal voluntary isometric contraction torque through a 90° range of motion. Doppler ultrasonography was used to assess femoral artery diameter and pulse wave blood velocity before and immediately after the dynamic fatiguing contraction.

**RESULTS:** The reduction in MVCC power was greater for T2D ( $40.5 \pm 17.6\%$ ) compared with CON ( $31.3 \pm 20.8\%$ ,  $P < 0.05$ ) as assessed at the end of exercise. T2D and CON both demonstrated similar increases in leg blood flow after the dynamic fatiguing contraction ( $71.7 \pm 41.1\%$  vs.  $69.0 \pm 37.3\%$ , respectively;  $p > 0.05$ ).

However, greater reductions in MVCC power (i.e. greater fatigability) was associated with lower blood flow following dynamic fatiguing contractions ( $p = 0.034$ ,  $r = 0.633$ ).

**CONCLUSIONS:** Greater fatigability of the knee extensor muscles during dynamic fatiguing contractions was associated with lower blood flow. Impaired blood flow responses to exercise may limit exercise performance among T2D, and this work highlights the need for future studies that examine skeletal muscle perfusion during dynamic exercise in people with T2D.

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3217 Board #122 June 2 3:30 PM - 5:00 PM

**Prolonged Bouts Of Sedentary Behavior Are Associated With Cardiometabolic Disease Risk Factors In Young Adults**

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Research indicates sedentary behavior is associated with obesity and cardiometabolic disease (CMD) risk factors. Less understood is the effect of prolonged bouts of sedentary time on CMD risk factors, particularly in young adults. **PURPOSE:** To determine the associations among prolonged bouts of sedentary behavior and CMD risk factors in young adults. **METHODS:** 125 men (n=29) and women (n=96) participated in the study (mean  $\pm$  SD: age 22.8  $\pm$  4.8 y; BMI 26.4  $\pm$  4.7 kg/m<sup>2</sup>; body fat 29.1  $\pm$  9.4%; and  $VO_{2peak}$  40.9  $\pm$  8.3 mL/kg/min). Sedentary behavior ( $<150$  counts/min) and moderate-to-vigorous physical activity (MVPA,  $>2689$  counts/min) were measured by an accelerometer worn during waking hours for 7 consecutive days.

Sedentary bouts were defined as greater than or equal to 20, 30 and 60 min. Body composition, waist circumference, blood pressure, glucose, insulin, triglycerides (TG), high-density lipoprotein, and low density lipoprotein (LDL) cholesterol were measured. Multiple regression analyses were used to assess associations among variables, while controlling for age, sex, race/ethnicity, accelerometer wear time and MVPA. RESULTS: Total time spent in sedentary behaviors averaged  $8.7 \pm 1.5$  h/day. Sedentary bouts greater than or equal to 20, 30 and 60 min accounted for 36%, 23%, and 6% of total sedentary time, respectively. The average length for bouts of greater than or equal to 20, 30, and 60 min was  $33.7 \pm 4.1$  min,  $45.6 \pm 6.6$  min and  $63.7 \pm 40.5$  min, respectively. Sedentary bouts of 20 min or more had the strongest relationships with CMD risk factors, compared to bouts of 30 and 60 min or more. Time spent in sedentary bouts of 20 min or more was independently associated with BMI ( $R^2=0.13$ ,  $\beta=0.24$ ,  $p=0.01$ ), waist circumference ( $R^2=0.15$ ,  $\beta=0.25$ ,  $p=0.01$ ), LDL ( $R^2=0.28$ ,  $\beta=0.27$ ,  $p<0.01$ ), TG ( $R^2=0.11$ ,  $\beta=0.25$ ,  $p=0.02$ ), insulin ( $R^2=0.55$ ,  $\beta=0.25$ ,  $p<0.01$ ), and fat mass ( $R^2=0.23$ ,  $\beta=0.27$ ,  $p<0.01$ ), after adjusting for all covariates. CONCLUSIONS: Our novel findings suggest that sedentary behavior, in bouts of 20 min or more, is significantly and independently associated with markers of CMD in young adults. These findings have important implications for CVD prevention programs for young adults and suggest that public health guidelines with regards to minimizing prolonged sedentary behaviors are warranted. Funded by NIH 1U54GM104944

3218 Board #123 June 2 3:30 PM - 5:00 PM

### Superior Acute Effects of High-Intensity Interval Exercise in Type 2 Diabetes Patients: A Pilot Study

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(No relationships reported)

**PURPOSE:** High-intensity interval training (HIIT) is a time-efficient intervention for preventing and treating type 2 diabetes (T2D). Rate of perceived exertion scale (RPE) is a simple and inexpensive tool for prescribing and self-regulating exercise. Our purpose was to analyze the hemodynamic and metabolic response to a HIIT session prescribed and self-regulated by RPE ( $HIIT_{RPE}$ ) in T2D patients.

**METHODS:** Ten (two males) T2D patients (time since diagnosis =  $9.1 \pm 1.7$  yr) aged  $50.7 \pm 2.8$  yr underwent a symptom-limited CPX on a treadmill to determine their heart rate (HR) response to exercise. Patients were then assigned to perform of  $HIIT_{RPE}$  (4 min of warm-up and 21 min of jogging/running at 15-17 (1 min) alternating with walking at 9-11 (2 min) on the 6-20 RPE scale),  $HIIT_{HR}$  prescribed and regulated by HR response to CPX ( $HIIT_{HR}$ , 4 min of warm-up and 21 min of jogging/running at 85% (1 min) alternating with walking at 50% (2 min) of reserve HR), continuous moderate exercise (CME) prescribed and self-regulated by RPE (30 min of walking at 11-13 on the 6-20 RPE scale), and control session (CON, sitting in a quiet environment) in a random order (3 to 7 days between intervention). Capillary glucose, endothelial function and carotid-femoral pulse wave velocity (PWV) were assessed before, immediately after and 45 min after each intervention. 24-h ambulatory blood pressure (ABP) after each intervention.

**RESULTS:** Exercise distance was not different between all interventions. Exercise HR and speed were also not different between  $HIIT_{RPE}$  and  $HIIT_{HR}$ . T2D patients showed similar reductions in capillary glucose after  $HIIT_{RPE}$  ( $21.9 \pm 4.0\%$ ) and  $HIIT_{HR}$  ( $25.2 \pm 4.8\%$ ), which were greater ( $P < 0.05$ ) than the observed after CME ( $16.4 \pm 6.2\%$ ). T2D patients also showed similar nighttime ABP reductions after  $HIIT_{RPE}$  and  $HIIT_{HR}$  when compared to CON; but the reduction was statistically significant ( $P < 0.05$ ) only after  $HIIT_{RPE}$ . No ABP reductions was found after CME. No significant differences on endothelial function and PWV were observed during all interventions.

**CONCLUSION:** HIIT was superior to CME to acutely reduce capillary glucose and ABP, independently if it was prescribed and regulated by RPE or the HR response to CPX. This result suggest that the 6–20 RPE scale may be an efficient tool for prescribing and self-regulating HIIT in T2D patients.

3219 Board #124 June 2 3:30 PM - 5:00 PM

### Energy Expenditure in Yoga versus Other Forms of Physical Activity

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It is currently not clear whether yoga is an activity that meets the requirements for moderate-to-vigorous physical activity and how yoga compares in intensity to other forms of physical activity.

**PURPOSE:** This study compared energy expenditure during acute bouts of Vinyasa yoga (YOGA) and two treadmill walking protocols. **METHODS:** Data from were available on 28 participants (15 males, 13 females) who performed three 60-minute activity bouts on separate days that included: 1) YOGA, 2) treadmill walking at a self-selected brisk pace (SELF), 3) treadmill walking at a pace that matched their HR to that of their yoga session (HR-MATCH). Energy expenditure (kcal and metabolic equivalent of task [MET]) was measured with indirect calorimetry. **RESULTS:** When examining the entire 60 minute period of activity, energy expenditure was significantly lower in YOGA ( $285.1 \pm 71.6$  kcal,  $3.7 \pm 0.6$  MET/min) compared to both HR-MATCH ( $367.3 \pm 93.7$  kcal,  $p < 0.001$ ;  $4.9 \pm 0.8$  MET/min,  $p < 0.001$ ) and SELF ( $329.2 \pm 82.1$  kcal,  $p = 0.003$ ;  $4.4 \pm 0.7$  MET/min,  $p < 0.002$ ), and in HR-MATCH compared to SELF (p-value for kcal = 0.012; p-value for MET/min = 0.016). Because the final 15 minutes of the YOGA session was restorative in nature, data analysis was repeated using only the initial 45 minutes of each activity session. For these analyses, energy expenditure was significantly lower in YOGA ( $234.0 \pm 57.8$  kcal,  $4.1 \pm 0.6$  MET/min) compared to HR-MATCH ( $306.0 \pm 77.6$  kcal,  $p < 0.001$ ;  $5.4 \pm 0.9$  MET/min,  $p < 0.001$ ) but not SELF ( $242.8 \pm 60.7$  kcal,  $p = 0.393$ ;  $4.3 \pm 0.7$  MET/min,  $p = 0.650$ ), and in HR-MATCH compared to SELF (p-value for kcal  $< 0.001$ ; p-value for MET/min  $< 0.001$ ). Gender did not significantly influence the pattern of the results observed.

**CONCLUSIONS:** Across a 60-minute period, energy expenditure in YOGA is significantly lower than both SELF and HR-Match. When the restorative component of YOGA was removed from the analysis, energy expenditure in YOGA was comparable to SELF. Moreover, YOGA met the energy expenditure requirement ( $> 3$  METs) for moderate-intensity physical activity, and therefore is likely to elicit health benefits similar to walking performed at a self-selected brisk walking pace. Interventions to directly compare YOGA to other forms of physical activity are warranted.

3220 Board #125 June 2 3:30 PM - 5:00 PM

### Physical Activity and Physical Functioning in Persons with Down Syndrome

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(No relationships reported)

Persons with Down syndrome (DS) are generally considered to be less active than the general population. However, limited objective accelerometer data exist on their levels of physical activity (PA) and sedentariness. Furthermore, PA and sedentariness may be associated with low levels of physical functioning in persons with DS. **PURPOSE:** To examine the levels of PA and sedentariness in persons with DS, and whether these are associated with measures of physical functioning. **METHODS:** Seventeen persons with DS (9 women and 8 men; age  $28 \pm 14$  y) participated in this study. They wore for 7 days on their right wrist an accelerometer (GT3X+, Actigraph). PA variables, time spent sedentary, and the percent of participants meeting the PA Guidelines for Americans were determined with the Freedson cut-points. Physical functioning variables included performance during the timed-up-and-go (TUG) test, as well as the distance covered and the energetic cost (oxygen uptake per meter measured with portable spirometry) during the 6 min walk (6MW) test. **RESULTS:** Participants accumulated an average of  $83 \pm 164$  min per week of moderate-to-vigorous PA in bouts at least 10 min in duration. Only two participants with DS (12% of the sample) met the recommended amount of 150 min of weekly moderate-to-vigorous PA, and 15 participants (88%) did not. Participants performed light PA for  $1427 \pm 241$  min per week ( $\sim 3.5$  h per day). Mean sedentary time was  $3210 \pm 210$  min per week ( $\sim 7.5$  h per day). Mean performance on the TUG was  $9.82 \pm 3.22$  s. Mean distance covered during the 6MW test was  $284.7 \pm 113.7$  m and mean walking speed was  $0.79 \pm 0.32$  m  $\cdot$  s<sup>-1</sup>. The energetic cost during the 6MW was  $0.34 \pm 0.12$  ml  $\cdot$  kg<sup>-1</sup>  $\cdot$  m<sup>-1</sup>. Light PA had moderate and significant associations with TUG performance, 6MW distance, and 6MW energetic cost ( $r = 0.61$ ,  $0.61$ , and  $0.66$ , respectively;  $p < 0.03$ ). In addition, 6MW distance was associated with time spent sedentary ( $r = 0.55$ ;  $p = 0.02$ ). Low and

non-significant correlations were found between measures of physical functioning and other PA variables. **CONCLUSION:** Persons with DS have low levels of PA and high levels of sedentariness. Most persons with DS do not meet the PA Guidelines for Americans. They also have low levels of physical functioning. Lower levels of physical functioning are associated with greater participation in light PA among persons with DS.

**F-56 Free Communication/Poster - Descriptive Epidemiology and Surveillance**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

**3221 Board #126 June 2 2:00 PM - 3:30 PM Screen Time, Physical Activity, And Bmi Among Hispanic Children In Puerto Rico**

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(No relationships reported)

Screen time (ScT) represents a behavior usually, but not always, associated with reduced physical activity, and increased sedentary time and BMI among children. Childhood obesity is a major health problem, particularly among Hispanic children in Puerto Rico (PR). Little information is available regarding ScT and its association with BMI and moderate to vigorous physical activity (MVPA) in this population. **PURPOSE:** To evaluate ScT, including the use of passive vs. active video games (PVG and AVG), MVPA, and BMI among 6-8-year-old Hispanic children in PR. **METHODS:** A convenience sample of 100 children (54 boys and 46 girls) wore an accelerometer attached to an elastic band over the right hip area for 7-days, and their parents completed a physical activity questionnaire including information regarding their children's screen time. T-tests were conducted to detect sex differences, and correlation analyses to detect associations between variables. **RESULTS:** Total screen time (2.1±1.5 hrs/day), including PVG (0.4±0.6 hrs/day) and AVG (0.1±0.4 hrs/day), and MVPA (4.1±0.9 hrs/day) were not significantly different between boys and girls. An inverse correlation was observed between MVPA and AVG ( $\rho = -0.20$ ,  $P = 0.04$ ). No other significant correlations were detected between ST, MVPA, and BMI. **CONCLUSION:** ScT in the group of Hispanic children evaluated was in the recommended limit, and appear not to affect their level of MVPA, which exceeded current recommendations. They appear to spent more time using PVG than AVG, and those that spent more time in AVG also spent less time in MVPA. These results support other studies suggesting that ScT does not influence MVPA or BMI in young children.

**3222 Board #127 June 2 2:00 PM - 3:30 PM Comparison Of Step Count During A Bout Of Pokémon Go Vs Traditional Aerobic Exercise**

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Traditional video game use employs sedentary behavior but exergames allow for such games to involve physical activity (PA). Pokémon Go is a live, real-time version of a popular video game involving the use of a mobile device's GPS capability to locate, capture, battle, and evolve virtual characters. Users transport to physical locations to advance in the game, meanwhile potentially using a mode of PA during play. **Purpose:** To compare the number of steps taken when playing Pokémon Go to a traditional bout of aerobic exercise, walking at a self-selected pace. **Methods:** Seventeen regular Pokémon Go users ages 18-65 years old wore a pedometer on their waist while playing the popular reality game for 30-minutes and walking for 30-minutes at a self-selected pace. The order of events were randomized and the game was played either as an individual or in a group depending upon the participant's normal type of play. Regular PA patterns and distance traveled (km) during habitual play were self-reported. A paired-sample t-test compared the number of steps taken during each activity; Pearson's correlations evaluated potential relationships between step count, type of play, distance traveled, and regular PA patterns. **Results:** Users were primarily intermediate or advanced players of the game (94%) and average level of play was  $21 \pm 5$  (range 8-30). Mean step count while playing Pokémon Go was  $2992 \pm 548$  vs  $3379 \pm 206$  when walking at a self-selected pace for an equivocal amount of time ( $P = 0.009$ ). Users accumulated an average of 388 fewer steps during 30-minutes of Pokémon Go than with traditional walking outdoors. Steps taken during the 30-min walk were significantly associated with regular PA patterns ( $r = 0.594$ ,  $p = 0.012$ ). No associations were noted between type of play and distance traveled in habitual play or step count of the study session. **Conclusion:** Significantly less steps were taken during

a 30-minute bout of Pokémon Go than participating in a traditional walk. However, the practical implications of the data imply a relatively small difference in overall PA in 388 steps. Playing the exergame as an individual or in a group did not influence steps taken during the study or km traveled during habitual play.

**3223 Board #128 June 2 2:00 PM - 3:30 PM Patterns of Objectively-assessed Sedentary Behavior in Community-dwelling Japanese Older Adults**

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(No relationships reported)

Accumulated evidence suggests greater time spent in sitting is associated with adverse health outcomes. However, limited data on how sedentary behavior (SB) is patterned in older adults. **PURPOSE:** To examine patterns of objectively-assessed SB classified by duration of bout in community-dwelling Japanese older men and women. **METHODS:** This cross-sectional study included 450 Japanese older adults (255 men, 70-79 years) who were randomly selected from resident registries and provided valid data (wearing at least four days of  $\geq 10$  hours/day) of accelerometer (HJA-350IT, Omron Healthcare, Japan). Descriptive analyses of the duration (min/day) and number of bouts (times/day) of SB ( $\leq 1.5$  METs) were conducted, stratified by gender. Total SB time was further divided into five types according to the duration of SB: 1-9 min, 10-19 min, 20-29 min, 30-59 min, and  $\geq 60$  min. Gender differences in patterns of SB were assessed using analysis of covariance (ANCOVA) after adjusting for age and wear time. **RESULTS:** The adjusted mean SB time (min/day) in men and women was 561.8 and 469.3, respectively ( $P < 0.001$ ), and number of SB bouts (times/day) was 57.0 in men and 61.3 in women ( $P < 0.001$ ). The number of SB bouts of less than 10 min was 42.9 in men and 49.4 in women ( $P < 0.001$ ). On the other hand, the number of SB bouts of lasting 20-29 min was 2.9 and 2.3 in women, that of 30-59 min was 3.5 in men and 2.5 in women, and that of at least 60 min was 1.6 in men and 1.1 in women (all  $P < 0.001$ ). Time accumulated by short-bout (1-9 min) SB in women was significantly longer than men (men:114.7, women:128.3), whereas time accumulated by long-bout SB in women was significantly shorter than men (20-29 min SB; men:70.4, women:55.6, 30-59 min SB; men:143.4, women:103.1, and  $\geq 60$  min SB; men:148.4, women:100.2). **CONCLUSIONS:** Older women were less likely to be prolonged sedentary with more frequent interruption compared to older men. Effect of patterns of SB on health outcomes may differ by gender.

**3224 Board #129 June 2 2:00 PM - 3:30 PM Exploring Associations Between Greenspace, Physical Activity, And Health Outcomes: Results From The 2011-2015 Illinois BRFS**

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**PURPOSES:** 1) To examine spatial effects of green space on health outcomes at various levels of geography; 2) To examine the potential mediating effect of physical activity on the relationship between green space and health outcomes. **METHODS:** Socio-demographic (e.g., sex, race, poverty, age) and health outcome variables (e.g., obesity, diabetes, heart disease, and mental health) were derived from the 2010-2015 Illinois Behavioral Risk Factor Surveillance System (BRFSS). Measures of green-space were created using tree canopy data from the 2011 National Land Cover Dataset (NLCD). Residential area was defined using measures of urban density by counting dwellings per 10 hectares. Green space was calculated for three levels of buffers, specifically 300m, 500m, 1km for each residential unit and the entire county where the residential unit was located. ArcGIS 10.3 (ESRI, CA), was used to geoprocessing all data. Residential green space was used as the primary independent variable while accounting for socio-demographic variables in regression analysis. **RESULTS:** Due to missing data, only 78 of 102 Illinois counties (76.47 %) were included in the analysis. The amount of green space, regardless of buffer level, has no association with health outcomes. Physical activity explained a significant proportion of variance only for diabetes all measures of green space: 300m, 500m, and 1000m for residential units ( $\beta = -.12$ ,  $p < .03$ ;  $R^2 = .30$ ,  $p < 0.001$ ); county level ( $\beta = -.14$ ,  $p < .02$ ;  $R^2 = .31$ ,  $p < .001$ ). **CONCLUSIONS:** Although county level green space was negatively associated with physical activity, residential green space showed no association. This difference supports the importance of appropriately defining geographical units used for large-scale population-based. Further studies clarifying geographic units of analysis are required.

3225 Board #130 June 2 2:00 PM - 3:30 PM  
**The Impact of Public Transportation on Daily Walking Level**  
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 (No relationships reported)

Background: Only 21% of the U.S. adults meet the recommended level of physical activity: 150 minutes of moderate intensity of physical activity per week, or 75 minutes of vigorous intensity of physical activity per week. Transportation is recognized as one of the most influential domains determining people's daily physical activity level. There are a few studies looked at the walking level of public transit users as well as socio-demographic traits. This study examined walking time difference between public transit users and non-public transit users to articulate how much walking time is derived from transit related walking more clearly, and how demographic characteristics differ among the two groups. Purpose: To investigate and articulate the impact of public transit on the walking activity level within the U.S. population in order to advocate the ongoing public transit improvement projects and policy changes toward walkable communities. Methods: The National Household Travel Survey conducted from March 2008 to May 2009 by the U.S. Department of Transportation was used to examine the association between public transit use and walking trip time for an assigned travel day. Multivariate linear regression model was applied to estimate the difference of walking time in minutes per day between public transit users (n=2,835) and non-public transit users (n=165,969). Results: People who used any forms of public transit walked 35.2 minutes more than people who did not use public transit during one travel day (p<0.01). 27.0 minutes of the 35.2 minutes difference was gained exclusively from transit related walking which includes access from or to public transit. In addition, people in low income group, minority population groups such as African American and Hispanic, people residing in bigger cities, and people perceiving the lack of access or availability of public transit as a big issue had longer daily walking time compared to the other groups (p<0.01). Conclusion: There is a significant association between public transit use and daily walking time. The results of this study will add on an evidence to the positive impact of public transit on physical activity level, and support ongoing project of public transit improvement, such as railway extension, as well as policy enactments with respect to public transit system.

3226 Board #131 June 2 2:00 PM - 3:30 PM  
**Social Network Engagement and Adherence with Physical Activity Recommendations; The American Time Use Survey**  
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Physical activity has numerous benefits in both primary and secondary prevention of chronic diseases. Current estimates suggest that most adults are not meeting the minimum recommended levels (PA-R) of leisure time physical activity (LT-PA) and these levels of adherence can vary by sociodemographic factors. Individuals' social networks may impact their health behavior choices through interpersonal support mechanisms. Many LT-PA intervention studies have utilized "buddy systems" or social network engagement (SNE), as a method of promoting adherence. Thus far, there have been no large-scale, population based examinations of the relationship between SNE and adherence to PA-R. **PURPOSE:** The current study used nationally representative data from the American Time Use Survey dataset to test the relationship between Social Network Engagement (SNE) and participants' adherence to minimum recommendations (PA-R) during leisure-time physical activity (LT-PA), and the impact of socio-demographic factors. **METHODS:** Data were collected from each cross sectional year (2003-2014) of the American Time Use Survey dataset. *Leisure Time-Social Network Engagement (SNE)* was conceptualized as the participation of LT-PA with a member of an individual's social network. *Adherence to PA Recommendations (PA-R)* was calculated using an estimation of physical activity intensity through the PA compendium MET values and corresponding activity codes. MET-weighted minutes of LT-PA were dichotomized into a PA-R adherence estimation. **RESULTS:** The data were stratified by gender for the analysis. Age group, the only significant covariate, was controlled for in the models presented here. Men (OR = 1.53; 95% CI: 1.11 to 2.11) and women (OR = 2.52; 95% CI: 1.90 to 3.34) engaging their social network during reported LT-PA were more likely to meet PA-R compared to participating alone. Men engaging a friend (OR = 2.80; 95% CI: 1.84 to 4.25) and women engaging a family member (OR = 4.39; 95% CI: 2.37 to 8.12) or a friend (OR: 3.08; 95% CI: 2.10 to 4.51) during LT-PA were more likely to meet PA-R compared to participating alone, and when controlling for age and other forms of SNE. **CONCLUSIONS:** Social Network Engagement is associated with meeting PA-R. This relationship varies by gender and the type of SNE, but not other common sociodemographic factors.

3227 Board #132 June 2 2:00 PM - 3:30 PM  
**Reported Walkable Destinations Across Age Groups Among US Adults — 2015**  
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 (No relationships reported)

The *Guide to Community Preventive Services* recommends community-scale design strategies as a way to increase physical activity. One example of this strategy is locating residences within walking distance of other destinations. Physical activity participation declines with increasing age. It is unclear if the prevalence of near-home walkable destinations also declines with age. **PURPOSE:** To describe the prevalence of four types of walkable destinations across age groups in a representative sample of US adults aged ≥18 years. **METHODS:** Respondents to the 2015 National Health Interview Survey reported the presence of four walkable destination types near their home: shops, stores, or markets; bus or transit stops; movies, libraries, or churches; and places that help one relax, clear one's mind, and reduce stress. The proportion reporting each was calculated and stratified by age group. Differences between age groups were assessed with Wald tests corrected for multiple comparisons; trends were tested with orthogonal contrasts. **RESULTS:** Overall, 71.8% reported walkable relaxing destinations, followed by shops (58.0%); transit (53.2%); and movies, libraries, or churches (47.5%). For shops; transit; and movies, libraries, or churches, adults aged 18–34 years reported similar values, beyond which the prevalence was progressively lower with increasing age (all p<0.05 for trend, Table). For relaxing destinations, the prevalence was similar among adults aged 18–44 years, and lower among those aged 45–64 and ≥65 years. **CONCLUSIONS:** In general, the prevalence of walkable destinations among adults was lower with increasing age, and most consistently among adults aged ≥45 years. Community-scale design, including locating residences and other destinations within walking distance, can help promote physical activity across all ages. Addressing differences in the presence of walkable destinations between older and younger adults may be a community design priority.

% Reporting Walkable Destinations								
Age (years)	Shops, stores, markets		Bus or transit stops		Movies, libraries, churches		Places to relax, reduce stress	
	%	95% CI	%	95% CI	%	95% IC	%	95% CI
18-24	71.5a	68.8-74.1	62.7a	59.7-65.6	58.9a	56.0-61.7	75.8a	73.3-78.2
25-34	67.8a	65.6-69.9	62.1a	59.7-64.5	55.8a	53.5-58.1	76.4a	74.7-78.1
34-44	60.5	58.3-62.6	56.0	53.6-58.3	49.6	47.6-51.7	74.7a	72.7-76.6
45-64	54.3	52.5-56.0	49.6	47.9-51.3	44.8	43.3-46.3	71.3	69.9-72.7
≥65	44.7	42.8-46.6	42.8	40.8-44.7	35.2	33.5-36.9	63.3	61.5-65.0

Within columns, values with the same letter are not significantly different (p>0.05)

3228 Board #133 June 2 2:00 PM - 3:30 PM  
**The Effect of Ramadan Month on Changes in Objectively Assessed Physical Activity in Adults**  
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Ramadan is the Islamic month, when Muslims around the world participate in an intermittent fast for 29 to 30 days as a part of their religious obligation. During this period, Muslims abstain from eating and drinking during daylight hours. Studies have shown that Ramadan fasting has negative influence on sleep, physical performance and attention. However, the effects of Ramadan fasting on physical activity are not clear. **PURPOSE:** To determine the impact of Ramadan month on objectively assessed physical activity among Muslim adults. **METHODS:** Around 802 Muslim adults (Males 51.7%) ages ranging from 18 to 60 years, were sampled from a national community health program in Qatar representing two consecutive years. Physical activity was assessed daily using a pedometer (Omron HJ-720 ITC). Daily average step count and aerobic step count during the days of Ramadan month was compared during non-Ramadan months (one month prior and one month after Ramadan). For this longitudinal study design, a linear mixed model statistical procedure was adopted to adjust for demographic and environmental factors to test the study hypothesis.

**RESULTS:** Objectively assessed physical activity, i.e. daily average step counts per day, declined during the month of Ramadan compared to non-Ramadan months in this population. The average daily steps per day during Ramadan month was 7,267 (95% CI 7,180 to 7354) steps. When compared to one month prior Ramadan there was an average reduction of 619 steps (95% CI 483 to 755) per day  $p < 0.001$ . The decline in physical activity during Ramadan was higher men (-729±74) steps compared to women (-490±81). However, one month post Ramadan the physical activity levels defined by daily average step counts increased by average 548 steps (95% CI 407 to 688) compared to Ramadan ( $P < 0.001$ ) and were similar to pre-Ramadan month ( $P = 0.692$ ).

**CONCLUSIONS:** This study confirmed that in this population, due to the shift in time of activity as well as calorie intake from daylight to evening hours during Ramadan there was substantial decline in objectively assessed daily physical activity among Muslim adults. Interventions are needed to promote physical activity during this period.

3229 Board #134 June 2 2:00 PM - 3:30 PM  
**Changes in Body Height And Weight Of Children And Adolescents In China During 1943-2014**  
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 (No relationships reported)

**PURPOSE:** To compare body height and weight of 5-19 years old children and adolescents between 1943 and 2014 in China, and to determine the change in morphological development in Chinese children and adolescents over 71 years.  
**METHODS:** Based on the Student Physical Standard (made by the Physical Education Committee of the Ministry of Education of China, with unknown sample size) in 1943 and the National Physical Fitness Surveillance Report (from the General Administration of Sport of China, with sample size of 358725.) in 2014, the data in body height and weight of 5-19yr boys and 5-17yr girls were compared. The difference of height and weight average of children and adolescents in each age, and the growth of each age were calculated. And contrast chart were generated. Due to the sample size data could not be obtained when the Student Physique Standard is established, in this study we couldn't test the mean difference. Therefore this study used simple statistical description to reflect the growth trend of children and adolescents. **RESULTS:** The average height in each age for boys between 5-19yr and girls between 5-17yr in 2014 was significantly higher than that in 1943, the differences were 4.6(19yr)-20.4(13yr) cm for boys and 3.4(17yr)-14.7(11yr)cm for girls. The average weight in each age for boys between 5-19yr and girls between 5-17yr in 2014 was significantly higher than in 1943, and the differences were 2.4(5yr)-14.8(13yr)kg for boys and 1.2(5yr)-11.6(11yr) kg for girls. In 1943, boys between 5-14yr were at a lower physical development level than girls, but boys after 14yr were at a higher physical development level than girls. However, in 2104, boys between 10-11yr were at a similar physical development level compared to girls, in each of the other ages boys were at a higher level than girls. In 1943, the height growth spurt periods were from 12-13yr in girls and from 15yr in boys, and the weight growth spurt periods were from 12-15yr in girls, and from 14-15yr in boys. In 2014, the growth spurt periods for both height and weight were 11yr in girls and 13yr in boys. **CONCLUSION:** Compared to the data collected in 1943, Chinese children in 2014 were higher and heavier. Moreover, a 1-2 years gap was also observed in terms of the growth spurt age. Supported by the Sports Medicine key laboratory of General Administration of Sport of China(A2015C06).

3230 Board #135 June 2 2:00 PM - 3:30 PM  
**Physical Literacy of 8-12 Year Old Children in Prince Edward Island, Canada**  
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 (No relationships reported)

**PURPOSE:** Physical literacy is defined as the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engaging in physical activities for life. The purpose of the present study was to assess the physical literacy of children and youth living in Prince Edward Island, Canada, using preliminary results from the RBC Canadian Assessment of Physical Literacy (CAPL).

**METHODS:** The CAPL includes tests in 4 domains: Motivation and Confidence (CSAPPA Questionnaire), Knowledge and Understanding (CAPL Physical Activity Questionnaire), Physical Competence (BMI, waist circumference, grip strength, PACER test, plank, sit and reach, and obstacle course), and Daily Behaviour (objectively measured steps/day and self-reported physical activity and sedentary behaviour). The scoring categories for each domain were: Beginning, Progressing, Achieving, or Excelling, with Achieving considered the minimum recommended score.  
**RESULTS:** Data were collected on 205 boys and 202 girls aged 8-12 years (mean: 10.7±1.1 years). The proportion of participants identified as Achieving or Excelling

in each domain was as follows: Motivation and Confidence: 40%; Knowledge and Understanding: 66%; Daily Behaviour: 64%; Physical Competence: 39%; Overall Physical Literacy: 63%.

**CONCLUSIONS:** Although two-thirds of participants were considered to have met the minimum recommended level of Knowledge, Daily Behaviour, and overall Physical Literacy, only a minority of children met the minimum recommended levels of Physical Competence and Motivation and Confidence.

**FUNDING:** Research funding was provided by the Children's Hospital of Eastern Ontario Research Institute through the RBC Learn to Play project, delivered in partnership with ParticipACTION and the Public Health Agency of Canada.

3231 Board #136 June 2 2:00 PM - 3:30 PM  
**Geographical Distribution, Socioeconomic Status And Health-related Physical Fitness In Adolescents From A Large Population-based Sample From Bogotá, Colombia: The Ser Study**

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**PURPOSE:** The negative gradient between socio-economic status and prevalence of non-communicable disease in adulthood has prompted investigation of potential foundations based in childhood. The objective of the present study is to examine the influence of socio-geographical variations and socioeconomic status on health-related physical fitness in adolescents from a large population-based sample of Colombian ninth graders.

**METHODS:** During the 2014-2015 school years, we examined a cross-sectional component of the SER Study is a cross-sectional Body mass, height, muscular fitness (standing broad jump and handgrip tests) and cardiorespiratory fitness (20 m shuttle-run) were measured in n=52,204 14-16-year-olds. Area-level socioeconomic status was categorized from 1 to 6. A model was built by means of a step-by-step process and gradient maps were created to show physical fitness in the quartiles and the trend of physical fitness across disaggregated in Zonal Planning Units (in Spanish UPZ) in Bogotá, for each of the five health-related physical fitness variables.

**RESULTS:** Socioeconomic status was used as the only group-level variable and this had a significant effect on the models for all health-related physical fitness parameters except for handgrip. Cardiorespiratory fitness, standing broad jump, and body mass index increased 6.31, 2.69, and 1.45 times, respectively, on average with the maximum increase in socioeconomic status categories, when we compared two random individuals in each stratum.

**CONCLUSIONS:** Our results suggest a significant association between health-related physical fitness variables and socio-geographical location in ninth grade adolescents from Bogotá, using a multilevel methodological approach.

3232 Board #137 June 2 2:00 PM - 3:30 PM  
**Trends in Walking for Transportation or Leisure Among U.S. Adults — National Health Interview Survey, 2005-2015**

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**BACKGROUND:** Physical activity confers considerable health benefits, but only half of U.S. adults report achieving levels of aerobic physical activity consistent with current guidelines. Walking is an excellent way for most people to increase their physical activity. The prevalence of walking among adults increased by 6 percentage points from 2005 to 2010, but it is unknown whether this increase has been sustained.

**PURPOSE:** To evaluate trends in the prevalence of walking for transportation or leisure among U.S. adults between 2005 and 2015.

**METHODS:** Nationally representative data from the 2005, 2010 and 2015 National Health Interview Survey (NHIS) cancer control supplements (n=78,741) were analyzed

to estimate the age-adjusted prevalence of self-reported walking among adults  $\geq 18$  years. Walking was defined as engaging in at least one 10-minute bout of transportation or leisure walking in the past seven days. Estimates are reported for the total sample and stratified by sex. Linear and quadratic trends in walking prevalence from 2005 to 2015 were tested using logistic regression.

**RESULTS:** The overall prevalence of self-reported walking increased significantly from 2005 to 2015, although a leveling off was observed between 2010 and 2015 (2005: 55.7%, 2010: 62.1%, 2015: 63.9%; p-value for linear and quadratic trends <math>\leq 0.05</math>). A similar trend was observed among men, with no significant difference in prevalence between 2010 and 2015 (2005: 54.3%, 2010: 61.8%, 2015: 62.8%; p-value for linear and quadratic trends <math>\leq 0.05</math>). Among women, the prevalence of walking demonstrated a significant linear increase from 2005 to 2015 with no significant quadratic trend; the increase in prevalence between 2010 and 2015 was significant (2005: 57.5%, 2010: 62.5%, 2015: 65.1%; p-value for linear trend only <math>\leq 0.05</math>).

**CONCLUSION:** Overall, the proportion of U.S. adults who reported walking significantly increased from 2005 to 2015; however, the results suggest that this increase has slowed in recent years, especially among men. This finding highlights the importance of implementing effective programs and policies that promote walking and improve the walkability of communities, as described in *Step it Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities*.

3233 Board #138 June 2 2:00 PM - 3:30 PM  
**Findings from the 2016 Active Healthy Kids Scotland Report Card**

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 (No relationships reported)

The Active Healthy Kids Scotland Report Card provides a comprehensive assessment on the physical activity and health of Scottish children and adolescents. **PURPOSE:** To summarize the report card grades; to identify changes in report card grades since the previous report card published in 2013; to critique Scottish surveillance of physical activity and health in children and young people.

**METHODS:** Report card grades were assigned to 10 indicators related to physical activity and health (7 behavioral indicators and 3 policy and environment indicators). Grades were based on Scottish data which were: recent (published after the 2013 card), derived from nationally representative samples and affected by minimal bias, and determined by the percentage of Scottish children and adolescents meeting an evidence-based benchmark: A is 81% to 100%; B is 61% to 80%; C is 41% to 60%, D is 21% to 40%; F is 0% to 20%; INC is Incomplete data combined with lack of an evidence-based recommendation. Grades were assigned a '+' if trends had improved since the last report card and a '-' if there was a marked socio-economic inequality in the indicator. **RESULTS:** Overall Physical Activity, Sedentary Behavior and Obesity received F or F- grades. Active Outdoor Play and Organised Sport Participation were graded as INC. Active Transportation to School/Nursery was graded C, and Diet D-. Family and Peer Influence was graded as D-. Community and the Built Environment, and National Policy were both graded B. Issues with measurement and reporting of several physical activity indicators were identified: no surveillance of moderate to vigorous physical activity in children, no surveillance of active outdoor play and sports participation in children or adolescents, and summary surveillance data not reported in line with evidence-based recommendations.

**CONCLUSIONS:** Grades were similar to those in 2013. Scotland has a favorable environment for physical activity, but children and adolescents have low physical activity and high screen-based sedentary behavior. Better surveillance of physical activity and health in Scottish children and adolescents is required and would encourage more evidence-informed physical activity and health policy in Scotland in future.

3234 Board #139 June 2 2:00 PM - 3:30 PM  
**Running Profiles And Their Associated Behaviors: A Proposal For Chilean Runners**

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**Purpose:** Identifying different runner profiles may improve running-related injuries (RRIs) prevention, education, and management. The aim of this study was to determine Chilean runner's profiles according to socio-demographic characteristics, motivations, training factors and behaviors associated with running during 2015-2016.

**Methods:** An email and web-based online cross-sectional survey were conducted. Runners from six different competitions and other running circuits were recruited. The survey collected information on 6 dimensions: (1)socio-demographics; (2)health; (3)motivations; (4)training factors; (5)behaviors associated with running; and (6) beliefs and perceptions. Profiles' construction was performed through a two-step cluster analysis using Bayesian Information Criterion and linear discriminant analysis to correctly assess subject classification. All statistical analyses were performed using SPSS22 with a significance level set at 5%. **Results:** A total of 821 runners (46% females), aged 36.6 ( $\pm 10.0$ ) years were analyzed. Cluster analysis allowed the generation of 4 groups (n=752) according to years-of-running-experience, volume (km/week) and hours of training (hrs/week). Main variable for runners' classification was years-of-running-experience: "Beginner"(n=163); "Basic"(n=164); "Intermediate"(n=160); and "Advanced"(n=265). Statistically significant (p<0.05) and clinically relevant variables among the 4 groups were: sex, age, years-of-running-experience, training factors, previous injury(PI) and technological implements used for running practice. Beginners were mainly females (63.2%), aged 28.5 ( $\pm 8.4$ ) years, having less than 1 year-of-running-experience, 32.5% reported PI, and accumulated a training volume of 18.3 ( $\pm 12.7$ ) km/week. Advanced runners were mainly males (65.3%), aged 37.4 ( $\pm 10.9$ ) years, 63.4% with more than 7 years-of-running-experience, 44.2% reported to have PI and accumulated a training volume of 38.2 ( $\pm 20.8$ ) km/week. **Conclusion:** Advanced runners accumulate greater training load per week, were older, and with higher PI proportions when compared with Beginners. Future work should include a differentiated classification of runners, in order to identify clinically specific risk factors related to running injuries.

3235 Board #140 June 2 2:00 PM - 3:30 PM  
**< The Relationship Among The Built Environment, Transportation Behavior, And Population Health: Comparison Of Two Cities >**

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**PURPOSE:** Active commuting and transportation behavior impacts obesity rates, wellbeing, and environmental health and quality. This study was designed to assess the relationship between active transportation, the built environment, and population perceived health in two comparable cities in the southeastern U.S.A.

**METHODS:** From 2006-2010, Charlotte, NC (city 1) improved the built environment (e.g., shifting a motor vehicle lane to designated bicycle lane) and transportation policies (e.g., bicycle safety) to facilitate active commuting in the downtown area. Jacksonville, FL (city 2) did not implement any changes to the built environment to foster active commuting. Data from the Behavioral Risk Factor Surveillance System [BRFSS] from 2006 (pre intervention) to 2012 (post intervention) were analyzed for both cities.

**RESULTS:** There were no significant differences between city 1 and city 2 in sample size and demographic make-up (age, race, gender, sex). Over the period 2006 to 2012, the annual difference between the percentage of Charlotte respondents rating physical health as good and those in Jacksonville rating physical health good increased at a rate of 13% per year based on an exponential growth regression model (p = 0.0213). That is, over time the difference between the two cities grew in favor of Charlotte.

**CONCLUSIONS:** Supportive urban and transportation policies aimed at facilitating healthy behaviors are associated with healthier communities in this convenience sample of two cities This study's findings were consistent with past findings that highlight the importance of the built environment and transportation policies on population health. Future research is needed to assess rates of active commuting and examine the populations and outcomes longitudinally.

3236 Board #141 June 2 2:00 PM - 3:30 PM

**Physical Activity Among U.S. Adults With Mobility Disability, Brfss, 2015**

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(No relationships reported)

The 2008 *Physical Activity Guidelines* recommends that all adults avoid inactivity and engage in activities based on their abilities. Mobility disability is the most prevalent disability type among US working-age adults and is related to poor health outcomes. Understanding physical activity (PA) patterns among this group can aid development of inclusive interventions to increase PA participation in ways that meet their needs and abilities. **PURPOSE:** To assess prevalence of PA levels among adults aged 18-64 years with mobility disability and determine the most common PA types by activity level. **METHODS:** Using the 2015 Behavioral Risk Factor Surveillance System (n=269,486), we classified respondents reporting serious difficulty walking or climbing stairs as having mobility disability (n=35,140). We calculated moderate-intensity-equivalent minutes/week (2\*vigorous min/wk + moderate min/wk) from self-reported type, frequency, and duration of PA in the past month. Three PA levels were: active ( $\geq 150$  min/wk), insufficiently active (10 - 149 min/wk), and inactive (no PA for  $\geq 10$  min/wk). Weighted prevalence estimates and 95% confidence intervals (CI) were calculated for PA levels and for activity types. **RESULTS:** Overall, 10.5% of 18-64 year old adults reported mobility disability. Among these adults, a significantly higher percentage were inactive [51.0% (95% CI: 50.0, 52.0)] than insufficiently active [19.1% (95% CI: 18.3, 20.0)] or active [29.9% (95% CI: 29.0, 30.9)]. Among those who were insufficiently active, walking was the most commonly reported activity (78.1%), followed by gardening/yard work (3.8%), and bicycling (3.3%). Among active adults, walking was the most commonly reported activity (61.3%) followed by gardening/yard work (9.4%) and bicycling (6.2%). **CONCLUSION:** Nearly 5 in 10 working-age adults with mobility disability avoid inactivity, primarily through walking. However, the other half of this group are inactive and missing the opportunity to protect or improve their health by regularly engaging in PA. These results highlight the need for PA promotion strategies in which all adults have opportunities to participate according to their abilities and the need to evaluate how specific activities, such as walking or wheelchair rolling, may increase PA among adults with mobility disabilities.

3237 Board #142 June 2 2:00 PM - 3:30 PM

**Assessing Street-scale Supports For Walking In The U.S. Virgin Islands — 2016**

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**PURPOSE:** Streets can be designed to provide safe and easy places that encourage walking by providing street-scale supports such as destinations, sidewalks, lighting, and traffic calming features. The prevalence of street-scale supports for walking across the US Virgin Islands (USVI) was assessed and differences determined by residential or commercial land use type.

**METHODS:** A two-stage sampling method was used to select representative street segments: (1) Estates (census subdivisions in the USVI) were selected using stratified random sampling (n=46 selected of 336) and (2) street segments were then randomly selected from within Estates (n=1550). The Microscale Audit of Pedestrian Streetscape Abbreviated Tool was locally adapted and used by trained auditors to conduct objective assessments of several key elements of street-scale design, including destinations, traffic calming features, street lighting, and sidewalks. Descriptive statistics were weighted to be representative of the total street length within the sampling frame. Audits were conducted on 1114 street segments (unweighted: 94.6 km of street length; weighted: 1456 km).

**RESULTS:** Overall, 22.1% of street length had at least one destination, 27.9% had at least one traffic calming feature, 53.0% had at least some street lighting, and 11.2% had sidewalks (TABLE). Significant differences were found by type of land use for the presence of several features, including number of destinations, the degree of street lighting, and sidewalks (Pearson's chi-square test,  $p < 0.001$ ).

**CONCLUSION:** Across the USVI, street-scale features that support walking were uncommon and were less prevalent on residential streets than on commercial streets. Implementing policies and projects relating to street-scale design in the USVI could improve walkability, particularly those that focus on residential areas.

**TABLE. Prevalence of built environment features among audited street length, US Virgin Islands, 2016**

Features	Overall (N=1456 Km)		Residential land use		Commercial land use		Pa
	%	95% CI	%	95% CI	%	95% CI	
Total	--	--	85.3	(76.0-91.4)	14.7	(8.6-24.0)	
Number of destinations							
0	78.0	(70.9-83.7)	87.3	(82.6-90.8)	20.3	(10.2-36.3)	<0.001
1-2	13.1	(9.5-17.7)	10.4	(7.0-15.2)	29.6	(21.7-39.0)	
>2	9.0	(5.9-13.4)	2.3	(0.6-8.1)	50.1	(38.4-61.7)	
Traffic calming features							
None	72.1	(60.4-81.4)	72.4	(58.8-82.8)	70.4	(47.3-86.2)	0.866
Any	27.9	(18.6-39.6)	27.6	(17.2-41.2)	29.6	(13.8-52.7)	
Street lighting							
None	47.0	(39.0-55.1)	50.4	(42.3-58.5)	26.9	(19.2-36.3)	<0.001
Some	50.7	(42.3-59.1)	47.2	(38.9-55.6)	71.1	(61.2-79.4)	
Ample	2.3	(0.6-8.1)	2.4	(0.6-9.7)	2.0	(0.7-5.4)	
Sidewalks							
Not present or continuous	88.8	(81.7-93.4)	93.9	(87.0-97.2)	60.3	(46.5-72.7)	<0.001
Present	11.2	(6.6-18.3)	6.1	(2.8-13.0)	39.7	(27.3-53.5)	

a. Pearson's chi-square test for differences in distributions by type of land use.

Note: Percentages may not add to 100% due to rounding.

3238 Board #143 June 2 2:00 PM - 3:30 PM

**Fitness And BMI Levels In Children Of The City Of Barcelona Related To Their Socio-economical Level (POIBA Project)**

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(No relationships reported)

**PURPOSE:** To study the fitness and the BMI levels of children from Barcelona (Spain), related to their socio-economical level.

**METHODS:** 3279 children (1634 boys) of 7-10 yr. were recruited from schools of three different socio-economical levels: low (n=343), medium (n=850) and high (n=1808), and participated in the study after the approval of the Clinical Ethics Committee research CEIC- Parc Salut Mar. The participants' families gave informed consent for their children to participate. Height, weight and BMI of all of them were obtained. A battery of fitness tests was performed: vertical jump, ball throwing, long jump, zig-zag running test, 20 m running velocity test and 20m shuttle run test (EUROFIT, 1993; Welk & Meredith, 2008). Descriptive for all variables were obtained, ANOVA and Bonferroni were applied to compare the three groups.

**RESULTS:** Significant differences appeared between the three groups, with worse values in the low socio-economic level for all the fitness tests, except for vertical jump test.

**CONCLUSIONS:** As a low socio-economical group showed worse fitness levels than medium and high groups. Moreover, their overweight/obesity levels could have conditioned the fitness levels. The study was partially funded by the "Fondo de Investigación Sanitaria (FIS)" (PI09/02259), of the Carlos III Health Institute (Ministry of Economy and Competitiveness, Spanish Government. Authors declare no conflict of interest.

Characteristics and Fitness test values compared between socio-economical levels						
	Socio-economic level					
Variables	HighMean (SD)	MediumMean (SD)	LowMean (SD)	P1	P2	P3
Descriptive						
Weight (kg)	31.7 (6.4)	32.0 (6.7)	32.6 (7.7)	1.0	.390	.075
Height (cm)	134.3 (6.0)	134.1 (5.9)	134.0 (6.5)	.781	1.0	.940
BMI	17.4 (2.6)	17.6 (2.9)	18.0 (3.2)	.276	.181	.004
Fitness test						
Ball throwing (cm)	415.7 (102.7)	407.7 (109.7)	390.4 (104.1)	.242	.042	.000
Long jump (cm)	129.4 (23.6)	126.2 (25.4)	122.7 (23.1)	.008	.098	.000
Vertical jump (cm)	22.3 (7.1)	22.17 (7.1)	21.9 (6.5)	1.0	1.0	1.0
Zig-zag running (sec)	12.0 (5.3)	12.7 (5.3)	12.8 (4.2)	.008	1.0	.262
20 m running velocity (sec)	4.6 (0.6)	4.7 (0.7)	4.8 (0.8)	.024	.010	.000
20m shuttle run	12.3 (3.7)	11.8 (3.9)	11.3 (3.9)	.052	.077	.000
Abbreviations: P1: group differences between High and Medium level; P2: group differences between Medium and Low level; P3: group differences between High and Low level						

3239 Board #144 June 2 2:00 PM - 3:30 PM  
**Objective And Subjective Measures Of Walkability And Bikability At Westfield State University**  
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*(No relationships reported)*

**PURPOSE:** Walking and bicycling are popular forms of active transportation that help an individual engage in physical activity. College campuses present unique opportunities for all of its members to engage in physical activity as they are moving on and around campus and these forms of active transport should be encouraged for all campus members. This study aims to compare objective walkability measurements of Westfield State University's (WSU) pathways and roadways and how they support walking and biking versus student and faculty/staff perceptions of infrastructure support for walking and biking. **METHODS:** Mixed methods were used to obtain data: selected segments of WSU campus were objectively measured using a modified CDC Walkability Audit tool; the results of the audits were compared to results of an online survey distributed to WSU students and faculty/staff about their perceptions of ease of walking and biking on and around the campus. Two open-ended response questions were given to each group to propose recommendations to facilitate walking and biking. **RESULTS:** Selected path segments (n=26) on and connecting the WSU campus were audited for their objective walkability/bikability. The segments received a mean score of 62.9±18.4, giving WSU a grade C. Only 31% of audited segments received a grade A or B while the remaining 68% received a grade C or F, indicating fair or poor conditions for walking and biking. Students (n=389) and faculty/staff members (n=78) responded to the survey. Student age was 20.4±1.7 years and 48.72% self-reported their daily physical activity level as a mix of both sedentary and activity. Faculty age was 48.2±13.2 years and 46.75% self-reported their daily physical activity level as mostly sedentary with some activity. For the open-ended questions, the top answers for both students and faculty/staff were posting more motivational signage about walking and installing bike racks and outdoor bike storage. **CONCLUSIONS:** The objective audit supports current student and faculty/staff perceptions of campus walkability and bikability. Both subjective and objective measures can be used when designing a long-term campus master plan as well as physical activity interventions.

3240 Board #145 June 2 2:00 PM - 3:30 PM  
**A National Survey of Popular Physical Activities among U.S. Children and Youth**  
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*(No relationships reported)*

**PURPOSE:** Understanding what children and youth enjoy to play is beneficial in helping design intervention and other physical activity (PA) related programs to help improve children's fitness levels. The aim of this study was to determine the popularity of different PA among children and youth aged from 3 to 15 yr. old. **METHODS:** The national representative data (N = 53,669,505; 51.12% male; 3-15 yr.) from the 2012 NHANES National Youth Fitness Survey were employed for the analysis. Descriptive analysis was applied to examine the popularity of different type of PA and t-tests were used to determine the sex difference and ANOVAs were applied to examine the age difference on total PA participation. **RESULTS:** Among the 30 types of PA listed, including running, football, basketball, soccer, swimming, dance, and walking, etc., the most popular PA for children and youth in all age groups is running (33.30%), followed by bike riding (27.86%), and backyard games (21.71%). The 3 most popular PA for boys are running (35.18%), basketball (30.31%), and bike riding (29.90%), and for girls are running (31.33%), bike riding (25.73%), and walking (21.55%). About 16.9% of children/youth participated in no activity, but about 18.7% took part in at least one activity and about 64.4% took part in more than one activities; on average, children/youth took part in 2.59 ± 2.18 (M±SD) activities and boys (2.81±2.31) participated in more activities than girls (2.36±2.02; t=758.544, p<0.00, effect size = .10). From 3 to 11 yr., as the children got older, they participated in more PA, but the PA participation decreased after 12yr. **CONCLUSIONS:** Running is the most popular PA for the US children and youth, and some gender and age impact on PA participation was found.

Physical activity participation in age and gender difference among U.S. children and youth					
	3-7 yr.	8-11 yr.	12-15 yr.	F	p-value
Boys	2.92±2.42	2.98±2.29	2.56±2.15	552152.12	.00
Girls	2.56±2.04	2.82±2.21	1.71±1.57	692984.56	.00
Total	2.75±2.26	2.90±2.25	2.14±1.94	81088.51	.00

3241 Board #146 June 2 2:00 PM - 3:30 PM  
**Do New Zealand Women's Age and Ethnicity Contribute to Achieving Physical Activity Guidelines?**  
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Regular participation in physical activity (PA) has overwhelming positive implications on long-term health and on disease prevention. Despite established government guidelines to improve health through PA, over half of New Zealand women reportedly fail to meet these criteria. Barriers to achieving minimum physical activity levels may include demographic characteristics (i.e. age, ethnicity), but the contribution of each factor is unclear. **PURPOSE:** To understand how age and ethnicity affect a New Zealand woman's ability to meet PA guidelines. **METHODS:** Healthy New Zealand women (n = 350) of three ethnicities (Māori, Pacific, European) aged 16-45y (stratified as 16-25y, 26-35y, 36-45y) wore triaxial accelerometers for 7 days. Levels of moderate-vigorous PA (MVPA; ≥2020 counts.min<sup>-1</sup>) were assessed. Participants were categorized as achieving or not achieving PA guidelines. PA guidelines are commonly reported as either ≥150 min.wk<sup>-1</sup> MVPA (Basic) or ≥150 min.wk<sup>-1</sup> MVPA in bouts of 10+ min (Basic10+), therefore both of these classifications were considered. **RESULTS:** Basic10+ guidelines were met by only 32% of New Zealand women; a further 34% of women (66% in total) met Basic guidelines. There were no significant differences between the three age groups when ethnicity was not also considered. Achievement of Basic guidelines was lower in Pacific women (37%) than Maori (65%; p=0.001) or European (75%; p<0.001) women. Specifically, fewer Pacific women in the 16-25y and 36-45y age groups achieved Basic PA guidelines than women of the same age but different ethnicity. More European women (38%) met Basic10+ guidelines than Maori (22%; p=0.011) or Pacific (22%; p=0.012) women. These differences between ethnicity were not specific to any age group. **CONCLUSION:** Although only two-thirds of New Zealand women achieved Basic PA guidelines, the prevalence was substantially higher than overall national statistics (48%). Given the extremely low rates of PA for periods of 10 or more minutes, a strategy is needed to increase the length of time women spend in bouts of MVPA. The findings further suggest that ethnicity, more so than age, is a contributing factor to achieving PA guidelines.

Funding Sources: Nutricia Research Foundation

3242 Board #147 June 2 2:00 PM - 3:30 PM

**Comparison Of Weekend And Weekdays Physical Activity Levels In Korean Professional Golfers.**

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The dominance of the U.S based LPGA/PGA tour by Korean-born golfers over the past decade has been well recognized. The sheer volume of quality golfers being produced by this relatively small golfing nation has certainly caught the attention of the field of golf. However, the level of physical activity in Korean professional golfers has never been systematically examined. **PURPOSE:** The present study was to describe the baseline characteristics of the participant and to compare the physical activity level between weekdays and weekends in Korean professional golfers using objective physical assessment tools (i.e., Accelerometer). **METHODS:** Fourteen (male=7; female=8) young Korean professional golfers (23 ± 2.4 yrs; height = 171±7.5 cm; weight = 73.7±7.5 kg, experience = 6.6 yrs) consented to participate in the study. Participants were asked to wear the accelerometer (i.e., Actigraph) on their right wrist for 24 hours/day, 7 consecutive days to provide data on time in moderate and vigorous physical activity (MVPA). ActiLife software (version 6.11.2) was used to download all data. Raw data were processed with the R package GGIR and associated Hilderband milling (mg) cut points. Descriptive for all variables was calculated and Pearson product moment correlations were used to test for relationships between weekdays and weekends. A paired sample t-test was used to evaluate differences between weekday and weekend physical activity level. **RESULTS:** The accelerometer wear compliance was excellent 6.8 days, 98% of the time. Time in MVPA was 99.5 ± 35.79 mins/day and 136.4 ± 35.2 mins/day for weekends, weekdays, respectively. There is no significant difference on physical activity levels on weekdays ( $t(12) = .379, p = .329$ ) and weekends ( $t(12) = -.004, p = .997$ ) between male and female golfers. No correlation was observed between weekdays MVPA and years of experience. However, weekends MVPA were inversely correlated with years of experience ( $r = -.215, p = .48$ ). Similar correlations were found between weekdays MVPA ( $r = -.432, p = .141$ ) and weekends MVPA ( $r = -.438, p = .134$ ) with golfers' age. **DISCUSSIONS:** Our data demonstrates that Korean professional golfers were highly active during weekdays compared to weekends. Experienced golfers were associated with little time spent in MVPA regardless of the days of the week.

**F-57 Free Communication/Poster - Energetics**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3243 Board #148 June 2 3:30 PM - 5:00 PM

**Effect Of Work Intensity On The Kinetics Of W'**

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**PURPOSE:**

To assess the effect of work intensity on the  $W'_{BAL}$  model during intermittent exercise

**METHODS:**

After determining  $VO_{2max}$ , critical power (CP), and  $W'$ , 10 untrained subjects completed three separate exercise tests on a cycle ergometer on different days, and in random order. In each case, subjects were asked to perform severe-intensity work intervals lasting 60s, followed by 30s of recovery at 20W. The intervals were repeated until volitional exhaustion. The work interval power was different during each visit, and was set using the 2-parameter CP model. Subjects were exercised at either the power predicted to result in exhaustion at 1.5, 3, or 4 min (P1.5, P3, P4). All subjects completed all trials. These data were entered into a continuous integrating equation predicting balance of  $W'$  remaining, assuming exponential reconstitution of the  $W'$  ( $W'_{BAL}$  model; Skiba 2012). The time constant ( $\tau W'$ ) was varied by iterative process until the remaining modeled  $W' = 0$  at the time of athlete exhaustion.  $\tau W'$  was compared across trials, and predicted  $\tau W'$  was compared to calculated  $\tau W'$ , using ANOVA. Results are reported as group means ± SD.

**RESULTS:**

Calculated  $\tau W'$  was not significantly different between trials (mean P1.5 = 507 ± 547s, P3 = 436 ± 266s, P4 = 463 ± 268s,  $p = 0.91$ ). Model predicted  $\tau W'$  (mean = 443 ± 45) was not significantly different from the calculated  $\tau W'$  in any of the experimental trials ( $p = 0.96$ ). However, considerable inter-individual variability was noted, resulting in high SD. In particular, three subjects showed unexpectedly slow recovery of the  $W'$  during the experimental trials.

**CONCLUSIONS:**

These data suggest that the recovery of the  $W'$  is insensitive to work intensity within the power ranges studied. These data provide further support for the utility of the  $W'_{BAL}$  model over a variety of work intensities, but also suggest the possible need to develop athlete specific models with a customized  $\tau W'$ .

3244 Board #149 June 2 3:30 PM - 5:00 PM

**Energy Expenditure In Low-load Resistance Exercise With Slow Movement Using Body Mass Alone As Load**

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(No relationships reported)

**PURPOSE:** Energy expenditure (EE) and MET values have been reported for many different physical activities and exercises. Resistance exercise using free weights and training machines at 3.5-6.0 METs has been defined as conditioning exercise. However, little research has been conducted on low-load resistance exercise with slow movement, such as squats and push-ups, using body mass alone as load. This study aimed to determine the EE and MET values in low-load resistance exercise using body mass alone as load. **METHODS:** Sixteen men aged 20-26 years performed 6 resistance exercises in random order, using body mass alone as load. The exercises consisted of squats, single-leg lunges, sit-ups, push-ups, heel raises, and hip lifts. The eccentric and concentric phases of the exercises were completed with 3-second slow movements, performed in 2 sets of 10 repetitions of each exercise. Oxygen consumption ( $VO_2$ ) was continuously measured during exercise, and EE was calculated by applying the  $VO_2$  and  $VCO_2$  to the Weir equation. We measured resting EE for 30 min before exercise, and 1 MET was calculated by dividing gross oxygen consumption (ml/kg/min) by individual resting EE. **RESULTS:** The mean EE and MET values for low-load resistance exercise using body mass alone as load were 3.2 0.8 kcal/min and 2.6 0.7 METs, respectively. Squats involved multiple major muscle groups, with the quadriceps showing the highest EE and MET values for 6 exercises, at 4.1 1.0 kcal/min and 3.4 0.4 METs, respectively. Heel raises showed the lowest values of 2.2 0.6 kcal/min and 1.8 0.3 METs, respectively. **CONCLUSIONS:** The EE and MET values for low-load resistance exercise using body mass alone as load were lower than the values observed during the use of free weights and training machines, and were equivalent to those for low-to-moderate-intensity exercises such as walking in daily life.

3245 Board #150 June 2 3:30 PM - 5:00 PM

**Energy Expenditure of Collegiate Golfers in a Competitive Setting**

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Tracking daily energy expenditure via wearable devices has become very popular. However, few in-lab and field studies validating these devices have been published. **PURPOSE:** To determine the accuracy of a wrist-based activity tracking device in a lab setting and during a NCAA style golf tournament. **METHODS:** Eight NCAA golfers [4 males; 4 females; Age: 19.3±2.0 yrs; WT: 149.5±13.4 lbs; Bag WT: 22.3±2.0 lbs; Bag Wt./Body Wt.: 15.0±1.8%; HT: 67.7±3.6 in; % BF: 20.0±7.3%] were tested. In-lab testing consisted of a  $VO_{2max}$  test with golf bag wt. simulation and two 6-min run/walk steady-steady (SS) tests (one with bag wt., one without). The golf tournament consisted of completing two, 18-hole rounds while carrying their own golf clubs. Variables collected during tournament play were HR, distance, time, speed, device kcals, kcals from the metabolic cart (MET kcals), pace, and score. Unpaired, paired t-test, and a repeated measures ANOVA were used to determine significant differences. Correlation and step-wise multiple regression were used to determine which variables had the largest influence on determining kcals expended. **RESULTS:** During the in-lab testing, the device overestimated kcals expended compared to the actual MET kcals (+22.4%;  $p = 0.01$ ) for the 6-min SS tests. Step-wise regression showed that HR had the largest impact on kcal expenditure ( $p = 0.04$ ) during the SS tests. During the golf tournament, males had lower mean HRs (males: 111.00 ± 4.31 bpm; females: 121.99 ± 15.26 bpm). The device showed females burned more tournament kcals (1,642.33 ± 442.98 kcals), but less kcals per hour (348.59 ± 78.09 cal/hour) than males (1,583.13 ± 145.80 kcals; 357.13 ± 30.21 cal/hour). Comparing MET kcals and device kcals, the device underestimated females by 6.22% (not significant, NS) and overestimated males by 5.3% (NS). Looking at the device kcals for all golfers across all rounds, step-wise regression showed that calories/hour and playing duration time ( $p \leq 0.01, p \leq 0.01, r\text{-squared} = 0.99$ ) were the primary independent device kcal determinants. **CONCLUSION:** The in-lab tests showed the device overestimated kcals expended.

During the golf tournament, the device overestimated males and underestimated the female kcals expended showing a possible golf tournament wearable kcal gender measurement tracking bias.

3246 Board #151 June 2 3:30 PM - 5:00 PM

### Muscle Oxygen Extraction is a Key Performance Adaptation in Sprint Canoe-Kayak

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**Background** The aerobic contribution to sprint canoe-kayak performance ranges from ~37% to ~85% of total energy expenditure from shortest (200m) to longest (1000m) events. While systemic  $\dot{V}O_{2\max}$  is a strong predictor of performance in 500m and 1000m races, the respective role of central and peripheral adaptations is poorly understood.

**Purpose** The purpose of this study was therefore to characterize the changes in oxygenation derived from portable near-infrared spectroscopy (NIRS) in various muscles during a  $\dot{V}O_{2\max}$  test and two on-water time trials (TT: 200m and 500m or 1000m), and to examine the link between muscle oxygenation, cardiac output and performance.

**Methods** Twenty one well-trained sprint canoe-kayak athletes (12 men: 8 kayakers (MK) and 4 canoeists (MC); 9 women: 4 kayakers (WK) and 5 canoeists (WC)) participated in three testing sessions: 1) an incremental  $\dot{V}O_{2\max}$  test on a canoe or kayak ergometer; 2) a 200-m TT; and 3) a 500-m (WK and WC) or 1000-m (MK and MC) TT. NIRS monitors were placed on the *latissimus dorsi* (LD), *biceps brachii* (BB), and *vastus lateralis* (VL) during the 3 testing sessions to assess changes in muscle  $O_2$  saturation ( $SmO_2$ , % from baseline). Cardiac output was measured by impedance during the  $\dot{V}O_{2\max}$  test in a subset of 9 athletes.

**Results** Performance in the 200m time trial correlated with both LD final  $SmO_2$  ( $R=0.700$ ,  $p=0.01$ ) and VL final  $SmO_2$  ( $R=0.568$ ,  $p=0.02$ ). Performance during the 500-1000m time trials correlated with BB final  $SmO_2$  obtained during the  $\dot{V}O_{2\max}$  test ( $R=0.519$ ,  $p=0.033$ ) and with  $\dot{V}O_{2\max}$  (L/min:  $R=-0.560$ ,  $p=0.03$ ). Maximal cardiac output was low (men:  $26.2 \pm 4.7$  L/min, women:  $24.0 \pm 2.6$  L/min) and did not correlate with 200m ( $R=0.253$ ) or 500-1000m ( $R=0.028$ ) performance.

**Conclusion** These results confirm that systemic  $\dot{V}O_{2\max}$  is related to performance in the longer canoe-kayak events, and suggest that peripheral adaptations (i.e., the muscle ability to extract oxygen during the effort) rather than central factors better contribute to success in this sport. The ability to extract oxygen during the effort appears to be a predictor of performance for both short and long events. These results indicate that training for sprint canoe-kayak athletes should emphasize the development of the peripheral component of oxygen consumption.

3247 Board #152 June 2 3:30 PM - 5:00 PM

### Gender Differences In Resting Energy Expenditure In Athletic Populations

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Gender differences in energy expenditure and fuel utilization have been observed during exercise. However, less is known about whether or not these differences are also evident at rest, particularly in athletic populations, and it is currently unknown whether these differences remain when adjusted for body mass (BM) and fat-free mass (FFM). **PURPOSE:** The purpose of this study was to determine the differences in resting metabolism between men and women athletes when adjusted for body mass and fat-free mass. **METHODS:** Twenty-one men (20.1 y; 180.8 6.3 cm; 97.7 17.3 kg; 17.2 8.5% BF) and nineteen women (20.1 y; 166.1 5.2 cm; 64.5 7.2 kg; 23.4% 4.4% BF) athletes were recruited to participate in a single testing session. Resting metabolism was estimated using Resting Energy Expenditure (REE) measurements through indirect calorimetry (TrueOne® 2400 Metabolic Measurement system, ParvoMedics, Sandy, UT) and body composition analyses via air displacement plethysmography (BODPOD, Cosmed, USA) to determine fat mass (FM) and FFM. Athletes reported to the lab in a rested (>48 hrs. from strenuous exercise) and fasted (>8 hrs.) state. During REE assessment, athletes remained in a supine position, motionless for 15-20 minutes while maintaining conscious awareness. Data recordings were then obtained when criterion variables (i.e.,  $\dot{V}O_2$  L/min) experienced less than a 5% alteration during the final five minutes of data collection. A one-way analysis of variance was used to compare differences in REE and body composition. **RESULTS:** Body mass and FFM were significantly greater in men ( $p<0.001$ ). Women had higher body fat percentages (M:  $17.2 \pm 8.5$  vs. W:  $23.4 \pm 4.4$ %;  $p=0.007$ ) however no differences between groups

were observed for FM ( $p=0.361$ ). Absolute REE was significantly higher in men athletes (M:  $2,480.8 \pm 208.6$  vs. W:  $1,583.1 \pm 192.8$  kcals;  $p<0.001$ ). When expressed relative to BM and FFM there were no differences in REE observed between men and women athletes (M:  $25.8 \pm 3.5$  vs. W:  $24.6 \pm 1.9$  kcals/kg of BM;  $p=0.183$ ), (M:  $31.2 \pm 3.1$  vs. W:  $32.1 \pm 3.1$  kcals/kg of FFM;  $p=0.357$ ) respectively. **CONCLUSIONS:** Based upon the results of the current study it appears as though the greater REE observed in men athletes are likely attributable to their increased BM and FFM.

3248 Board #153 June 2 3:30 PM - 5:00 PM

### Exercise-induced Changes In Plasma Adenosine Triphosphate Concentration In Highly-trained Sprinters And Triathletes

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**PURPOSE:** It is known that plasma adenosine triphosphate (ATP) concentration increases during exercise and depends on its intensity. There are no reports about the effect of specific long-term training adaptation on plasma ATP levels during exercise. The aim of our study was to compare the exercise-induced plasma ATP release in athletes specialized in speed-power vs endurance disciplines. **METHODS:** Nine sprinters, 9 triathletes at national/international level, and 9 amateur runners (controls), aged  $23.8 \pm 2.8$  y,  $23.1 \pm 4.3$  y, and  $25.2 \pm 2.7$  y, respectively, were studied. They underwent an incremental exercise test until exhaustion on a motorized treadmill. Venous blood samples were drawn at rest, at exhaustion (maximum intensity), and after 10 and 30 min of recovery. Blood samples were immediately centrifuged for 30 s at 14,000 rpm and 4°C, frozen in liquid nitrogen, stored at -86°C, and then analyzed using high-performance liquid chromatography. Comparisons between groups and exercise phases were made using two-way ANOVA with repeated measures and Scheffe post-hoc test. **RESULTS:** In all three groups, a significant increase in plasma ATP was observed between rest and exhaustion, as well as after 30 min of recovery (see: Figure). A significantly greater plasma ATP concentration was observed in sprinters than in triathletes and controls at exhaustion and after 10 min of recovery. No significant between-group differences were observed at rest and 30 min after exercise. **CONCLUSION:** Plasma ATP response to incremental exercise until exhaustion is different depending on specific training adaptation. Training based on speed-power exercise brings about much greater plasma ATP release than endurance training. Underlying mechanisms, connected with exercise-induced vasodilation and its mediators, erythrocyte function, skeletal muscle activity, and other factors, need further research. Supported by National Science Center Poland Grant 2013/09/B/NZ7/02556

3249 Board #154 June 2 3:30 PM - 5:00 PM

### Energetics of Semi-contact Karate in Trained Young Athletes

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**PURPOSE:** Karate will have its debut in the 2020 Olympic Games. Understanding the energetics in karate as a contact sport event may provide information for performance training. However, the existing studies on karate have limited mainly on non-contact fighting. The aim of this study is to determine the energetics of semi-contact karate in trained young athletes.

**METHODS:** Nine females ( $18.3 \pm 1.7$  yrs,  $166 \pm 4.7$  cm,  $57.2 \pm 4.5$  kg,  $2.1 \pm 1.7$  yrs training experience) and nine males ( $16.7 \pm 2.0$  yrs,  $176 \pm 8.2$  cm,  $61.1 \pm 9.4$  kg,  $2.4 \pm 1.7$  yrs training experience) from the Chinese national youth team participated in one round of semi-contact karate, with the duration of 2 min and 3 min, respectively. A portable spirometric system (MetaMax 3B, Cortex, Germany) was utilized to measure the inspired oxygen uptake. Capillary blood was taken from the earlobe prior to and post the karate, and analyzed with blood lactate analyzer (Biosen C-line, EKF, Germany). Athletes were encouraged to fight as in real matches, but without touching the spirometric machine. The energy contributions were calculated based on the accumulated oxygen uptake and blood lactate during karate, as well as the fast component of oxygen debt during the recovery.

**RESULTS:** The peak blood lactate values after karate were  $3.36 \pm 1.15$  and  $5.14 \pm 1.70$  mM for females and males. The averaged oxygen uptakes during karate were  $30.6 \pm 4.6$  and  $40.5 \pm 5.0$  ml/min/kg for females and males. The energy contribution from anaerobic alactic, anaerobic lactic, and aerobic pathways were  $27.3 \pm 11.8$  ( $27.7 \pm 8.1$  %),  $7.5 \pm 4.4$  ( $7.4 \pm 3.3$  %), and  $61.6 \pm 10.7$  ( $64.9 \pm 9.3$ %) kJ for females, and  $31.1 \pm 10.8$  ( $17.7 \pm 5.3$  %),  $13.0 \pm 5.9$  ( $7.1 \pm 2.7$  %), and  $132.7 \pm 22.2$  ( $75.2 \pm 5.3$ %) kJ for males.

**CONCLUSIONS:** Karate is an aerobic-dominant sport event, while the anaerobic energy system may play an important role in high-intensity fighting. These findings are consistent with existing studies on non-contact karate.

3250 Board #155 June 2 3:30 PM - 5:00 PM

**A Comparison of Energy Expenditure Between Motorized and Non-Motorized Treadmills**

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Non-motorized, arced treadmills are becoming more popular in fitness settings and are thought to require greater effort than walking or running on a traditional motorized treadmill. However, little research has been conducted to evaluate this type of exercise equipment.

**PURPOSE:** The purpose of this study was to compare the energy expenditure (EE) required to complete one mile on a non-motorized, arced treadmill (AT) and a motorized treadmill (TM).

**METHODS:** Nine recreationally trained healthy participants (4 male, 5 female) ages 26.1±9.6 years walked or ran 1-mile at a self-selected speed on a motorized treadmill (TM) and a non-motorized arced treadmill (AT) while VO<sub>2</sub>, EE, and heart rate (HR) were measured. The EE in kcal•min<sup>-1</sup> and kcal•mile<sup>-1</sup> was calculated from VO<sub>2</sub> measured after subjects achieved steady-state. The tests were counterbalanced so half of the subjects completed the TM trial first and half completed the AT trial first.

**RESULTS:** Nine participants completed the 1-mile effort at an average speed was 125.1±32.6 m•min<sup>-1</sup> (range: 88.4–160.8 m•min<sup>-1</sup>). The mean VO<sub>2</sub>, EE, and HR were significantly higher during the TF trial compared to the TM trial:

	TM	AT	p
VO <sub>2</sub> (L•min <sup>-1</sup> )	1.6±0.9	2.2±1.1	0.0006
EE (kcal•min <sup>-1</sup> )	7.9±4.6	10.9±5.4	0.0005
EE (kcal•mile <sup>-1</sup> )	98.4±35.4	144.8±32.2	0.0001
HR (beats•min <sup>-1</sup> )	152.0±29.3	164.9±23.3	0.005

Values expressed as mean±SD

**CONCLUSION:** Use of a non-motorized arced treadmill resulted in a significantly higher VO<sub>2</sub>, EE, and HR compared to a traditional treadmill at the same speed. This could be due to the unique design of the arced treadmill that requires a different movement pattern and additional effort to propel the non-motorized belt. This may have implications for fitness applications in which EE is of interest.

3251 Board #156 June 2 3:30 PM - 5:00 PM

**Energy Expenditure Characteristics of Overweight Women at the Same Speed of Jogging and Walking**

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**PURPOSE:** Jogging and walking are two common exercises in overweight people. However, the relationship between energy expenditure of jogging and walking in overweight people is still not clear. This paper probes into characteristics of energy expenditure and physiology of overweight adult women at the same speed of jogging and walking.

**METHODS:** Twenty six overweight and twenty five normal weight adult women (age: 22.0±1.6 years) participated in the study. The resting energy expenditure and the energy expenditure of overground walking and jogging were measured by Cortex portable gas metabolism system. The overground walking speed from low to high were 4.0km/h, 4.5km/h, 5.0km/h, 5.5km/h, 6.0km/h, 6.5km/h and 7.0km/h. The overground jogging speed were 6.0km/h, 7.0km/h and 8.0km/h. The duration of each speed was 6 minutes. Net energy expenditure of each speed was calculated as energy expenditure minus resting energy expenditure.

**RESULTS:** When the jogging speed over 7.0km/h (including 7.0km/h) and walking speed over 5.5km/h (including 5.5km/h), the net energy expenditure, energy expenditure and heart rate of overweight women were significantly higher than normal weight women (P<0.05). When walking speed was 6.0km/h, net energy expenditure (5.44±0.95 vs 6.51±1.65 kcal/min) and energy expenditure (6.49±0.91 vs 7.55±1.64 kcal/min) of overweight women were significantly lower than jogging at the speed of 6.0km/h (P<0.01). However, when walking speed was 7.0km/h, net energy expenditure (9.60±1.48 vs 8.69±1.57 kcal/min), energy expenditure (10.64±1.50 vs 9.73±1.56 kcal/min), heart rate (170±10 vs 158±14 BPM) and RPE (17±1 vs 13±2) of overweight women were significantly higher than jogging at the speed of 7.0km/h (P<0.05).

**CONCLUSIONS:** The differences of BMI will result in differentiations of energy consumption and physiological indexes of women when walking and jogging at a

certain speed. When speed reach and exceed 7.0km/h, walking will consume more energy than jogging. As far as the weight control of overweight people is concerned, the effect of walking at this speed is better than that of jogging.

3252 Board #157 June 2 3:30 PM - 5:00 PM

**Comparisons Of Caloric Expenditure During- And Post- Treadmill Activity Vs. Racquetball In Apparently Healthy College-aged Adults**

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**PURPOSE:** The purpose of this study was to examine the possibility that alternative modes of exercise, specifically racquetball, may provide similar caloric benefits as traditional aerobic physical activity guidelines defined by the American College of Sports Medicine. Alternative modes of physical activity can be used to counteract many common physical activity barriers. This study examined the caloric expenditure (Kcal) differences during and post treadmill activity in comparison to racquetball.

**METHODS:** Twenty-six university students, aged 18-22 years, participated in this study. All participants completed a 30-minute racquetball session and a 30-minute treadmill running session (at 40-60% heart rate reserve), each session followed by a 30-minute of post-exercise monitoring of oxygen consumption (VO<sub>2</sub>) using a metabolic cart. Minute-by-minute VO<sub>2</sub> and respiratory exchange ratio were utilized to calculate the total Kcal over the 30-minute recovery period, during which participants were laying supine. To obtain Kcal during exercise, accelerometer connected to heart rate monitor was utilized.

**RESULTS:** Out of 26 participants, 4 were excluded from the analyses due to equipment malfunctioning during testing, resulting in N = 22 (Male n=11, Female n = 11). A two-way (sex x modality) repeated measures ANOVA, using an alpha level of .05, indicated that there was a significant modality (treadmill vs. racquetball) effect on Kcal post activity, F(1,20) = 5.61, p = .028, meaning that Kcal was significantly higher post treadmill activity vs. post racquetball session. A two-way repeated measures ANOVA indicated that there was a significant modality (racquetball vs. treadmill) effect on Kcal during activity, F(1,20) = 5.08, p = .036. More specifically, Kcal expended during racquetball activity was significantly higher than Kcal expended during treadmill activity. Ultimately, a two-way repeated measures ANOVA indicated that modality was not a significant predictor of total (during- and post-exercise) Kcal expenditure, F(1,20) = 1.33, p = .262.

**CONCLUSION:** These findings suggest that participating in a recreational activity, such as racquetball, will yield similar total energy expenditure benefits compared to simple aerobic running exercise among apparently healthy college-aged males and females.

3253 Board #158 June 2 3:30 PM - 5:00 PM

**Acute Metabolic Responses of Exercise with a Sauna Suit**

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**Purpose:** The purpose of this study was to examine acute metabolic responses of exercise with a sauna suit (SS) under different exercise intensity and duration conditions. **Methods:** Twelve physically active men (age = 27.1±7.5 yrs, height = 175.4±6.3 cm, weight = 75.6±7.9 kg, maximal oxygen uptake - VO<sub>2max</sub> = 38.6±7.8 mL•kg<sup>-1</sup>•min<sup>-1</sup>) completed four experimental trials on a cycle ergometer: 1) 30min moderate-intensity (MI) exercise (55-60% heart rate reserve-HRR) with SS, 2) 20min vigorous-intensity (VI) exercise (75-80% HRR) with SS, 3) 30min MI exercise (55-60% HRR) without a sauna suit (CON), and 4) 20min VI exercise (75-80% HRR) CON. Trials were separated by 24-96 hours and performed in randomized order.

Exercise energy expenditure (EE), one hour excess post-exercise oxygen consumption (EPOC), and one hour post-exercise weight loss (PEWL) were measured for each trial. **Results:** There were significant differences (p<0.05) in exercise EE, one hour EPOC and one hour PEWL between SS and CON under both MI and VI conditions. MI results: exercise EE was greater with SS vs. CON (282.6±34.7 kcal vs. 247.8±40.2 kcal), one hour EPOC was greater with SS vs. CON (69.9±4.3 kcal vs. 45.2±3.0 kcal), and the SS condition resulted in greater change in one hour PEWL (0.52±0.14 kg vs. 0.37±0.15 kg). VI results: exercise EE was greater with SS vs. CON (204.7±24.2 kcal vs. 184.6±21.3 kcal), one hour EPOC was greater with SS vs. CON (87.7±7.0 kcal vs. 72.1±3.4 kcal), and the SS condition resulted in greater change in one hour PEWL (0.63±0.15 kg vs. 0.39±0.12 kg). **Conclusion:** Our findings support the feasibility of exercise training with a sauna suit—and the amplified exercise EE and EPOC—to contribute to long-term energy balance and thus improve cardiovascular health.

3254 Board #159 June 2 3:30 PM - 5:00 PM

**Impact of Alternative Footwear on Human Energy Expenditure**

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**PURPOSE:** Use of alternative footwear options such as flip-flop style sandals and minimalist athletic shoes are becoming increasingly popular footwear choices. The purpose of the investigation was to analyze the energy expenditure and oxygen consumption requirements of walking at preferred pace while wearing flip-flops, slip-on style shoes, and minimalist athletic shoes.

**METHODS:** Eighteen healthy male adults participated in this study. In addition to an initial familiarization session, participants were tested in three different footwear conditions [thong-style flip-flops (FF), slip on shoes (CROC), and minimalist shoes (MIN)]. Then after a brief warm-up, participants walked a one-mile distance at their preferred pace. Immediately following completion of the one-mile walk, participants stood quietly on the treadmill for an additional period to assess excess post-exercise oxygen consumption (EPOC).

**RESULTS:** A repeated-measures ANOVA showed that the following variables did not show evidence of a significant differently value between conditions: preferred pace ( $p = 0.392$ ), average oxygen consumption ( $p = 0.804$ ), energy expenditure per mile ( $p = 0.306$ ), or EPOC ( $p = 0.088$ ). There was shown to be a significantly higher RER during exercise in CROC compared to MIN ( $p = 0.031$ ) with no significant differences observed when comparing CROC to FF ( $p = 0.106$ ) or FF to MIN ( $p = 0.827$ ).

**CONCLUSIONS:** Based on the results of the current study, it appears that the alternative footwear selected for evaluation do not lead to a substantial alteration of walking pace or overall EE. However, the significant difference in RER suggesting a slightly elevated exercise intensity while wearing the CROC could perhaps be related to the softer sole, influencing overall mechanical efficiency.

3255 Board #160 June 2 3:30 PM - 5:00 PM

**Energy Expenditure of College Students**

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A great deal of research has made it evident that an increase in physical activity (PA) leads to a decrease in risk for developing health issues such as cardiovascular disease (CVD). While persons of all ages and skill levels can increase their PA, young adults often have the ability to focus on decreasing their risk of CVD early in life through avoiding sedentary lifestyles and meeting PA guidelines (PAG). The 2008 PAG suggest that a 70 kg person expends approximately 1198.75 kcals/week, which equates to 0.12 kcals/min, at 50% HR<sub>max</sub> intensity to elicit health benefits. **PURPOSE:** To determine the PA level of college students as compared to PAG through monitoring their level of energy expenditure (EE) as kilocalories per minute (kcals/min) burned. **METHODS:** Twenty-three college students (20 y.o.; 69.93 kg) wore an Actigraph accelerometer on the waist during daily activities to determine EE. The following measurements were also collected: 1) medical history, 2) demographic info, 3) BP, 4) HR, 5) height, 6) weight. **RESULTS:** The average EE for one week was approximately 0.1641 kcals/min=0.11988. **CONCLUSION:** Our data indicate that college students met and exceeded the PAG of 0.12 kcals/min (1198.75 kcals/week) by 0.0441 kcals/min. This PAG is based off recommendations that one should exercise 150 min/week at moderate intensity. However, through calculating PAG as 0.12 kcals/min, we were able to apply recommendations that are based off activity level throughout an entire week at various intensities. Further research is warranted to better understand whether one should focus on intensity of exercise or expending the recommended number of kcals to elicit/maintain health benefits.

3256 Board #161 June 2 3:30 PM - 5:00 PM

**Metabolic Demands of Stationary ElliptiGO Cycling Compared to Treadmill Running**

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(No relationships reported)

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 ± 1.1 yr, body mass 60.8 ± 9.2 kg, height 1.70 ± 0.07 m, body fat 12.6 ± 5.9%) completed 5×3 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 ~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 V<sub>E</sub> were significantly higher during running ( $p < 0.05$ ), however the RPE for each intensity was similar ( $p > 0.05$ ). 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, V<sub>E</sub>, and RPE were significantly higher for ElliptiGO compared to running. **CONCLUSION:** ElliptiGO cycling is a practical training device that will elicit a similar metabolic demand, but higher HR, V<sub>E</sub>, and RPE compared to running at faster cycling speeds. Supported by the Student Summer Scholars program at Grand Valley State University.

**F-58 Free Communication/Poster - Ergogenic Aids III**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3257 Board #162 June 2 2:00 PM - 3:30 PM

**Accounting For The 'Dehydration Factor' In The Athlete Biological Passport**

Katherine Mitchell, Robert Kenefick, FACSM, Samuel Chevront, FACSM. USARIEM, Natick, MA. (Sponsor: Samuel N. Chevront, FACSM)  
(No relationships reported)

The Athlete Biological Passport (ABP) was implemented by the World Anti-Doping Agency in 2008 to monitor elite athletes for banned substances. The potential for dehydration to bias the ABP by elevating parameters such as hemoglobin (Hb) and hematocrit (Hct) deserves careful attention before integration into detection models. **PURPOSE:** To examine biological variation in euhydrated Hb and Hct for comparison against changes observed in response to a standardized loss of total body water (~3-4% body mass) achieved using two distinct types of dehydration. **METHODS:** Ten participants (7M, 3F; 23 ± 4 years) completed three days of controlled euhydration (EUH) from which the within-subject biological variation (CVw) and analytical variation (CVa) were used to estimate a meaningful change (unidirectional 95% level). Two trials of controlled dehydration via sweating (HYP) and diuretic administration (DIUR) followed. **RESULTS:** The CVw and CVa for Hb and Hct were both ~2% and 0.5%, respectively. When properly summed [ $RVCV = 2^{1.5} \times 1.65 \times (CVa^2 + CVw^2)^{0.5}$ ] they explain a relative increase of ~5% (0.7 Hb units and 2.0 Hct units) between any two successive values measured 24 hours apart. Participants achieved body mass losses of 3.13 ± 0.44% (HYP) and 3.70 ± 0.54% (DIUR). The change in Hb was 0.6 units (HYP) and 1.4 units (DIUR) ( $P < 0.05$ ) vs EUH. The change in Hct was 2.1 units (HYP) and 4.2 units (DIUR) ( $P < 0.05$ ) vs EUH. Only with the diuretic was the change in Hb and Hct (1.4, 4.2) well beyond expected values due to biological variation (0.7, 2.0). **CONCLUSION:** Dehydration by ~3-4% of body mass produced changes in Hb and Hct beyond day-to-day variation (> unidirectional 95% level) only when achieved using a diuretic. These findings have important implications for claims made against dehydration as a bias factor in the ABP and also provide important insight related to hydration testing in general. Funded by USAMRMC; author views not official US Army or DOD policy.

3258 Board #163 June 2 2:00 PM - 3:30 PM

**Nrf-2 Activation by Palm Fruit Bioactives**Shawn M. Talbott, FACSM<sup>1</sup>, Cory Grand<sup>2</sup>, Kevin L. Ohashi<sup>3</sup>, Joseph De Angelo<sup>3</sup>. <sup>1</sup>EQOIL, Draper, UT. <sup>2</sup>Wasatch Scientific Services, Salt Lake City, UT. <sup>3</sup>Phenolaeis, Cambridge, MA.**Reported Relationships:** S.M. Talbott: Consulting Fee; Scientific advisor to Phenolaeis.

**PURPOSE:** Overexposure to reactive oxygen species has been implicated in the pathogenesis of a wide range of chronic conditions, including cardiovascular disease, cancer, and the aging process (e.g. "free radical theory of aging"). While some early studies have shown the benefits of "direct" antioxidants (e.g. vitamins A, C, E) in reducing oxidative cellular damage, more recent evidence suggests that mega-doses of antioxidants (e.g. E, beta-carotene, resveratrol) may interfere with internal cellular protection pathways, disrupt redox balance, and suppress several important exercise-induced adaptations. In contrast, up-regulation of endogenous "indirect" antioxidant pathways has been proposed as a mechanism for optimizing redox balance. Activation of nuclear factor (erythroid-derived 2)-like 2 (Nrf2), a transcriptional regulator of phase II antioxidant enzymes, has been suggested as an important step in attenuating oxidative stress. A number of natural phytonutrients have been shown to activate Nrf2, including turmeric and green tea. Palm Fruit Bioactives (PFB), a standardized 5-polyphenol blend, has been shown to exhibit anti-hypertensive, anti-atherogenic, anti-diabetic, and chemo-preventive effects in animal models. The purpose of this study was to evaluate the effect of palm fruit bioactives (PFB) on activation of the Nrf2 pathway in cell culture as one potential mechanism of action for PFB's health effects. **METHODS:** AREC32 cells (MCF-7 cell line stably transfected with a vector containing firefly luciferase under the control of the Antioxidant Response Element, ARE) were cultured in RPMI 1640 culture medium with L-glutamine and supplemented with 10% fetal bovine serum and antibiotic/antimycotic. AREC32 cells were seeded at a density of 500 cells/well and exposed to PFB at varying concentrations from 0.125% to 20% for 6-24h. **RESULTS:** PFB increased cell viability at 6h (0.125% and 3.3%) and 24h (2% and 3.3%). At both time points, PFB increased Nrf2-activation expression over untreated controls by a factor of 9-20 fold (0.25% and 7.5% at 6h; 0.125% and 5% at 24h). **CONCLUSIONS:** These data demonstrate potent Nrf2-activation by PFB which may provide a potential mechanism of attenuating oxidative stress and explaining previously observed cardiovascular, metabolic, and cell-protection effects.

3259 Board #164 June 2 2:00 PM - 3:30 PM

**Effects Of Seaweed Supplementation On Oxidative Stress And Blood Glucose Regulation After Resistance Training In Rats**Chun-Tai Chen<sup>1</sup>, Chi-Hong Lu<sup>1</sup>, Chi Yang<sup>1</sup>, Yu-You Wu<sup>1</sup>, Ching-Hung Lin<sup>2</sup>, Chien-Wen Hou<sup>1</sup>. <sup>1</sup>University of Taipei, Taipei, Taiwan. <sup>2</sup>Yuan Ze University, Taoyuan, Taiwan.

(No relationships reported)

**PURPOSE:** To investigate the effects of resistance training and supplement seaweed on oxidative stress and blood glucose regulation in rats.

**METHODS:** The five-week-old SD rats were randomly divided into four groups: C group (control group), S group (seaweed group), E group (exercise group) and ES group (exercise plus seaweed group). The rats in E group and ES group were trained with climbing resistance every two days, S group and ES group were given seaweed immediately after exercise. C group and E group were given placebo at the same time. After 10 weeks training, the ability of blood glucose regulation and oxidative stress of muscle would be test.

**RESULTS:** HOMA-IR of ES group were significantly higher than C group (C group  $2.3 \pm 0.2 < ES$  group  $3.8 \pm 0.8$ ). TBARS of E group were significantly higher than C group (E group  $1.3 \pm 0.2$  umole/g  $> C$  group  $1.0 \pm 0.05$  umole/g), but ES group were significantly lower than E group (ES group  $1.0 \pm 0.05$  umole/g  $< E$  group  $1.3 \pm 0.2$  umole/g). SOD of ES group and S group were significantly higher than C group (ES group  $0.61 \pm 0.04$  U/mg  $> C$  group  $0.47 \pm 0.05$  U/mg, S group  $0.60 \pm 0.04$  U/mg  $> C$  group  $0.47 \pm 0.05$  U/mg). Resistance training was significantly increased for GSH, but supplemental seaweed had no effect. While in the GSSG, supplementation of seaweed was significantly reduced.

**CONCLUSIONS:** Ten weeks of resistance training and supplementation of seaweed immediately after exercise may reduce oxidative stress, but reduce insulin sensitivity.

3260 Board #165 June 2 2:00 PM - 3:30 PM

**Flavanol-Rich Lychee Fruit Extract Prevents Diabetes-Induced Muscle Loss And Palmitate-Induced Myotube Loss**Hung-Wen Liu<sup>1</sup>, Sue-Joan Chang<sup>2</sup>. <sup>1</sup>National Taiwan Normal University, Taipei, Taiwan. <sup>2</sup>National Cheng Kung University, Tainan, Taiwan.

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(No relationships reported)

Diabetes-induced muscle loss is associated with stimulated the muscle RING-finger protein 1 (MuRF1), a muscle specific E3 ubiquitin ligase. Elevated lipid metabolites impair myogenesis. Flavanol-rich lychee fruit extract (FRLFE) exhibited anti-diabetic and -obesity properties which would be an alternative approach for maintaining muscle homeostasis. **PURPOSE:** The underlying mechanisms of FRLFE on maintaining muscle homeostasis was studied *in vivo* and *in vitro*. **METHODS:** Dietary (10 wk) FRLFE supplementation (200 mg/kg diet) on the skeletal muscle size and transcription factors such as NF- $\kappa$ B and Foxo3a involved in regulation of MuRF1 were investigated in diabetic db/db mice (n=10/per group). The roles of FRLFE on cell cycle and senescent phenotype were investigated in palmitate-induced insulin resistance in C2C12 muscle cells. The statistical significance of the differences among the groups (P < 0.05) was determined by one-way ANOVA and following post hoc assessment by Student-Newman-Keuls Method. **RESULTS:** The average cross-sectional area was significantly increased by 1.6-fold after administration of FRLFE compared with non-treated db/db mice ( $420\mu\text{m}^2$ ). Prevention of muscle loss by FRLFE was associated with down regulation of MuRF1 mRNA expression (410% vs. 100%, p<0.05). Decreased NF- $\kappa$ B expression in the nuclear fraction was observed in FRLFE treated db/db mice compared with untreated mice (260% vs. 60%, p<0.05). At transcriptional level, FRLFE abated ceramide-induced MuRF1 promoter activity (200% vs. 100%, p<0.05). Restoration of SIRT1 expression (30% vs. 150%, p<0.05) prevented Foxo3a nuclear localization in FRLFE treated db/db mice. A strong  $\beta$ -galactosidase staining positive signal was observed in the palmitate-treated myoblasts. For cell cycle analysis, significantly increased proportion of cells in G2-phase by palmitate was observed compared with group without palmitate treatment (28.9% vs. 18.3%). Weak  $\beta$ -galactosidase staining positive signals in accordance with decreased proportion of cells in G2-phase (21.7%) were observed in FRLFE-treated myoblasts. **CONCLUSION:** The efficacy of FRLFE on preserving skeletal muscle mass and myogenic process indicates that FRLFE acts as an effective supplement for diabetes and/or obesity-induced muscle atrophy.

3261 Board #166 June 2 2:00 PM - 3:30 PM

**No Adverse Effects of Matcha Green Tea Powder on Metabolic and Physiological Responses during Running**

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(No relationships reported)

Matcha is powder made from green tea leaves that had restricted light exposure to enhance composition. Consumption of the powder in Matcha green tea drinks ensures substantially higher intake of catechins and caffeine than normally brewed green tea. Green tea effects are commonly examined with epigallocatechin gallate (EGCG) or green tea extract with evidence to support enhanced fat oxidation and increased endurance performance. The metabolic and physiologic responses of short-duration intake of Matcha green tea powder during exercise are not known.

**PURPOSE:** To examine the metabolic and physiological responses of Matcha green tea powder during submaximal treadmill running. **METHODS:** Twelve male recreational runners (mean $\pm$ SD, age: 31 $\pm$ 9 years, height: 185 $\pm$ 9 cm, body mass: 79 $\pm$ 11 kg, maximum oxygen uptake ( $\dot{V}O_{2\text{max}}$ ): 55 $\pm$ 6 mL $\cdot$ kg<sup>-1</sup> $\cdot$ min<sup>-1</sup>) completed a 40-minute treadmill run at 55% of the running speed at  $\dot{V}O_{2\text{max}}$ , i.e. running at 10.0 $\pm$ 0.8 km $\cdot$ h<sup>-1</sup>. In the Matcha condition, participants were supplemented with 3x3 capsules on the day before and 3 capsules one hour before exercise in a fasted state. Each capsule contains 77 mg total catechins of which 37.5 mg EGCG and 12 mg caffeine. Expired air, heart rate and rating of perceived exertion (RPE) were collected at 10-minute intervals and analysed with two-way repeated measures and Bonferroni *post hoc* testing. Significance was accepted at p<0.05. **RESULTS:** There was no condition effect of Matcha green tea powder at any time point on minute ventilation, oxygen consumption, fat oxidation, carbohydrate oxidation, heart rate and RPE. For example, fat oxidation values and heart rates during 9-10 min, 19-20 min, 29-30 min and 39-40 min were 0.63 $\pm$ 0.18, 0.65 $\pm$ 0.24, 0.71 $\pm$ 0.17, 0.80 $\pm$ 0.24 g $\cdot$ min<sup>-1</sup> and 0.63 $\pm$ 0.22, 0.67 $\pm$ 0.26, 0.67 $\pm$ 0.22, 0.73 $\pm$ 0.24 g $\cdot$ min<sup>-1</sup>, and 139 $\pm$ 13, 145 $\pm$ 14, 148 $\pm$ 14, 150 $\pm$ 14 beats $\cdot$ min<sup>-1</sup> and 140 $\pm$ 13, 144 $\pm$ 13, 147 $\pm$ 13, 150 $\pm$ 13 beats $\cdot$ min<sup>-1</sup>, for the control and Matcha condition, respectively. **CONCLUSION:** Short-duration intake of Matcha green tea powder had no adverse effects on metabolic and physiological responses during submaximal

intensity running. Future studies should address whether there is an effect of long-duration intake of Matcha green tea on metabolic and physiological responses and exercise performance.

Matcha capsules were provided by OMGTEA Ltd, United Kingdom.

3262 Board #167 June 2 2:00 PM - 3:30 PM  
**Beyond Ginseng And Echinacea: A Meta-analysis Of Herbal Supplement Use By Athletes**

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(No relationships reported)

Herbal supplements are noteworthy components of athletes' nutritional supplement regimens. Recent reviews have characterized use of herbal supplements vaguely, or ginseng and echinacea specifically, but neglected less common supplements such as ginkgo, spirulina, St. John's Wort, and others. **PURPOSE:** To determine the frequency of athletes' use of specific herbal supplements beyond ginseng and echinacea through a meta-analysis of previously published surveys. **METHODS:** Thirty-two studies (published between 1985 and 2016) that reported specific herbal supplement data were identified through a combination of systematic database searching and citations from previous works. Usage rates for specific herbs were tabulated and overall prevalence calculated. When available, demographic information including age, sex, sport, and athlete country-of-origin were also tabulated. **RESULTS:** 11,855 athletes were in the final data set. All-supplement usage averaged 58.7%. Average individual herbal supplement usages were: ginseng (9.6%), echinacea (9.6%), ephedra (3.8%), ginkgo (3.0%), garlic (2.8%), St. John's Wort (0.6%), and spirulina or blue-green algae (0.4%); others ( $\leq 0.3\%$ ) included chamomile, ciwujia, yohimbe, flaxseed, green tea, arnica, evening primrose, guarana, kava kava, tribulus, goldenseal, kola nut, and peppermint. Several additional studies reported that athletes consumed various lesser-known herbal supplements including these and others (such as tea tree oil), but did not provide usage statistics. Multi- or poly-herbal supplements (2.0%) and "other" unspecified herbal supplements (4.9%) usage averages were also reported. Surveyed athletes were predominantly male (61.6%), from North America (40.3%), and college-aged (38.9%); most surveys sampled athletes from multiple sports. **CONCLUSION:** While ginseng and echinacea are (unsurprisingly) the herbal supplements most frequently consumed by athletes, over a dozen other herbal supplements are also consumed and warrant better attention in both athlete nutrition surveys and research. Certain athlete populations are underrepresented in the current literature, including females, those hailing from the southern hemisphere, non-college-aged athletes, and athletes with impairments.

3263 Board #168 June 2 2:00 PM - 3:30 PM  
**Seaweed Supplement Harmed The Exercise Effect In Ovariectomy Rats**

Ji-Hong Lu, Chun Tai Chen, Jian Liu, Yu You Wu, Chi Yang, Ching Hung Lin, Chien Wen Hou. *University of Taipei, Taipei, Taiwan.* (Sponsor: Chia Hua, Kuo, FACSM)

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(No relationships reported)

**Purpose**

This study aimed to find out the effect on blood glucose regulation after 10 weeks resistance exercise of ovariectomized rats with seaweed supplementation.

**Method**

12-month-old Sprague Dawley female rats were subjected to bilateral ovariectomy and then were randomly divided into 3 groups: Control (C), Exercise (E), Exercise-Seaweed (ES). Resistance exercise started 2 weeks after the surgery and operated 5 days/week in E and ES group. In ES group, 50 mg/kg of seaweed gavage was given immediately after exercise. In C and E group, rats also receive the same volume of water gavage after exercise. Oral glucose tolerance test (OGTT) and serum insulin level was evaluated after 10 weeks of resistance training

**Result**

After 10 weeks of resistance training, ES had higher fasting and 60 min blood glucose compared to E. (Fasting glucose:  $E 96.9 \pm 3.12 < ES 105.0 \pm 3.32$  mg/dl; 60min glucose:  $E 141.4 \pm 6.39 < ES 161.7 \pm 9.51$  mg/dl.  $p < 0.05$ ). E had lower fasting blood insulin level than C and ES. ( $E 0.4 \pm 0.1 < C 0.8 \pm 0.2$ ;  $ES 0.9 \pm 0.2$  ug/dl  $p < 0.05$ )

**Conclusion**

10 weeks of resistance exercise significantly improve the ability of blood sugar regulation on ovariectomized rats. However, if combined with seaweed supplementation, the benefits of exercise were eliminated.

3264 Board #169 June 2 2:00 PM - 3:30 PM

**Capsaicin Induces Metabolic Gene Expression in C2C12 Myotubes**

Michele A. Johnson<sup>1</sup>, Jamie K. Schnuck<sup>1</sup>, Lacey M. Gould<sup>1</sup>, Nicholas P. Gannon<sup>2</sup>, Roger A. Vaughan<sup>1</sup>. <sup>1</sup>*High Point University, High Point, NC.* <sup>2</sup>*Medical College of Wisconsin, Milwaukee, WI.*

(No relationships reported)

**PURPOSE:** Capsaicinoids may possess thermic effects resulting in increased energy expenditure, leading some to consume concentrated capsaicin supplements for weight loss. Capsaicin has been shown to activate select molecular targets contributing to increased metabolism, however the effects of capsaicin on many molecular targets have yet to be determined. This study investigated the effects of capsaicin on metabolic gene expression in cultured skeletal muscle. **METHODS:** C2C12 myotubes were treated with either DMSO control or capsaicin at 0.25 $\mu$ M, 0.5 $\mu$ M, 1.0 $\mu$ M, or 2 $\mu$ M for 24 hours. Gene expression of several regulators of mitochondrial biogenesis and oxidative metabolism including peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1 $\alpha$ ), nuclear respiratory factor 1 (NRF1), and mitochondrial transcription factor A (TFAM) were measured via qRT-PCR. Mitochondrial content was quantified via fluorescence which was confirmed visually using fluorescent microscopy. Cellular lipid content was determined by oil red o colorimetric staining. **RESULTS:** Gene expression experiments identified capsaicin at 0.5 $\mu$ M to be the most optimal concentration for inducing myotube mitochondrial biogenesis. Specifically, capsaicin at 0.5 $\mu$ M significantly elevated PGC-1 $\alpha$  (18.6 fold  $\pm 14.5$ ), NRF1 (4.6 fold  $\pm 1.7$ ), and TFAM (5.0 fold  $\pm 2.3$ ) gene expression following 24-hour treatment. Cells treated with capsaicin at 0.5 $\mu$ M also exhibited significantly greater mitochondrial staining (7.5%  $\pm 4.5\%$ ). Moreover, capsaicin induced the expression of several related metabolic genes such as Forkhead Box O1 (Foxo1) and Sirtuin 3 (Sirt3). Lastly, despite unaltered peroxisome proliferator-activated receptor gamma (PPAR $\gamma$ ) expression, capsaicin-treated cells exhibited significantly reduced lipid content suggesting lipid oxidation may be enhanced following capsaicin treatment. **CONCLUSION:** Capsaicin appears to stimulate several genes which govern mitochondrial biogenesis and cellular energetics. These findings suggest capsaicin may provide metabolic benefits, however, these data require verification at the protein and functional level.

3265 Board #170 June 2 2:00 PM - 3:30 PM

**The Effect Of Chlorella Supplementation On Exercise Performance And Inflammation-related Blood Cells After Dehydration.**

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(No relationships reported)

**PURPOSE:** The purpose of this present study was to investigate the effect of chlorella supplementation on aerobic performance and complete blood count (CBC) after dehydration.

**METHODS:** Twelve male college students with exercise habit were recruited in this double-blind, crossover designed study. All subjects were divided into control and Chlorella groups. All subjects performed an acute treadmill exercise at 40% VO<sub>2</sub>max in 35°C and 70% relative humidity environment until reaching dehydration to 3% body weight. Subjects of Control and Chlorella were given 130 ml of placebo or chlorella drink respectively immediately after dehydration, and then all subjects were rehydrated with sports drink (6% sucrose and 0.04% NaCl), 1.5 times amount of weight loss within 2 hours after dehydration. Blood samples were obtained before, 1h to 4h, 24h, and 48h after dehydration. The maximal aerobic exercise capacity was determined before, 4h, 24h and 48h after dehydration. White blood cells, neutrophils, lymphocytes and blood glucose levels were measured from blood samples.

**RESULTS:** The results showed that dehydration caused a significant reduction in exercise time and a significant increase in white blood cells and neutrophils numbers. The exercise time of Chlorella group was significantly higher than that of control group 4 hours after dehydration. White blood cells and neutrophils numbers in Chlorella group were significantly lower than that of the control group within 2 to 4 hours after dehydration. However, blood glucose level and the lymphocytes number showed no significant differences between control and Chlorella groups.

**CONCLUSIONS:** Our results concluded that Chlorella supplementation can improve aerobic exercise capacity and reduce Inflammation after dehydration.

3266 Board #171 June 2 2:00 PM - 3:30 PM

**High Intensity Intermittent Training And Chlorella Intake Enhance Muscle Glycolytic And Oxidative Metabolism In Rats.**

Naoki Horii<sup>1</sup>, Natsuki Hasegawa<sup>1</sup>, Shumpei Fujie<sup>1</sup>, Masataka Uchida<sup>1</sup>, Eri Miyamoto-Mikami<sup>2</sup>, Takeshi Hashimoto, FACSM<sup>1</sup>, Izumi Tabata, FACSM<sup>1</sup>, Motoyuki Iemitsu<sup>1</sup>. <sup>1</sup>Ritsumeikan University, Kusatsu, Japan. <sup>2</sup>National Institute of Fitness and Sports in Kanoya, Kanoya, Japan. (Sponsor: Izumi Tabata, FACSM)

(No relationships reported)

Chronic chlorella intake enhances aerobic exercise capacities, i.e. exercise tolerance. High intensity intermittent exercise (HIIE) training enhances aerobic and anaerobic exercise capacities via elevation of muscle glycolytic and oxidative metabolism. However, the additive effects of combination of HIIE training and chlorella intake on exercise performance and muscle glycolytic and oxidative metabolism remain unclear. **PURPOSE:** The purpose of this study was to investigate the effect of chronic chlorella intake alone or in combination with HIIE training on exercise performance and muscle glycolytic and oxidative metabolism in rats. **METHODS:** Male 12-week-old Sprague-Dawley rats were randomly assigned to the four groups; sedentary control, chlorella intake (0.5% chlorella powder in normal feed), HIIE training, and combination of HIIE training and chlorella intake for 6 weeks (n = 10 each group). HIIE training comprised 14 repeats of a 20-s swimming session with a 10-s pause between sessions, while bearing a weight equivalent to 16% of body weight, 4 days/week. Exercise performance was tested after the interventions by measuring the maximal number of HIIE sessions that could be completed. **RESULTS:** Chlorella intake and HIIE training significantly increased the maximal number of HIIE, and enhanced the expression of monocarboxylate transporter (MCT)1, MCT4, and peroxisome proliferator activated receptor  $\gamma$  coactivator-1 $\alpha$  concomitantly with the activities of lactate dehydrogenase (LDH), phosphofructokinase, citrate synthase (CS), and cytochrome oxidase (COX) in the red region of the gastrocnemius muscle (p<0.05). Furthermore, the combination further augmented the increased exercise performance and the enhanced expressions and activities (p<0.05). By contrast, in the white region of the gastrocnemius muscle, MCT1 expression and LDH, CS, and COX activities did not change. **CONCLUSIONS:** These results showed that compared to only chlorella intake and only HIIE training, chlorella intake combined with HIIE training has a more pronounced effect on exercise performance and muscle glycolytic and oxidative metabolism, in particular lactate metabolism.

Supported by Grants-in-Aid for Scientific Research (#26282199, M. Iemitsu)

3267 Board #172 June 2 2:00 PM - 3:30 PM

**Effects of Energy Drink on Metabolic Parameters and Exercise Performance Following Basketball Game Simulation**

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(No relationships reported)

**PURPOSE:** Intermittent sports are characterized by intermittent bursts of high-intensity exercise and are dependent upon a combination of anaerobic and aerobic energy systems, both of which rely on carbohydrate as an important fuel source. A potential reason for athletes to use energy drinks is due to the conception the energy drinks would promote improvement of performance and this practice has been common among athletes in recent history. This study examined the effects of energy drink on metabolic parameters and exercise performance following basketball game simulation (BGS).

**METHODS:** Six female college basketball players, aged 21.5 $\pm$ 1.9 yrs, volunteered for this study which was designed by a randomized counterbalanced experimental design with repeated measures under two different trials: energy drink (ED, extrication glucose 20 g from corn, citrus juice 2% from pure Calamansi fruit, branched chain amino acid 600 mg and taurine 600 mg) and placebo (PO, aspartame) with a double-blind experiment. The drink, either ED or PO is provided for the participants right after BGS, and the participants has a 20 min recovery period (POST). The BGS consisted of major basketball movements such as walking, jogging, running, low and high shuffles, dribble, jump, sprint, and pass which are all performed during 20 min. Height, body weight, blood pressure, and heart rate, blood glucose (BG), blood lactate (BL) were measured at a baseline (BASE). Vertical jump, 10 m $\times$  5 shuttle run and Wingate tests were performed prior to BGS and POST to evaluate muscular power, agility, and anaerobic power, respectively. BG and BL were measured at right after SBC (PRE) and POST. Data were analyzed by two-way ANOVA with repeated measures.

**RESULTS:** BG decreased significantly in PO (PRE: 106.5 $\pm$ 13.2 mg $\cdot$  dL<sup>-1</sup>, POST: 91 $\pm$ 5.1 mg $\cdot$  dL<sup>-1</sup>, p=.018) and BL decreased significantly in the both ED (PRE: 5.5 $\pm$ 1.8 mmol $\cdot$  L<sup>-1</sup>, POST: 3.1 $\pm$ 1.4 mmol $\cdot$  L<sup>-1</sup>, p=.0001) and PO (PRE: 5.0 $\pm$ 0.9 mmol $\cdot$  L<sup>-1</sup>,

POST: 3.5 $\pm$ 0.8 mmol $\cdot$  L<sup>-1</sup>, p=.000). Vertical jump (BASE: 58.0 $\pm$ 7.3 cm, POST: 55.5 $\pm$ 8.2 cm, p=.012) and anaerobic work (BASE: 12.3 $\pm$ 1.3 KJ, POST: 11.4 $\pm$ 1.5 KJ, p=.035) decreased significantly in PO.

**CONCLUSIONS:** The results indicate that energy drink may replenish a deficiency of fuel source and promote improvement of muscular and anaerobic power during recovery period.

3268 Board #173 June 2 2:00 PM - 3:30 PM

**Seven Days Of Mushroom Blend Supplementation Improve Measures Of Aerobic And Anaerobic Performance**

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(No relationships reported)

**PURPOSE:** The purpose of this study was to determine the effects of one week of mushroom blend supplementation (PeakO2, Compound Solutions, USA) on maximal oxygen uptake, peak power output, time to fatigue, and submaximal aerobic economy in apparently healthy young adults.

**METHODS:** Forty recreationally active men and women volunteered to participate, were randomized into one of two groups, and completed the testing protocol. At baseline each participant completed a maximal oxygen consumption (VO<sub>2</sub>max) test, which included a 5 minute economy state from minutes 3-8 along with a Wingate cycle ergometer test (peak power) at least 24 hrs later. The treatment group (T, n=23, mean  $\pm$  standard deviation, Age = 23.5  $\pm$  5.2 yrs, Height = 172.9  $\pm$  8.8 cm, Body Mass = 72.4  $\pm$  12.1 kg) consumed 12.0 g /day of mushroom blend (PeakO2) along with 12.0 g of Gatorade powder for one week. The control group (C, n=17, Age = 22.5  $\pm$  4.6 yrs, Height = 172.4  $\pm$  8.4 cm, Body Mass = 72.3  $\pm$  11.8 kg) consumed placebo (whole wheat flour) and Gatorade powder in identical fashion.

**RESULTS:** There were no differences between groups in any variables at baseline. Analysis was conducted stratifying each group by VO<sub>2</sub>max at baseline, in which the top 50% of each group was compared to the bottom 50% (Treatment top, TT, Treatment bottom, TB, Control top, CT, Control bottom, CB). TB increased VO<sub>2</sub>max significantly (1.95  $\pm$  2.76 ml $\cdot$ kg<sup>-1</sup> $\cdot$ min<sup>-1</sup>, p = 0.02) while TT, CT, and CB did not change significantly. PPO did not change significantly in any group, however; a trend (p = 0.059) for increased PPO in TB by was observed. Submaximal HR was lower (3.5 $\pm$ 18.5 bpm, p=.0167) in TT, but these changes were not different from changes in TB, CT, CB. TTF increased significantly (p < 0.05) in both TT and CT but changes between groups were not significant.

**CONCLUSIONS:** Seven days of supplementation with 12.0 g/day of PeakO2 may improve aerobic and anaerobic power output in less aerobically fit, healthy individuals. Those higher fit, apparently healthy individuals may see an improvement (e.g. lower HR) in economy during submaximal aerobic exercise.

3269 Board #174 June 2 2:00 PM - 3:30 PM

**Increased Time to Fatigue Following Twenty-Eight Days of Mushroom Blend Supplementation**

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(No relationships reported)

**PURPOSE:** There is evidence to suggest a commercially available, Cordyceps militaris-containing mushroom blend supplement (Peak O2, Compound Solutions, USA) improves tolerance to high-intensity exercise. However, the optimal dosing strategy remains unclear. Therefore, the purpose of the present study was to determine the effects of Peak O2 on indices of maximal and submaximal aerobic performance following 28 days of low-dose (1.0 g/day) supplementation in apparently healthy young adults.

**METHODS:** Twenty-one individuals (Mean  $\pm$  standard deviation, Age = 23.0  $\pm$  3.2 yrs, Height = 169.7  $\pm$  6.4 cm, Body Mass = 70.3  $\pm$  12.9 kg) participated in this randomized, blinded, placebo-controlled study. The treatment group (T, n=11) was given 1.0 g/day mushroom blend while the control group (C, n=11) received 1.0 g/day of color-matched wheat flour as placebo for 28 days. A graded maximal cycle ergometer test was used to evaluate maximal oxygen consumption (VO<sub>2</sub>max), time to fatigue (TTF), two-minute heart rate recovery following exhaustion (HRr), submaximal oxygen consumption (VO<sub>2</sub>) and blood lactate (BL) following 28 days of supplementation.

**RESULTS:** Dependent measures t-tests were used to evaluate changes within groups. TTF increased by 56.7  $\pm$  80.4 sec (p = 0.04) in T while there was no change in C (-2.1  $\pm$  31.3 sec, p = 0.42). VO<sub>2</sub>max increased in both groups (M, 1.9  $\pm$  2.6 ml $\cdot$ kg<sup>-1</sup> $\cdot$ min<sup>-1</sup>, p < 0.05; C, 1.0  $\pm$  1.6 ml $\cdot$ kg<sup>-1</sup> $\cdot$ min<sup>-1</sup>, p < 0.05). HRr, VO<sub>2</sub> and BL at submaximal workload showed no change in either group from pre to post.

**CONCLUSIONS:** Twenty-eight days of supplementation with a mushroom blend (1.0 g/day) may increase TTF in young, recreationally active adults.

3270 Board #175 June 2 2:00 PM - 3:30 PM  
**The Effect Of Blackcurrant Polyphenols On Recovery And Performance In Elite Endurance Athletes In Preparation For The World Championships**

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(No relationships reported)

Strategies that enable athletes to tolerate a higher training load may be advantageous for athlete health and performance.

**PURPOSE:** To examine the effects of New Zealand blackcurrants polyphenols (NZBK) on recovery and physical performance in elite athletes during a period of intensified training.

**METHODS:** Nine male modern pentathletes were tested at baseline (T1), after 7 days of receiving a placebo (P; T2) and after 7 days of receiving a blackcurrant supplement (NZBK; T3). Training volume was 30% higher during the second week. The test battery included a counter movement jump (CMJ) a running test (4 x 800 m), a mood state questionnaire (Recovery-Cue), and an extensive panel of blood tests including haematology and biochemistry. CMJ, lactate, a biomarker of oxidative damage (FORT) and anti-oxidant defense (FORD) were measured at rest and immediately before and after the 4 x 800 m run. A general linear model, with Tukey's post-hoc test for pairwise comparisons was used to determine differences between conditions, with Cohen's effect sizes (*d*) to calculate the magnitude of the standardised difference in means where significant; reported as 0.2 (small), 0.5 (moderate), 0.8 (large), and 1.3 (very large). Data are presented as mean ± SD. **RESULTS:** No effects were seen for P or NZBK on hormonal, haematological biochemistry markers, mood state, or running performance (*p*>0.05). NZBK reduced inflammation in comparison to P (HS-CRP 0.8±0.3 mg·L<sup>-1</sup> at T3 vs. 1.3±0.4 mg·L<sup>-1</sup> at T2, *p*=0.024, *d*=1.41), despite the increased training volume. There was a trend and effect for NZBK on reducing FORT (1.7±0.31 mmol·L<sup>-1</sup> at T1 vs. 1.62±0.31 mmol·L<sup>-1</sup> at T2 vs. 1.50±0.25 mmol·L<sup>-1</sup> at T3; *p*=0.063) and FORD (1.53±0.1 mmol·L<sup>-1</sup> at T1 vs. 1.54±0.16 mmol·L<sup>-1</sup> at T2 vs. 1.34±0.18 mmol·L<sup>-1</sup> at T3; *p*=0.015, *d*=1.17). Of interest, oxidative damage (FORT) correlated with testosterone, cortisol, CMJ and mood state (*p*<0.05).

**CONCLUSIONS:** NZBK reduces inflammation and oxidative stress in the presence of an increased training volume, with no effects on performance. Furthermore, the monitoring of oxidative damage in endurance athletes may be effective for tracking fatigue and well-being given the relationship with measures of recovery (e.g. hormones, CMJ and mood state).

3271 Board #176 June 2 2:00 PM - 3:30 PM  
**The Effects Of Cissus Quadrangularis On Body Composition And Blood Lipids**

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(No relationships reported)

**PURPOSE:** The purpose of this study was to determine the effects of 6 wks of supplementation with *Cissus Quadrangularis* (CQ) on body composition and blood lipids in healthy college aged adults. **METHODS:** A total of 27 healthy college aged adults (13 males, 14 females, 21.0±0.6 y; mean±SD) completed this study. All testing was done first thing in the morning following an overnight fast. Baseline body composition was assessed by whole body densitometry using air displacement plethysmography, and blood lipids and glucose were assessed using whole blood obtained via finger puncture. Following baseline testing, subjects were randomly assigned in a double blind manner into one of two groups: 3.2 g/d of CQ; or 3.2 g/d of a maltodextrin placebo (PL). Subjects consumed half of the daily dose in the morning and half in the evening on an empty stomach. All testing was repeated following 6 wks of treatment. Pre to post differences were analyzed using a treatment by time repeated measures ANOVA. **RESULTS:** Compared to the PL group, there was a significant increase in fat free mass following treatment with CQ (CQ= 0.3±1.2 kg, PL= -0.6±0.9 kg, *p*=0.03), a significant decrease in fat mass (CQ= -0.7±1.2 kg, PL= 0.8±1.4 kg, *p*=0.005), a significant decrease in body fat percentage (CQ= -0.7±1.4 % body fat, PL= 1.1±1.8 % body fat, *p*=0.006), and a significant increase in HDL (CQ= 0.01±0.18 mmol/L, PL= -0.20±0.2 mmol/L, *p*=0.009). No significant differences were observed for body mass (CQ= -0.4±1.2 kg, PL= 0.0±1.5 kg, *p*=0.41), total cholesterol (CQ= -0.11±0.42 mmol/L, PL= -0.23±0.29 mmol/L, *p*=0.39), LDL (CQ= -0.12±0.39 mmol/L, PL= -0.08±0.35 mmol/L, *p*=0.93), glucose (CQ= -0.06±0.46 mmol/L, PL= 0.14±0.45 mmol/L, *p*=0.28) or triglycerides (CQ= -0.09±0.61 mmol/L, PL= 0.22±0.30 mmol/L, *p*=0.10). **CONCLUSION:** 6wk of supplementation with CQ prevented

the drop in HDL that was seen in the PL group, with no other changes observed for blood lipids or glucose. CQ significantly increased lean mass and decreased fat mass, resulting in a significant decrease in body fat percentage.

3272 Board #177 June 2 2:00 PM - 3:30 PM  
**Effects of Tart Cherry Concentrate Upon Muscle Oxygenation During Cycling Exercise**

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(No relationships reported)

Previous studies examining the effects of short-term tart cherry (TC) ingestion are primarily limited to inflammatory markers and markers of oxidative stress. Short-term ingestion of nitrate-rich supplements have shown improvements in exercise performance. **PURPOSE:** The primary aim of the study was to determine if short-term TC concentrate ingestion would enhance exercise performance via increased serum nitrate levels, and subsequent increased muscle oxygenation (SmO<sub>2</sub>). **METHODS:** Healthy college-age males were randomly assigned to a TC supplement treatment (*n*=18) or a placebo treatment (PL) (*n*=12). Peak VO<sub>2</sub> and baseline measures were obtained. 48 hours later, participants returned to the lab following an overnight fast. The TC or PL supplement was provided and blood was drawn from the cubital vein 30 minutes, 1 hour, and 2 hours after supplement consumption. Subsequently, participants were given additional supplements to consume over the next 6 days. Following supplementation, participants cycled at a power output achieved at 60% of VO<sub>2</sub> peak for a maximum of 60 minutes or until exhaustion. Near-Infrared Spectroscopy sensors were placed on the vastus lateralis of each leg. Serum was analyzed for total nitrate levels via colorimetric assay. All samples were analyzed in duplicate. Results are presented as mean ± SEM. **RESULTS:** A repeated measures ANOVA revealed blood nitrate (μM/L) levels at 30 minutes (TC = 13.01 ± 1.80, PL = 10.78 ± 0.53) 1 hour (TC = 11.70 ± 0.66, PL = 11.00 ± 0.64) and 2 hours (TC = 9.25 ± 1.79, PL = 10.07 ± 0.77) were not significant for treatment, (*F* = 0.14, *p* = 0.71) time, (*F* = 1.89, *p* = 0.18) or treatment by time interaction (*F* = 0.75, *p* = 0.49). One way ANOVA revealed SmO<sub>2</sub> in the left leg (TC = 0.69 ± 0.05, PL = 0.82 ± 0.06; *F* = 2.68, *p* = 0.12) and right leg (TC = 0.65 ± 0.04, PL = 0.78 ± 0.11; *F* = 1.94, *p* = 0.18) were not significantly different between groups. An independent *t*-test revealed no significant differences for time (min) to exhaustion between groups (TC = 39.11 ± 5.66, PL = 42.94 ± 6.06; *t* = 0.46, *p* = 0.65). **CONCLUSIONS:** TC concentrate ingestion does not acutely increase blood nitrate levels. Furthermore, short-term TC ingestion does not increase muscle oxygenation during cycling exercise nor does it improve exercise performance, likely due to an absence of change in blood nitrate levels.

3273 Board #178 June 2 2:00 PM - 3:30 PM  
**Effects Of Aquarobic Exercise And Burdock Extract On Blood Lipids And Vascular Compliance In Elderly Women**

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(No relationships reported)

The elderly's health issues are often complex and tend to lead to chronic diseases; such issues can be due to a fitness decline resulting from a lack of physical activities. **PURPOSE:** The present study aims to determine the effects of aquarobic exercise and burdock intake on blood lipid profiles and vascular compliance in elderly women, by implementing the 16-week program. **METHODS:** Thirty eight healthy elderly female volunteer subjects aged 75.27 ± 4.32 years comprised the control group (*n*=8), aquarobic exercise group (*n*=10), aquarobic exercise and burdock intake combination group (*n*=10), and burdock intake group (*n*=10). This intervention trial was designed to compare pre-and post-exercise intervention variables. Changes from baseline to the end of the intervention were determined by a paired *t*-test and one-way analysis of variance (ANOVA). The variables of body composition, serum blood lipids, and vascular elasticity were measured in all participants before and after the 16-week study. **RESULTS:** TC(176.45 ± 20.61 vs. 189.18 ± 24.28 mg/dl), TG(112.45 ± 38.73 vs. 127.27 ± 48.19 mg/dl), LDL-C(145.83 ± 30.03 vs. 152.32 ± 30.04 mg/dl), glucose(94.00 ± 16.25 vs. 93.18 ± 12.18 mg/dl), and insulin(7.77 ± 3.77 vs. 7.03 ± 5.09 uU/mL) decreased significantly in the aquarobic exercise group and aquarobic exercise and burdock intake combination group(*p*< 0.05). However, no statistically significant changes were found within or between groups in high-density lipoprotein cholesterol and HOMA-IR. No statistically significant changes were found within or between groups in pulse wave velocity before and after participation in the 16-week aquarobics exercise program and /or burdock intake program. **CONCLUSIONS:** The findings of the present study discussed so far suggest that aquarobic exercise and burdock extract

intake had positive effects on risk factors of cardiovascular diseases in elderly women. It is likely that aquarobic exercise prevents and improves cardiovascular disease, and that burdock acts as a supplement against cardiovascular diseases.

3274 Board #179 June 2 2:00 PM - 3:30 PM  
**No Effect of Acute Beetroot Juice Supplementation on Moderate and Vigorous Intensity Aerobic Exercise**

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(No relationships reported)

Nitric oxide (NO) plays a critical role in regulating blood flow to skeletal muscle. NO production in humans is 1) oxygen-dependent via NO-synthases that convert L-arginine to NO and 2) oxygen-independent via the nitrate-nitrite-NO pathway. The latter pathway is largely dependent on the intake of nitrate-rich foods, such as beetroot and beetroot juice supplements (BR). Consumption of BR has been shown to lower resting blood pressure and the volume of oxygen ( $VO_2$ ) required to perform submaximal aerobic exercise. **Purpose:** The purpose of the present study was to investigate the acute effect of a low dose of BR compared to placebo (PL) during moderate and vigorous intensity aerobic exercise. **Methods:** Ten female division-3 collegiate club-level volleyball players (mean  $\pm$  SD: age =  $19.3 \pm 1.3$  yr,  $VO_{2peak} = 37.4 \pm 3.3$  ml $\cdot$ kg $^{-1}\cdot$ min $^{-1}$ ) completed three exercise trials consisting of an initial graded test to exhaustion and two performance trials on a motorized treadmill. For the performance trials, participants consumed either 60 mL of BR or PL, three hours prior to five minutes of walking/jogging at 45%, 65%, and 85% of volume of oxygen uptake reserve ( $VO_2R$ ). **Results:** Separate two-way repeated measures ANOVAs were run to determine the effect of treatment (BR or PL) and exercise intensity (45%, 65%, and 85%  $VO_2R$ ) on  $VO_2$ , heart rate (HR), and rating of perceived exertion (RPE). Paired samples t-tests were run to compare differences between resting systolic (SBP) and diastolic blood pressure (DBP) between treatments. All data are reported mean  $\pm$  standard deviation with statistical significance accepted at  $p < 0.05$ . There were no statistically significant interactions between treatment and exercise intensity for  $VO_2$ , HR, or RPE. The main effect of treatment was not statistically significantly different for  $VO_2$  (BR:  $19.9 \pm 6.6$  vs. PL:  $20.4 \pm 6.5$  ml $\cdot$ kg $^{-1}\cdot$ min $^{-1}$ ;  $p = .360$ ), HR (BR:  $131.3 \pm 25.8$  vs. PL:  $135.4 \pm 25.3$  beats $\cdot$ min $^{-1}$ ;  $p = .172$ ), or RPE (BR:  $9.8 \pm 2.2$  vs. PL:  $9.9 \pm 2.4$ ;  $p = .504$ ). There were no statistically significant differences in resting SBP (BR:  $110.6 \pm 6.8$  vs. PL:  $112.7 \pm 8.0$ ;  $p = .166$ ) or DBP (BR:  $70.8 \pm 5.5$  vs. PL:  $73.3 \pm 6.6$ ;  $p = .275$ ) between treatments. **Conclusions:** These results suggest that a low dose of BR taken three hours prior to moderate and vigorous intensity aerobic exercise has no effect on  $VO_2$ , HR, RPE, or resting SBP and DBP.

3275 Board #180 June 2 2:00 PM - 3:30 PM  
**Effects Of Spice-TRP Channel Activator Drink on Performance During Intermittent High-Intensity Exercise**

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**PURPOSE:** Transient Receptor Potential (TRP) channel activation in the mouth, esophagus and stomach after ingestion of spicy food extracts can have direct effects on central nervous system (CNS) function that have been linked to increased maximal power output and decreased muscle cramps. However, no studies have evaluated the effects of consuming TRP agonists on exercise performance. **METHODS:** This "proof of concept" study was designed to test the effects of a spice-TRP channel activator drink (1.7 fl oz with organic spice extracts, known TRPV1 and TRPA1 agonists; STA) on intermittent high-intensity cycling (IHI) using a randomized, double-blinded, placebo-controlled (PLA), crossover design in 20 healthy, active, college-aged men ( $n=10$ ) and women ( $n=10$ ). Subjects performed 2 trials (STA and PLA), each trial consisting of a 30-s maximal sprint (MS), 10-min rest, 45-min IHI (60% $VO_{2max}$  ride with 1-min 100%  $VO_{2max}$  sprints every 5 min), 15-min rest, and a 10-min time trial (TT). Drinks were given before MS and TT. Performance measures included power output during MS (5-s intervals, mean, total), and distance covered during TT. Leg muscle pain (pain), heart rate, mean arterial pressure, core body temperature, profile of mood state (mood), plasma glucose, IL-6, and IL-10 were also measured at multiple times during exercise and rest. Data were analyzed via paired t-tests and 2-way repeated-measures ANOVA. **RESULTS:** No significant differences ( $p < 0.05$ ) were found between STA and PLA for any of the variables. However, there was a consistent trend toward benefits of STA, including increased muscular power output (5s intervals, mean, total,  $p=0.09$ ), increased TT distance (13 of 19 subjects,  $p=0.20$ ), reduced pain ( $p=0.17$ ), and enhanced mood ( $p=0.20$ ); all except TT produced moderate-to-large

effect sizes (Cohen's  $d$  and partial  $\eta^2$ ). Meanwhile, no treatment differences were observed for cardiovascular, metabolic, and inflammatory measures. **CONCLUSION:** Results of this "proof of concept" study support further research on the CNS benefits of consuming natural spice-derived TRPV1 and TRPA1 agonists as a novel intervention to improve performance during intermittent high-intensity exercise, with no apparent adverse side effects. Supported by Flex Pharma, Inc.

3276 Board #181 June 2 2:00 PM - 3:30 PM  
**Effect Of A Nutraceutical Product On Energy, Fatigue, And Perceived Exertion In Healthy Active Adults**

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(No relationships reported)

**PURPOSE:** Evaluate the effectiveness of a commercially available nutraceutical product on levels of exercise-related energy, fatigue, and exertion before and after 4 weeks of supplementation. Primary ingredients within the product include a proprietary blend of blueberry extract, green tea extract, L-carnosine, and Vitamin D3 (NT-020) and rhodiola rosea, a plant that purports to boost energy. **METHODS:** Twenty-seven participants (12 female, 15 male, mean BMI = 23) completed baseline assessment of aerobic fitness (mean  $VO_2$  peak = 40 mL x kg $^{-1}$  x min $^{-1}$ ) before being randomized into a placebo or supplement condition for four weeks. All participants were involved in regular physical activity three or more days per week. Assessment of energy, fatigue, and perceived exertion responses during and after moderately intense cycle ergometry exercise was conducted before and after the 4-week ingestion period during which participants were instructed to maintain existing exercise activities. **RESULTS:** Data were analyzed by way of repeated measures ANOVA and dependent t-tests to determine the presence of significant differences across time and between the supplement and placebo conditions. Participants receiving the supplement reported: greater levels of energy and lower levels of fatigue during the initial moments after completing the exercise trial ( $p < 0.05$ ), greater levels of energy at the midpoint of the exercise trial ( $p < 0.05$ ) but not at the end of the exercise session ( $p > 0.05$ ), and lower perceived exertion at four of the six measurement points during exercise ( $p < 0.05$ ). No differences were observed from pre to post intervention within the placebo condition ( $p > 0.05$ ). **CONCLUSIONS:** Findings indicate that a commercially available supplement marketed to boost energy and reduce fatigue can deliver the purported benefits at least in part. Related findings that supplementation for a 4-week period can allow for equal work at a lower rating of perceived exertion provides further, though limited support that this product may have efficacy.

3277 Board #182 June 2 2:00 PM - 3:30 PM  
**Betalain-Rich Concentrate Supplementation Improves Exercise Performance and Recovery in Competitive Triathletes**

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**Reported Relationships:** C.F. Montenegro: Salary; VDF FutureCeuticals, Incorporated.

**INTRODUCTION:** Beetroot juice has been shown to have ergogenic effects on endurance exercise due to its high nitrate concentration, which increases mitochondrial coupling and blood flow. Another possible reason for the ergogenic effects of beetroot could be the abundance of betalains, which have been shown to have anti-oxidant and anti-inflammatory properties at rest, and could therefore be responsible for part of the ergogenic effects of beetroot during exercise.

**PURPOSE:** We aimed to determine the effects of a betalain-rich concentrate (BRC) of beetroots, containing no sugars or nitrates, on exercise performance and recovery. **METHODS:** Twenty-two (9 men and 13 women) triathletes ( $38 \pm 11$  yrs) completed two double-blind, cross-over, randomized trials (BRC and placebo) starting 7 days apart. Each trial was preceded by 6 days of supplementation with 100 mg $\cdot$ d $^{-1}$  of BRC or placebo. On the 7th day of supplementation, exercise trials commenced 120 min after ingestion of 50mg BRC or placebo and consisted of 40 min of cycling (75 $\pm$ 5 % $VO_{2max}$ ) followed by a 10-km running time trial (TT). Subjects returned 24 h later to complete a 5-km running TT to assess recovery. **RESULTS:** 10-km TT duration ( $49.5 \pm 8.9$  versus  $50.8 \pm 10.3$  min,  $p=0.03$ ) was faster with the BRC treatment. Despite running faster, average heart rate and ratings of perceived exertion were not different between treatments. 5-km TT duration ( $23.2 \pm 4.4$  versus  $23.9 \pm 4.7$  min,  $p=0.003$ ), 24 h after the 10-km TT, was faster in 17 of the 22 subjects with the BRC treatment. Creatine kinase, a muscle damage marker, increased less ( $40.5 \pm 22.5$  versus  $49.7 \pm 21.5$  U $\cdot$ L $^{-1}$ ,  $p=0.02$ ) from baseline to after the 10-km TT and subjective fatigue increased less ( $-0.05 \pm 6.1$  versus  $3.23 \pm 6.1$ ,  $p=0.05$ ) from baseline to 24 h after the 10-km TT with BRC. **CONCLUSION:** BRC supplementation improved 10-km TT performance in

competitive male and female triathletes. Improved 5-km TT performances 24 h after the 10-km TT and the attenuated increase of CK and fatigue, suggest an increase in recovery while taking BRC.  
Supported by a grant from VDF FutureCeuticals, Incorporated.

3278 Board #183 June 2 2:00 PM - 3:30 PM

### Effects of Korean Wild Ginseng Drink on Recovery from Acute Strenuous Exercise

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(No relationships reported)

Korean Wild Ginseng (KWG) has been known to have efficacy not only in physical stamina but also in anti-oxidative and anti-inflammatory properties. However, its effect on performance recovery by acute strenuous exercise is not well known.

**PURPOSE:** To investigate the effects of KWG Drink on performance recovery from acute strenuous exercise (ASE). **METHODS:** This study was conducted in double-blind, counterbalanced, placebo-controlled design with 14 days washout periods. Ten healthy male volunteers (27.1 ± 4.33 years old) were randomly assigned to one of two parallel trials. KWG (2g of KWG; 16.8 mg of ginsenosides/package) or placebo supplementation were consumed right after ASE and following 4 days (2 packs/day). The ASE program consisted of downhill running and jumping exercise. Subjects performed downhill running (-10 %) for 20 minutes at 60 % of VO<sub>2</sub> max. After downhill running, subjects performed jumping exercise that consisted of five sets of 20 maximal drop jumps from height of 60 cm with a 10 seconds interval between jumps and 2 minutes rest between each set. Peak and mean power, isometric muscle strength, electromyography activity, cognitive function, cortisol, interleukin-6 (IL-6), myoglobin, total antioxidant capacity (TAC), and muscle soreness were assessed at each time points: baseline, 2, 48, and 96 hours after ASE. A series of 2 x 4 repeated measures ANOVA, and MANOVA were used to determine differences according to the supplementation. **RESULTS:** There were no statistical differences in performance (F= 0.368, p= .970), cognitive function (F= 0.366, p= .983), blood variables (cortisol: F= 0.598, p= .584; IL-6: F= 1.662, p= .206, myoglobin: F= 0.574, p= .544, TAC: F= 1.508, p= .241), and muscle soreness (F= 0.760, p= .462) according to the supplementation. **CONCLUSION:** Supplementation of KWG extract has no efficacy for performance recovery from acute strenuous exercise in healthy male subjects. Dosage and short duration of KWG application may produce non-significance results. Further studies are needed to investigate the different dosage and duration of KWG supplementation on performance recovery.

3279 Board #184 June 2 2:00 PM - 3:30 PM

### Effects of Ursolic Acid Supplementation on Early Strength Gains and Body Composition

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(No relationships reported)

**PURPOSE:** Ursolic Acid (UA) is a compound commonly found in apple peels and other fruit skins. Previous studies in animal models have shown that UA may inhibit skeletal muscle atrophy, as well as increase the size and strength of skeletal muscle. In humans, one study lasting eight weeks showed significant effects of combined UA supplementation and resistance training on increased muscle strength and decreased body fat percentage, but the mechanisms are unclear. Another study found acute effects of UA supplementation during exercise included stimulating the pathway for muscle hypertrophy in resistance-trained men. Our study was designed to investigate whether any potential effects of UA supplementation on muscle strength gain occur during the early phase of neuromuscular adaptations to resistance training. We hypothesized that oral consumption of 150 mg of Ursolic Acid (UA) three times a day in combination with resistance training would lead to increased muscle strength gain but no effect on body composition over four weeks compared to equivalent training with Placebo. **METHODS:** Twelve untrained adults (six in each group of Placebo or UA) were recruited to participate in our four-week training study. Subjects ingested either a Placebo or 150 mg of UA 3 times a day with every meal, for a total of 450 mg per day for four weeks. A 1 Repetition Maximum (1RM) bench press test was used to assess muscular strength pre and post resistance training. Resistance training consisted of two supervised sessions per week of three sets of 10 repetitions of flat bench press, incline bench press, and flat dumbbell flies at 60-80% of 1RM. Pre and post resistance training body fat percentage was measured via hydrostatic weighing. **RESULTS:** After four weeks of resistance training, subjects experienced a significant increase in muscular strength as measured by a 1RM bench press test and no change in body fat percentage. There were no significant differences in muscle strength gain between the Placebo and UA supplementation groups. **CONCLUSION:** We conclude that any potential ergogenic effects of UA supplementation are unlikely to involve neuromuscular adaptations in the early strength gains of a resistance training program.

3280 Board #185 June 2 2:00 PM - 3:30 PM

### Effects of Peppermint Oil Supplementation on the Ventilatory Threshold in Young Women

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(No relationships reported)

**PURPOSE:** Peppermint oil (*mentha piperita*) has been shown to have cooling effects in animals and humans, as well as beneficial influences on pulmonary function tests possibly due to bronchodilatory mechanisms. In a previous study in our lab, we found that a single supplementation of one milliliter of peppermint oil mixed in one cup of water significantly raised the ventilatory threshold measured as %VO<sub>2max</sub> with no effect on VO<sub>2max</sub> in endurance-trained and moderately active men. In this current study, we replicated the methods in recreationally active women and hypothesized that peppermint oil supplementation would increase ventilatory threshold, but not VO<sub>2max</sub> in the female population. **METHODS:** Ten female participants (age 20.4 ± 0.6 yr) performed two maximal oxygen consumption (VO<sub>2max</sub>) tests on a cycle ergometer under randomized, single-blind trials of peppermint oil and placebo. For each exercise test, ventilatory threshold was determined by detecting the onset of hyperventilation in the ventilation vs. time curve. **RESULTS:** In the recreationally active female population, peppermint oil supplementation had no effect on the ventilatory threshold measured as a percentage of VO<sub>2max</sub> compared to placebo (peppermint 61.5 ± 4.1 % of VO<sub>2max</sub> vs. placebo 63.5 ± 2.5 % of VO<sub>2max</sub>). Additionally, VO<sub>2max</sub> values were not different between the two conditions (peppermint 36.6 ± 2.1 ml/kg/min vs. placebo 35.8 ± 1.8 ml/kg/min). **CONCLUSION:** Our findings suggest that peppermint oil supplementation may not play a significant role in the ventilatory threshold of recreationally active women, despite a significant effect having been observed in age-matched men. The ventilatory threshold phenomenon is complex, and sex differences may explain the inconsistent responses between men and women in peppermint oil supplementation during incremental exercise.

3281 Board #186 June 2 2:00 PM - 3:30 PM

### Heteropterys Tomentosa A. Juss. Extract Improved The Physical Performance And Presented A Powerful Antimutagenic Effect

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**PURPOSE:** Studies which evaluated the *Heteropterys Tomentosa A. Juss* extract (EHHt)-induced mutagenesis and its effects on swim performance in the animal models are non-existent. Thus, we verified, for the first time, the mutagenic potential (*in vitro*) as well as the acute ergogenic activity of the EHHt (in rats). **METHODS:** Step one: CHO-k1 cells were used for *in vitro* micronucleus (MN) assay; these cells were treated with vehicle, 10, 30, and 100 mg/kg of EHHt; DOXO at 0.03M was used as positive control. Step two: Twenty-four male Wistar rats (90 days old; weight 180 to 220 grams) were divided into vehicle, EHHt 25mg/kg, EHHt 100 mg/kg, EHHt 400 mg/kg and subjected to swimming progressive load test (overload equivalent to 3% of body weight plus 0.5%, every 5 min, until exhaustion); caffeine at 5mg/kg was used as positive control. **RESULTS:** Step one: The MN frequency was extremely lower (P=0.01) at 10 (5.33 ± 0.57), 30 (10.66 ± 4.04), and 100 (19.0 ± 1.41) mg/kg of EHHt if compared to vehicle (24.75 ± 5.18) and DOXO (90.7±3.1), being vehicle < DOXO. Step two: The rats administered with EHHt 25mg/kg presented higher values of time-to-exhaustion [TTE; min] (67.64±7.23; P=0.011) and exercise overload [EO; %] (9.6±0.96; P = 0.019) if compared to vehicle (TTE: 46.28±6.30; EO: 7.3±0.75), EHHt 100 mg/kg (TTE: 51.49±7.8; EO: 7.9±0.96), EHHt 400 mg/kg (TTE: 53.86±7.91; EO: 8.1±0.74), and caffeine (TTE: 59.17±9.43; EO: 8.6±0.89). **CONCLUSIONS:** EHHt acutely improved the performance of the animals subjected to swimming exercise until exhaustion at 25 mg/kg dose and, importantly, showed a strong antimutagenic effect at all doses administered. Further studies are needed in order to better understand the bioavailability of EHHt and which substance(s), in isolation, is(are) the main inductor(s) of these two interesting outcomes and the possible correlation between them.

3282 Board #187 June 2 2:00 PM - 3:30 PM

**The Effects Of Long-term Vs. Single Dose Nitrate Supplementation On Skeletal Muscle Oxygenation During A Simulated Cycling Time Trial**

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A transient augmentation in the energy efficiency of working skeletal muscle is the purported basis for dietary nitrate (NO<sub>3</sub><sup>-</sup>) supplementation amongst competitive and recreational athletes alike. Previous studies support the ergogenic benefits of NO<sub>3</sub><sup>-</sup> as results indicated improved microvascular blood flow, skeletal muscle oxygenation, and exercise performance with relatively short-term supplementation. As with most ergogenic aids, the optimum duration of supplementation prior to performance or competition, i.e. loading phase, is a critical determinant for efficacy. **Purpose:** Therefore, the purpose of this study was to investigate the effects of long-term vs. single dosing NO<sub>3</sub><sup>-</sup> supplementation on skeletal muscle oxygenation and cycling performance. **Methods:** In a randomized, placebo controlled, double blind, parallel design study, healthy, recreationally active male (n=15) and female (n=14) subjects (age= 18-29 yrs.) completed a 5-mi simulated cycling time trial before and after a 14-day supplementation period with either a NO<sub>3</sub><sup>-</sup> supplement (pre-nitrate loading; PRE) (n=14) or placebo (single nitrate dosing; SGL) (n=15). Both groups consumed a single dose of the NO<sub>3</sub><sup>-</sup> supplement 2 hours prior to the post-treatment time trial. In addition, skeletal muscle oxygenation was measured via near-infrared spectroscopy during each time trial. **Results:** Fourteen days of NO<sub>3</sub><sup>-</sup> supplementation (i.e. PRE) significantly decreased time to completion (TTC) (p=0.01) and increased average power (PWR<sub>AVG</sub>) (p=0.04) and speed (SPEED<sub>AVG</sub>) (p=0.02) from pre- to post-treatment while a single dosing (i.e. SGL) produced no significant changes to these measures. There were no significant differences over time and across treatments for any other measures including muscle oxygenation variables. **Conclusion:** Overall, long-term NO<sub>3</sub><sup>-</sup> supplementation appears to have slight benefits over a single pre-exercise dosing in terms of cycling performance. However, this ergogenic response cannot be explained by changes to skeletal muscle oxygenation, thus controverting previously purported mechanisms of action.

3283 Board #188 June 2 2:00 PM - 3:30 PM

**Effect Of Inorganic Nitrate Supplementation On O2 Uptake Kinetics And Exercise Tolerance: Influence Of Muscle Oxygenation**

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(No relationships reported)

**PURPOSE:** To test the hypothesis that inorganic nitrate (NO<sub>3</sub><sup>-</sup>) supplementation would improve muscle oxygenation, oxygen uptake (O<sub>2</sub>) kinetics and exercise tolerance (T<sub>lim</sub>) in normoxia and that these improvements would be augmented in hypoxia and attenuated in hyperoxia.

**METHODS:** In a randomized, cross-over study, ten healthy males completed work-to-work step cycle tests to exhaustion following acute consumption of 210 mL NO<sub>3</sub><sup>-</sup>-rich beetroot juice (BR; 18.6 mmol NO<sub>3</sub><sup>-</sup>) and NO<sub>3</sub><sup>-</sup>-depleted beetroot juice placebo (PL; 0.12 mmol NO<sub>3</sub><sup>-</sup>). These tests were completed in normobaric normoxia (FIO<sub>2</sub>: 21%), hypoxia (FIO<sub>2</sub>: 15%) and hyperoxia (FIO<sub>2</sub>: 40%). Pulmonary O<sub>2</sub> and quadriceps tissue oxygenation index (TOI), derived from multi-channel near-infrared spectroscopy, were measured during all trials.

**RESULTS:** Plasma [nitrite] was higher in all BR compared to all PL trials (P<0.05). Quadriceps TOI was higher in normoxia compared to hypoxia (P<0.05) and higher in the hyperoxia compared to hypoxia and normoxia (P<0.05). T<sub>lim</sub> was improved after BR compared to PL ingestion (250 ± 44 vs. 231 ± 41 s), with the magnitude of improvement being negatively correlated with quadriceps TOI at exhaustion (r = -0.78), in the hypoxic trials (P<0.05). T<sub>lim</sub> tended to be improved with BR in normoxia (BR: 364 ± 98 vs. PL: 344 ± 78 s; P=0.087), but was not improved in hyperoxia (BR: 492 ± 212 vs. PL: 472 ± 196 s; P>0.05). BR ingestion increased peak O<sub>2</sub> in hypoxia (P<0.05), but not normoxia or hyperoxia (P>0.05).

**CONCLUSIONS:** NO<sub>3</sub><sup>-</sup> supplementation is more likely to improve T<sub>lim</sub> and peak O<sub>2</sub> as skeletal muscles become increasingly hypoxic.

3284 Board #189 June 2 2:00 PM - 3:30 PM

**Beetroot-Based Gel Improves Forearm Reoxygenation and Strength after Exercise in Elderly with Cardiovascular Risk Factors.**

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(No relationships reported)

**ABSTRACT** Muscle oxidative capacity and recovery time of muscle oxygenation following maximal exercise decline with the aging. Although dietary nitrate supplementation has been shown to improve muscle oxygenation in health subjects, these effects in elderly has not been addressed. **PURPOSE:** To evaluate the effect of a beetroot-based nutritional gel (BG) on forearm muscle oxygenation, blood volume and handgrip strength in elderly with cardiovascular risk factors. **METHODS:** 12 elderly participated in a randomized, double-blind and crossover study. Maximal voluntary contraction (MVC) was collected for baseline, immediately and 20 min after exercise in both BG (100 g of beetroot-based gel containing approx. 12 mmol nitrate) or PLA (100 g of nitrate-depleted gel nitrate-depleted) were provided. After 150 min of ingestion of each intervention, elderly performed a rhythmic handgrip exercise which consisted of one 1-min sets at 30 % of the MVC of each subject following 1 min of quiet recovery after exercise. Muscle deoxygenation (SmO<sub>2min</sub>), muscle reoxygenation (SmO<sub>2max</sub>), muscle deoxygenation time (SmO<sub>2/DT</sub>), muscle reoxygenation time (SmO<sub>2/RT</sub>) and blood volume (tHb) were continuously monitored using an NIRS device. **RESULTS:** significant reduction in SmO<sub>2min</sub> and SmO<sub>2/DT</sub> was observed during exercise and SmO<sub>2/RT</sub> during recovery, as it was in the ΔMVC (BG: -18.56±13.8 vs. PLA: -26.18±14.6 N; P<0.05) only 20 min after handgrip exercise. Significant increase in tHb during and after exercise was observed in BG. There was no significant difference in SmO<sub>2max</sub> between interventions. **CONCLUSION:** Single dose of BG improve microvascular hemodynamic which may accelerate the muscle recovery after short exercise in elderly with cardiovascular risk factors.  
Supported by FAPERJ (E-26/010.002692/2014) and CNPq (442977/2014-0) Grant.

Table 1. Values of near-infrared spectroscopy (NIRS) during exercise and recovery period of exercise.

Variable	PLA	BET
SmO <sub>2min</sub> (%)	59.2±5.6	55.7±8.2*
SmO <sub>2max</sub> (%)	71.4 ± 3.8	71.3 ± 3.2
SmO <sub>2/DT</sub> (s)	24.2 ± 10.8	19.5 ± 9.5*
SmO <sub>2/RT</sub> (s)	14.2 ± 8.3	8.1 ± 7.7*
ΔtHb <sub>exercise</sub> (A.U)	24.1 ± 15.8	31.4 ± 16.6*
ΔtHb <sub>recovery</sub> (A.U)	7.5 ± 4.9	11.2 ± 7.3*

The values are mean ± SD. \* (P<0.05) vs. PLA

3285 Board #190 June 2 2:00 PM - 3:30 PM

**Muscle Damage and Inflammation Following a Marathon: Influence of Beetroot Juice**

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(No relationships reported)

**Purpose** The present study examined whether consuming an antioxidant-rich beetroot juice (BTJ) would attenuate markers of inflammation and muscle damage following a marathon. **Methods:** Using a double blind, independent groups design, 34 marathon runners (~16 previous marathons completed) consumed either BTJ (~3mmol/L Trolox equivalent antioxidant capacity; polyphenol content: ~405 mg of Gallic Acid Equivalents) or an isocaloric placebo (PLA) for 3 days following a marathon race (3 x 250 ml per day). Maximal isometric voluntary contractions (MIVC), countermovement jumps (CMJ), muscle soreness, serum cytokines, leucocytosis, creatine kinase (CK), high sensitivity C-reactive protein (hs-CRP) and aspartate aminotransferase (AST) were measured pre, post, and on the 2 days after the marathon. **Results:** Muscle function (CMJ and MIVC) was significantly reduced after the marathon (P<0.05) but no group differences were observed at any time point (P>0.05). At 48 h post-marathon, CMJ was similarly depressed in the BTJ and PLA groups (95 ± 6 vs. 95 ± 9 % of baseline values, respectively), with MIVC returning to baseline levels in both groups (100 ± 13 vs. 99 ± 10 %, respectively). Muscle soreness was increased in both groups in the day after the marathon (BTJ; 45 ± 48 vs. PLA; 46 ± 39 mm) and had returned to baseline by day 2, irrespective of supplementation (P>0.05). Cytokines (Interleukin-6; IL-6, interleukin-8, tumour necrosis factor-α) were increased immediately post-marathon but apart from IL-6 (~0.9 fold change in BTJ and ~1.5 in PLA) had returned to

baseline values by day 1 post. No group differences were evident ( $P < 0.05$ ). Leucocytes increased 1.7 fold immediately after the race and remained elevated 2 days' post, irrespective of supplement. CK, AST and hs-CRP were all still elevated 2 days after the marathon ( $P < 0.05$ ), but no group differences were present. **Conclusions:** Beetroot juice supplementation was no more effective than a PLA for attenuating inflammation and functional markers of muscle-damage following a marathon race.

3286 Board #191 June 2 2:00 PM - 3:30 PM  
**The Impact of Beetroot Extract Ingestion on Lactate Kinetics During Submaximal Exercise**

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**PURPOSE:** Dietary nitrate supplementation in the form of beetroot extract (BRE) has recently emerged as a potential modulator of exercise capacity. To date, the impact of BRE ingestion on lactate kinetics, a key determinant of endurance exercise performance, has not been rigorously assessed.

**METHODS:** We performed a single-blinded, randomized crossover study in which competitive masters rowers underwent graded stepwise (3 mins, 20W increment) rowing ergometer testing to define lactate handling profiles. Each participant was tested 2.5 hours after ingestion of a commercially available BRE product (Beet-It Sport Shot, Ipswich, UK) and blackcurrant juice placebo (R.W. Knudsen Just Black Currant, Chico, CA). Capillary lactate concentrations were measured at the completion of each testing stage to develop lactate handling curves.

**RESULTS:** Participants ( $n = 12$ , 50% men, age =  $54 \pm 5$  years, peak  $\dot{V}O_2 = 47 \pm 7$  ml/kg) with  $24 \pm 12$  years of rowing experience completed all aspects of this protocol. Heart rate, oxygen consumption, respiratory exchange ratio, and perceived effort were similar at all exercise intensities during testing following ingestion of BRE and placebo. Similarly, parameters of lactate handling including absolute lactate concentrations at each exercise intensity, workload at onset of blood lactate accumulation, and workload at 4 mmol lactate concentration were similar following ingestion of the active BRE compound and placebo (Figure).

**CONCLUSION:** Ingestion of a single dose of commercially available BRE does not appear to have a significant impact on lactate handling. Performance during activities that depend on lactate handling may be unresponsive to BRE ingestion.

**Figure.** Capillary lactate concentrations during stepwise rowing ergometer exercise testing following ingestion of beetroot extract (BRE) and placebo.

3287 Board #192 June 2 2:00 PM - 3:30 PM  
**Dietary Nitrate Supplementation Improves Sprint and High-Intensity Intermittent Running Performance**

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 (No relationships reported)

The influence of dietary nitrate ( $\text{NO}_3^-$ ) supplementation on indices of maximal sprint and intermittent exercise performance is unclear. **Purpose:** To investigate the effects of  $\text{NO}_3^-$  supplementation on sprint running performance, and cognitive function and exercise performance during the sport-specific Yo-Yo Intermittent Recovery level 1 test (IR1). **Methods:** In a double-blind, randomised, crossover study, 36 male team-sport players received  $\text{NO}_3^-$ -rich (BR; 70 mL·day<sup>-1</sup>; 6.4 mmol of  $\text{NO}_3^-$ ), and  $\text{NO}_3^-$ -depleted (PL; 70 mL·day<sup>-1</sup>; 0.04 mmol  $\text{NO}_3^-$ ) beetroot juice for 5 days. On day 5 of supplementation, subjects completed a series of maximal 20-m sprints followed by the Yo-Yo IR1. Cognitive tasks were completed prior to, during and immediately following the Yo-Yo IR1. **Results:** BR improved sprint split times relative to PL at 20 m (1.2%; BR  $3.98 \pm 0.18$  vs. PL  $4.03 \pm 0.19$  s;  $P < 0.05$ ), 10 m (1.6%; BR  $2.53 \pm 0.12$  vs. PL  $2.57 \pm 0.19$  s;  $P < 0.05$ ) and 5 m (2.3%; BR  $1.73 \pm 0.09$  vs. PL  $1.77 \pm 0.09$  s;  $P < 0.05$ ). The distance covered in the Yo-Yo IR1 test increased by 3.9% (BR  $1422 \pm 502$  vs. PL  $1369 \pm 505$  m;  $P < 0.05$ ). The reaction time to the cognitive tasks was shorter in BR ( $615 \pm 98$  ms) than PL ( $645 \pm 120$  ms;  $P < 0.05$ ) at rest but not during the Yo-Yo IR1 (BR:  $612 \pm 104$  vs. PL:  $621 \pm 92$  ms;  $P > 0.05$ ). There was no difference in overall response accuracy (BR:  $34.7 \pm 1.4$  vs. PL:  $34.6 \pm 1.5$  correct responses;  $P > 0.05$ ) and there were no differences in response accuracy at any specific time point. **Conclusion:** Dietary  $\text{NO}_3^-$  supplementation enhances maximal sprint and high-intensity intermittent running performance in competitive team sport players. Our findings suggest that  $\text{NO}_3^-$  supplementation has the potential to improve performance in single-sprint or multiple-sprint (team) sports.

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ACSM May 30 – June 3, 2017

3288 Board #193  
**Abstract Withdrawn**

3289 Board #194 June 2 2:00 PM - 3:30 PM  
**Acute Nitrate Supplementation Improves Ischemic Exercise Tolerance in Post-Menopausal Women**

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 (No relationships reported)

**PURPOSE:** Inorganic nitrate supplementation elicits its most consistent ergogenic benefits during conditions of low muscle oxygen availability. In the present study we tested the ability of acute dietary nitrate supplementation to attenuate perceived effort and increase time to volitional fatigue during blood flow-restricted exercise in post-menopausal women. **METHODS:** Eleven post-menopausal women (57 to 64 yr) performed intermittent isometric handgrip squeezes (10% of MVC, 30 per min) during progressive upper arm cuff inflation (+20 mmHg per min) on 3 study visits, with 7 to 10 days between visits. Approximately one week following visit 1, participants randomly consumed 140 ml of nitrate-concentrated (0.8 gm of nitrate; BrJ<sub>nitrate</sub>) or nitrate-depleted (BrJ<sub>placebo</sub>) beetroot juice (James White Beet-It Sport; IND#119978), with handgrip exercise beginning two hours post-consumption. Ratings of perceived exertion (Borg RPE) were assessed each minute. Venous blood was collected (before, 90 min post, 180 min post consumption) on both BrJ visits for measurement of plasma nitrate [ $\text{NO}_3^-$ ] and nitrite [ $\text{NO}_2^-$ ]. **RESULTS:** Compared to responses observed during the BrJ<sub>placebo</sub> consumption visit, BrJ<sub>nitrate</sub> consumption raised plasma [ $\text{NO}_3^-$ ] (13-fold) and [ $\text{NO}_2^-$ ] (4-fold), delayed the initial rise in RPE (+50 sec), and increased time to volitional fatigue ( $526 \pm 46$  vs.  $567 \pm 50$  sec) (all  $p < 0.05$ ).

**CONCLUSIONS:** These findings provide further support for the ergogenic potential of nitrate supplementation under conditions of restricted muscle blood flow/oxygen availability. Funding: Penn State Hershey Family & Community Medicine (JAFPE Endowment)

3290 Board #195 June 2 2:00 PM - 3:30 PM  
**Dietary Nitrate Supplementation Reduces The Oxygen Cost Of Submaximal Arm Crank Exercise**

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 (No relationships reported)

There is evidence to suggest that the ingestion of  $> 5$  mmol inorganic nitrate ( $\text{NO}_3^-$ ) can enhance exercise economy [lower pulmonary oxygen uptake [ $\dot{V}O_2$ ]] and performance during cycling and running exercise. However, the effect of dietary  $\text{NO}_3^-$  supplementation on economy and performance during isolated upper-body exercise is less clear. **PURPOSE:** To test the hypothesis that dietary  $\text{NO}_3^-$  supplementation would improve economy and performance during arm cranking exercise. **METHODS:** Eight recreationally-active males were assigned in a randomized, double-blind, crossover design to receive  $\text{NO}_3^-$ -rich beetroot juice (BR; 12.2 mmol  $\text{NO}_3^-$ ·day<sup>-1</sup>) and  $\text{NO}_3^-$ -depleted beetroot juice (PL; 0.01 mmol  $\text{NO}_3^-$ ·day<sup>-1</sup>) for 7 days. On days 5 and 7 of supplementation, subjects completed two bouts of moderate-intensity exercise and one bout of severe-intensity exercise that was continued until exhaustion on an arm-crank ergometer. Resting venous blood samples were obtained, for later determination of plasma nitrite concentration ([ $\text{NO}_2^-$ ]) and breath-by-breath  $\dot{V}O_2$  were measured during all exercise tests.

**RESULTS:** Plasma [ $\text{NO}_2^-$ ] was higher following BR, compared to PL (PL:  $86 \pm 51$  nM vs. BR:  $542 \pm 285$  nM;  $P < 0.05$ ). BR supplementation lowered steady-state  $\dot{V}O_2$  during moderate-intensity exercise by 3% (PL:  $0.93 \pm 0.24$  L·min<sup>-1</sup> vs. BR:  $0.90 \pm 0.23$  L·min<sup>-1</sup>;  $P < 0.05$ ). Exercise economy and time-to-exhaustion (PL:  $459 \pm 102$  vs. BR:  $474 \pm 135$  s;  $P > 0.05$ ) were not impacted by BR supplementation during severe-intensity arm cranking.

**CONCLUSIONS:** Short-term dietary  $\text{NO}_3^-$  supplementation improved moderate-intensity exercise economy, but not severe-intensity exercise economy or tolerance, during arm-cranking exercise in recreationally-active subjects.

3291 Board #196 June 2 2:00 PM - 3:30 PM  
**The Effect of an Acute Dose of Beet Juice on Female College Soccer Performance**  
 Marisa J. Brothwell<sup>1</sup>, Deanna Schied<sup>2</sup>, Gavin Connolly<sup>2</sup>, Shane O'Riordan<sup>2</sup>, Christen Chiesa<sup>2</sup>, Yeonsoo Kim<sup>2</sup>, Paul L. O'Connor<sup>2</sup>. <sup>1</sup>University of Michigan, Ann Arbor, MI. <sup>2</sup>Central Michigan University, Mt Pleasant, MI.  
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 (No relationships reported)

**PURPOSE:** Beet juice is a potential source of inorganic nitrates in the diet. Inorganic nitrates have been shown to improve exercise performance. Increased levels of nitrates may reduce the ATP cost of force production and may influence mitochondrial efficiency leading to a reduction in the energy cost of exercise. Most studies to date assessed high intensity endurance performance with time trials lasting 15 - 138 min. However, there is a lack of research on the effect of nitrates on intermittent exercise similar to that performed in soccer. The purpose of this project was to examine the effects of acute beet juice supplementation on performance during a simulated soccer match.

**METHODS:** 8 female college soccer players ( $VO_{2max}$ :  $52.3 \pm 8.5$  ml/kg/min; mean  $\pm$  SD) each completed two trials in a randomized, double-blind design. Participants ingested one nitrate rich beet juice shot (BR;  $\sim 6.5$  mmol of nitrate per 70 ml) or one nitrate depleted beet juice shot (PL;  $\sim 0.04$  mmol nitrate per 70 ml) 3 h before performing a modified Loughborough Intermittent Shuttle Test (LIST), separated by 7 days. Participants performed a Yo-Yo intermittent shuttle test to estimate maximal aerobic speed used in the modified LIST. The LIST consists of six 15 min periods of walking, running, sprinting and shooting. Each 15 min period is separated by a 3 min break.  $O_2$  consumption and heart rate were measured continuously using a portable metabolic system. Values were averaged over the last 5 min of each 15 min period. Lactate and RPE were collected every 15 min.

**RESULTS:** There was no significant difference at any time point in any of the measured variables between PL and BR trials. The average  $VO_2$  between the PL and BR trial was  $33.8 \pm 4.4$  vs  $34.2 \pm 4.1$  ml/kg/min. In both trials the  $VO_2$  was significantly higher in the first 15 min compared to all other time points ( $p < 0.05$ ). The average heart rate between the PL and the BR trial was  $172 \pm 18$  vs  $175 \pm 6$  bpm. The average lactate value between the PL and the BR trial was  $3.8 \pm 2.0$  vs  $3.2 \pm 1.5$  mmol. RPE values between the PL and the BR were  $15.4 \pm 1.2$  vs  $15.8 \pm 1.6$ . In both trials the RPE was significantly lower in the first 15 min compared to all other time points ( $p < 0.05$ ).

**CONCLUSIONS:** Acute ingestion of nitrate rich beet juice did not improve simulated soccer performance.

3292 Board #197 June 2 2:00 PM - 3:30 PM  
**Far-infrared Emitting Fabric Improves Aerobic Metabolism, Oxidative Stress and Exercise Tolerance, Independent of Nitric Oxide**  
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 (No relationships reported)

Studies have shown that FIR emitted by materials can, without change temperature, enhance cell metabolism and function, increase cellular availability of nitric oxide (NO) and  $Ca^{2+}$ , improve blood circulation and an *ex-vivo* study of skeletal muscle has shown the effect of delay fatigue. However, the effectiveness of FIR fabric as ergogenic aid and its related mechanism in humans remains unknown. **PROPOSE:** Analyze the effect of fabric made by polyamide fiber mixed to FIR emitting substances on exercise bioenergetics, oxidative stress, NO and exercise tolerance. **METHODS:** Eighteen active men performed two ergospirometric tests, two familiarizations and two testing days composed by a square-wave cycling exercise at moderate intensity (2 sets of 10 min), followed by very heavy intensity until exhaustion. Tests occurred two weeks apart and after 96 hours of FIR or Placebo fabric usage, in a crossover, double-blind, placebo-controlled design. The exercise oxygen uptake, lactate accumulation and fast  $VO_2$  off-kinetics were used to calculate Aerobic (Ae), Anaerobic Lactic (AnL) and Anaerobic Alactic (AnA) metabolism relative to total energy expenditure values, using the GEDAE-LaB software. High temperature was measured by an infrared thermometer, oxidative stress by gas chromatography-tandem mass spectrometry measurements of  $F_2$ -isoprostanes, NO by chemiluminescence analysis of Nitrite and Nitrate. **RESULTS:** There were no differences for any variable between FIR and Placebo fabrics pre-tests and post-moderate exercise. For the very heavy exercise until exhaustion, exercise time was higher for FIR than Placebo ( $403 \pm 127$ s vs.

$338 \pm 110$ s,  $p = 0.004$ ). Relative energy system contributions (%) were as followed: Ae (FIR  $66.48 \pm 10.91$  - Placebo  $61.44 \pm 15.58$ ,  $p = 0.04$ ); AnL (FIR  $21.41 \pm 5.63$  - Placebo  $23.02 \pm 6.53$ ,  $p > 0.05$ ); AnA (FIR  $12.10 \pm 9.38$  - Placebo  $15.53 \pm 13.69$ ,  $p > 0.05$ ). Temperature ( $^{\circ}C$ ) were not different between fabrics (FIR  $31.8 \pm 1.6$  - Placebo  $31.9 \pm 2.2$ ,  $p > 0.05$ ).  $F_2$ -isoprostanes (pg/dl) just increase for Placebo (pre  $216.75 \pm 52.78$  - post-VH  $291.53 \pm 88.95$ ,  $p = 0.005$ ). **CONCLUSION:** Far-infrared emitting fabric enhances aerobic metabolism, reduced oxidative stress and improves exercise tolerance during very heavy intensity exercise, independent of NO availability.

3293 Board #198 June 2 2:00 PM - 3:30 PM  
**Beetroot Supplementation Effects On Exercise Performance During Cycling And Oxidative Damage**  
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 (No relationships reported)

**PURPOSE:** The aim of this study was to compare the effectiveness of beetroot power in pill supplementation on cycle exercise performance as well as oxidative damage measured by Malondialdehyde (MDA) concentration. **METHODS:** Twenty-four untrained subjects ( $20.92 \pm 3.60$  years) performed on a Monark cycle ergometer exercise session for 15 minutes three times a week for four weeks. The Institutional Review Board (IRB) has approved all experimental procedures and subjects have been considered low risk according to the American College of Sports and Medicine. The subjects were split up randomly into two groups, control versus experimental. Twelve subjects (six females and six males) took two pills of beetroot power (500mg) and the other twelve took a placebo. Urine samples were taken on the last day of weeks 2, 3 and 4. During each exercise session times were noted when the subject reached 85% of their heart rate max and then finished out their 15mins at their 85%. Subjects were provided water during each meeting to make sure they were well hydrated. Since water has a various pH level the same bottle of water was provided for all subjects. Urine was stored at  $-20^{\circ}C$  until all samples were collected. Urine creatine levels were measured by using a Specimen Validity Test and a MDA Assay kit (Northwest Life Science Specialties, 2014) was used to determine MDA levels in the urine at the time the subject reach 85% of their heart rate max. A single factor ANOVA was performed on all data to see if there was significance. **RESULTS:** No significant difference ( $p > 0.05$ ) was in any of the parameter that were observed (Time to reach 85% of max heart rate, RPE, MDA concentrations). **CONCLUSION:** Beetroot supplementation had no effect on exercise performance nor did it alter oxidative damage measured via MDA Concentrations.

3294 Board #199 June 2 2:00 PM - 3:30 PM  
**Effects of Fermented Drink Intake on Post-exercise Glycogen Restoration in Rat Skeletal Muscle and Liver**  
 Tsubasa Shibaguchi<sup>1</sup>, Rie Ishizawa<sup>2</sup>, Atsushi Tsuji<sup>3</sup>, Yuya Yamazaki<sup>3</sup>, Keizo Matsui<sup>4</sup>, Kazumi Masuda<sup>1</sup>. <sup>1</sup>Kanazawa University, Ishikawa, Japan. <sup>2</sup>Waseda University, Saitama, Japan. <sup>3</sup>Industrial Research Institute of Ishikawa, Ishikawa, Japan. <sup>4</sup>Fukumitsuya Sake Brewery, Ishikawa, Japan.  
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 (No relationships reported)

Recently, we have created a new fermented drink (FD) containing lots of carbohydrates, amino acids, citric acids, and so on. However, physiological activities which the FD has are still unclear.

**PURPOSE:** This study investigated the effects of post-exercise FD supplementation on glycogen restoration in rat skeletal muscle and liver.

**METHODS:** Male Wistar rats (10-weeks-old) were randomly divided into two main groups: sedentary control (Con) and exercise. Following 12 h fasting, rats in the exercise group swam for 2.5 h in five 30-min bouts separated by 5 min of rest in order to deplete skeletal muscle and liver glycogen. The rats were orally ingested either water, glucose solution, or FD 0.5, 1, 1.5, and 2 h after the swimming. Immediately and/or 4 h after the exercise, soleus and deep portion of gastrocnemius (GasD) muscles and liver were dissected and analyzed.

**RESULTS:** Swimming exercise resulted in an approx. 20-60% reduction of glycogen concentration in all collected tissues compared with the value of fasted Con animals. Thereafter, the glycogen level in both skeletal muscles and liver increased significantly above the fasted Con level at 4 h after the swimming exercise only when either glucose or FD ingestion were performed during the recovery period ( $p < 0.05$ ). The degree of this increase was significantly greater in FD-treated than in glucose-treated animals, particularly in the liver ( $p < 0.05$ ). A similar trend was also observed in the GasD, but not in the soleus muscles.

**CONCLUSIONS:** These results suggest that FD supplementation will be an effective method for enhancing post-exercise glycogen restoration in both skeletal muscle and liver.

**F-59 Free Communication/Poster - Ergogenic Aids V**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3295 Board #200 June 2 3:30 PM - 5:00 PM

**Prescription Strength Ibuprofen Interferes with  
Prophylactic Adaptations to Heavy Unaccustomed  
Resistance Exercise**

Jessica G. Ehrbar<sup>1</sup>, Michael J. Saunders, FACSM<sup>1</sup>, M K. Todd<sup>1</sup>, Andrew C. D'Lugos<sup>2</sup>, Nicholas D. Luden<sup>1</sup>. <sup>1</sup>James Madison University, Harrisonburg, VA. <sup>2</sup>Arizona State University, Phoenix, AZ. (Sponsor: Michael J. Saunders, FACSM)  
(No relationships reported)

Skeletal muscle typically experiences a repeated bout effect (RBE) following a single bout of heavy unaccustomed exercise, characterized by rapid adaptations aimed at protecting against a subsequent insult. Previous research indicates that non-steroidal anti-inflammatory drugs such as ibuprofen (IBU) may interfere with key mechanisms governing early skeletal muscle adaptive responses. **PURPOSE:** This proof-of-concept study was designed to assess the influence of prescription strength IBU on the RBE following heavy exercise.

**METHODS:** In a double-blinded crossover design, eight males (23 ± 4 yr) completed two separate testing phases separated by a washout period (7 d). Each phase consisted of two sessions of unilateral eccentric resistance exercise (RE; 10 sets, 10 reps, 120% 1 RM), separated by 10 d. During each phase, subjects consumed either a prescription dose (800 mg) of IBU or placebo (PLA) 45 min prior to RE and in 8 h increments for 72 h following RE. Muscle recovery variables [muscle soreness, peak isokinetic torque, total isokinetic work during 30 reps and plasma creatine kinase (CK)] were measured 24 and 72 h following each RE session (Initial RE = RE<sub>1</sub>; RE 10 d later = RE<sub>2</sub>). Magnitude-based inferences were used to evaluate treatment effects on muscle recovery variables.

**RESULTS:** Changes in post-exercise muscle soreness 24 h following RE<sub>2</sub> were 'likely' reduced with PLA (RE<sub>1</sub>: 43 ± 15 mm to RE<sub>2</sub>: 27 ± 14 mm) compared to IBU (RE<sub>1</sub>: 39 ± 23 mm to RE<sub>2</sub>: 39 ± 15 mm). In addition, reductions in total work output 72 h following RE<sub>2</sub> were 'likely' attenuated with PLA (RE<sub>1</sub>: -598 ± 614 J to RE<sub>2</sub>: -13 ± 445 J), but not IBU (RE<sub>1</sub>: -335 ± 481 J to RE<sub>2</sub>: -343 ± 284 J). The impact of IBU on measures of peak muscle torque and CK were 'unclear'.

**CONCLUSION:** In general, ibuprofen consumption appeared to interfere with the RBE, compared to PLA. These data suggest that prescription-strength dosing of IBU following skeletal muscle trauma may be detrimental to the initial adaptive responses following heavy exercise.

3296 Board #201 June 2 3:30 PM - 5:00 PM

**Acute Naproxen Dose On Gastrointestinal Distress  
And Performance During Moderate-intense Cycling In  
The Heat**

Dawn M. Emerson<sup>1</sup>, J M. Davis, FACSM<sup>2</sup>, Stephen CL. Chen<sup>3</sup>, Toni M. Torres-McGehee<sup>2</sup>, Charles C. Emerson<sup>4</sup>, Craig E. Pfeiffer<sup>2</sup>, Joseph D. Bivona<sup>2</sup>, Justin V. Stone<sup>2</sup>, J L. Durstine, FACSM<sup>2</sup>. <sup>1</sup>University of Kansas, Lawrence, KS. <sup>2</sup>University of South Carolina, Columbia, SC. <sup>3</sup>Bob Jones University, Greenville, SC. <sup>4</sup>University of Missouri - Kansas City, Kansas City, MO.  
(No relationships reported)

Non-steroidal anti-inflammatory drugs are often perceived as performance enhancing due to their anti-inflammatory and analgesic effects. However, these drugs are known to cause gastrointestinal (GI) damage and alter cardiovascular function, which could be detrimental to performance. **PURPOSE:** To determine the effects of naproxen on GI distress and performance in hydrated humans cycling in the heat. **METHODS:** A double-blind, randomized and counterbalanced, cross-over design was utilized. Four trials: 1) placebo and ambient (Control [C]; ambient = 22.7 ± 1.8°C, 52.4 ± 5.5% humidity); 2) placebo and heat (H; heat = 35.7 ± 1.3°C, 53.2 ± 3.2% humidity); 3) naproxen and ambient (N; 1 - 220 mg naproxen sodium pill every 8 hrs for 24 hrs); and 4) naproxen and heat (NH) were completed. Eleven volunteers (6 male, 5 female; age = 27.8 ± 6.5 yrs, weight = 79.1 ± 17.9 kg, height = 177 ± 9.5 cm, and  $\dot{V}O_{2max}$  = 41.4 ± 5.7 ml/kg) cycled 80 min at a heart rate (HR) corresponding to 70%  $\dot{V}O_{2max}$  before completing a 10 min time trial for maximum distance. Heart rate, rate of perceived exertion (RPE) and GI symptoms were measured throughout cycling. Gastrointestinal symptoms were also assessed pre-, post-, 3 hrs post-, and 24 hrs post-cycling. Fecal occult blood was measured 24 hrs pre- and 24 hrs post-cycling. **RESULTS:** No statistically significant differences were found between conditions. Max HR was higher during N (176.2 ± 15 bpm) than C (175.7 ± 14.2 bpm) and NH (179.0 ± 18.0 bpm) than H (177.8 ± 18.2 bpm). Mean distance covered was greatest during N (3.3 ± 0.8 miles) and lowest in NH (2.8 ± 0.8 mile). During exercise, GI symptoms

occurred in 64% of all trials (C = 82%, N = 73%, H = 45%, and NH = 55%). At 3 hrs post-exercise, C experienced more frequent and serious upper, lower, and systemic GI symptoms than any other condition. Compared to other trials, H experienced higher serious upper (18%) and systemic (5%) GI scores 24 hrs post-exercise. NH resulted in more serious lower GI symptoms (12%) 24 hrs post-exercise. **CONCLUSION:** Although naproxen did not significantly affect performance or GI distress during 90 min of exercise in the heat, a possible negative interaction between naproxen and heat stress may exist, as indicated by higher max HR and lower distance during NH, which warrants further research.

Supported by the ACSM Foundation Carl V. Gisolfi Memorial Fund

3297 Board #202 June 2 3:30 PM - 5:00 PM

**Gender, Past Prescription, and Knowledge of Abuse  
Impact College Students' Feelings on Prescription Pain  
Killers**

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(No relationships reported)

Roughly 12% of college students report non-medical use of prescription opioid pain killers (OPK). The risk of overdose and addiction are great and information needs to be gathered for creation of effective prevention programs. **PURPOSE:** To determine what factors contribute to college students' perceptions related to their own use of OPKs and how perceptions are influenced by a brief education intervention. **METHODS:** 234 college students (21±3y, 70% female) completed three separate questionnaires. After responding to demographic questions, participants replied to Likert-style statements regarding responsible use of prescription opioids after being asked to imagine themselves in a situation where they had become injured and prescribed OPKs. The questionnaire was completed a second time after hearing an educational intervention regarding the costs, overdose rates, and OPK alternatives. **RESULTS:** Initially, females disagreed more strongly than males regarding the sharing of OPKs (t = -3.15, p = .002). Compared to never-prescribed, students that had previously been prescribed OPKs disagreed more strongly that they would finish their prescription regardless of pain (t = 4.44, p < .001). Those that knew at least one person who was addicted to OPKs, compared to those who did not know an OPK addicted person, were more in favor of prescription monitoring programs (t = -3.19, p = .002). The intervention positively influenced responses to statements regarding taking OPKs without first visiting a doctor, sharing unused OPKs, favorability of OPK monitoring programs, and agreement with doctors describing the risks of OPKs upon prescription (all p < 0.002). Participants were more concerned about the risks of OPKs and agreed more strongly that over-prescription of OPKs is a problem following the intervention (both p < .001). **CONCLUSIONS:** Gender and past OPK exposure influence initial feelings regarding OPKs. A brief low-cost and low-intensive educational intervention appears to have potential for positively influencing college students' ratings related to responsible OPK usage.

3298 Board #203 June 2 3:30 PM - 5:00 PM

**Hydrogen-rich Water Modulates Redox Status  
Repeated Three Consecutive Days Of Strenuous  
Exercise.**

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(No relationships reported)

**PURPOSE:** Repeated sprint exercise breaks redox balance, leading to cause oxidative stress. Excessive oxidative stress is considered as detrimental and thus as a likely cause of cell damage associated with severe exercise. In contrast, there is a growing evidence that the molecular hydrogen reacts with harmful oxidants such as hydroxyl radical in cells, and is proposed its potential for preventive and therapeutic applications. Therefore, we hypothesized that hydrogen-dissolved water drinking might attenuate accumulative fatigue imposed by intensive exercise for 3 consecutive days, by inhibiting excessive oxidative stress generation. To test this, we investigated the effects of hydrogen-rich water on oxidative stress induced by maximal pedaling exercises for three straight days.

**METHOD:** Eight male volunteers participated in this single blind, crossover, randomized controlled study. They completed two 3-day consecutive cycling exercise tests under the two conditions (i.e., hydrogen-rich and placebo water). The cycling exercise test was two 6-min sprint cycling consisted of 3 repetition of 10-s maximal effort against a resistance of 7.5 % body mass and 110-s active rest (no load pedaling). Before the first exercise test, and after the second exercise test, subjects drank the 500 ml of hydrogen-rich (5.14 ± 0.03 ppm) or placebo water. Seven hours before exercise tests on day 1 as a baseline, and 17 hours after exercise each day, blood sample was obtained to analyze the BAP/d-ROMs as an index of oxidative status.

**RESULTS:** The cycling performance in both conditions were not significantly changed over three consecutive days. In placebo trial, the relative changes in BAP/d-

ROMs from baseline level gradually decreased, as the day passed (Day 1 and Day 2 vs. Day 3,  $P < 0.05$ , respectively). However, the hydrogen-rich water drinking suppressed the reduction in BAP/d-ROMs.

**DISCUSSION:** Our present findings suggest that hydrogen-rich water drinking might contribute to maintain the redox status during consecutive days of strenuous exercise. This indicates that molecular hydrogen might have a potential to reduce exercise-induced oxidative damage.

3299 Board #204 June 2 3:30 PM - 5:00 PM

### Effect of Astaxanthin Supplementation on Cardiorespiratory Function in Runners

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**Reported Relationships:** S.M. Talbott: Contracted Research - Including Principle Investigator; study was funded by Beijing Ginko Group (BGG).

**PURPOSE:** Astaxanthin (AX) is a naturally occurring carotenoid, synthesized primarily by marine microalgae, with powerful antioxidant and anti-inflammatory properties. Rodent studies suggest that AX supplementation improves fat utilization and exercise endurance (Ikeuchi 2003). In athletes, AX supplementation (4mg/day for 4 wks) resulted in significant improvements in power output and cycling performance (Earnest 2011), however, a higher dose of AX (20mg/day for 4 wks) in well-trained cyclists and triathletes, yielded no significant changes in total antioxidant capacity, oxidative damage, rate of fat oxidation, or time trial performance (Res 2013). The purpose of this study was to assess the effects of 8 wks of AX supplementation (12mg/day) on cardiorespiratory function during higher and lower intensity exercise in recreational runners. **METHODS:** Using a double-blind parallel design, 28 recreational runners (male = 14, female = 14, age = 42) were supplemented for 8 wks w/ 12mg/day of AX (*Haematococcus pluvialis* algal extract) or a placebo. Before and after the supplementation period, subjects performed a maximal running test (VO<sub>2</sub>max on treadmill) and a maximal cycling test (watts on cycle ergometer). **RESULTS:** There was no improvement in maximal oxygen uptake (running VO<sub>2</sub>max) or maximal power output (cycling watts) with AX supplementation. Interestingly, subjects in the AX group showed a significant ~10% lower average heart rate at submaximal running intensities (aerobic threshold, AeT; AX 130±17 v. PL 145±14; and anaerobic threshold, AT; AX 139±20 v. PL 154±11,  $p < 0.05$ ) compared to placebo. **CONCLUSIONS:** Supplementation with 12mg/day of AX for 8 wks reduced running heart rate at submaximal endurance intensities (AeT & AT), but not at higher "peak" intensities. These results suggest that AX may be a beneficial ergogenic aid for long/ultra-distance endurance athletes, but not necessarily for athletes competing in shorter higher intensity efforts. In addition, these data are also suggestive of a general "cardiotonic" effect of AX, that should be investigated in non-athletic populations including elderly subjects and those with cardiac complications including post-myocardial infarction, heart failure, statin usage, mitochondrial dysfunction, chronic fatigue, and related conditions.

3300 Board #205 June 2 3:30 PM - 5:00 PM

### Effect Of Low Dose Cobalt Administration On Erythropoiesis

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**Reported Relationships:** W.F. Schmidt: Ownership Interest (Stocks, Bonds); W.F.J. Schmidt is a managing partner of Blood tec GmbH.

Before recombinant EPO became available cobalt chloride has been used as a therapeutic drug to treat anemic patients. Nowadays, cobalt (Co) is offered as nutritional supplement for endurance athletes as it is supposed to stimulate erythropoiesis also in small dosages. As a consequence, WADA has put cobalt on the list of prohibited substances although no information is available on the efficacy of low dose Co application on red cell production. **Purpose:** To evaluate the effect of low dose oral Co administration on erythropoietic activity. **Methods:** Three studies were performed: 1. application of a single dose of either 5mg Co (n=6) or 10mg Co (n=7); 2. application of 5mg (n=9) or 10 mg (n=7) per day for 5 days, and 3. application of 5 mg Co/day for 3 weeks followed by a 3-week wash-out period (n=16). In all studies a control group was included. Venous EPO concentration was determined in all studies, reticulocytes (ret%) and immature reticulocyte fraction (IRF) in study 2 and 3 and Hbmass in study 3 by the optimized carbon monoxide re-breathing method. **Results:** 10 mg Co significantly increased plasma EPO until 7h after the single dose (from 8.7 ±2.6 to 11.5 ±2.4 mU/ml) and after the 5-day administration (from 10.6 ±2.6 to 13.1 ±4.2 mU/ml,  $p < 0.05$ ). 5 mg Co had only a slight effect 5h after a single application (from 8.8 ±4.3 to 10.6 ±5.5 mU/ml,  $p < 0.05$ ). During the 3-week administration 5mg Co transiently increased EPO by 30% (from 9.5 ±3.0 to 12.4 ±5.2 mU/ml after 2 weeks,  $p = 0.01$ ). IRF increased after 5 days of 10mg Co administration (from 0.60

±0.22 to 0.87 ±0.27,  $p < 0.001$ ), but not after short or long-term dosage of 5 mg. Ret% slightly increased in study 3 after 2 weeks (from 1.16 ±0.42 to 1.25 ±0.41%,  $p < 0.05$ ). In study 3, Hbmass slightly increased until week 2 (+17.2 ±22.1g,  $p = 0.01$ ) and remained at higher level thereafter. **CONCLUSIONS:** Low dose cobalt administration which can be achieved with nutritional supplements slightly increases erythropoietic activity and total hemoglobin mass. Supported by WADA Grant 13D21DS.

3301 Board #206 June 2 3:30 PM - 5:00 PM

### Using Polyphenol-Based Soap Ameliorates Eccentric Exercise-Induced Muscle Damage

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**Reported Relationships:** B. Huang: Honoraria; Hong Kong Small Biomolecules Laboratory.

Exercise-induced muscle damage (EIMD) would impair the muscle strength, elevate the activity of creatine kinase (CK), and make individual perceive fatigue. Reactive oxygen species play an important role in EIMD, and supplement with antioxidants might attenuate the undesirable physiological effects. Polyphenols are chemical compounds with antioxidant property extracted from fruit and vegetables. Moreover, studies showed that some kinds of them can be absorbed via skin.

**PURPOSE:** To determine the effect of using dermal absorbable polyphenol-based soap (PBS) upon EIMD after a single bout eccentric endurance exercise. **METHODS:** Thirteen healthy adults (40±5 yrs) were recruited for a double-blind, cross-over, counter-balanced study. Graded exercise test (GXT) was performed to determine the maximal oxygen consumption (V̇O<sub>2</sub>max) of subjects one week before eccentric exercise. Thereafter, subjects took a single bout of -5% grade downhill running (DHR) for 60 min at a speed eliciting 75% on a level grade. After the DHR, subjects took showers twice a day (at 12 h intervals) with PBS or commercial neutral soap (CNP) for three days. Before, immediately after, 2 4h, 48 h, and 7 2h after DHR, capillary fingertip blood was collected and profiles of mood states (POMS) questionnaire were recorded for analyzing the activities of serum CK and the scores of fatigue. Fifteen minutes after blood sampling, isokinetic strength test with 3 maximum voluntary contractions at 150°/s. Data was analyzed by two-way repeated measures ANOVA to compare the differences between treatments and between time points. **RESULTS:** The activities of serum CK were significantly lower in PBS treatment at 48h and 72h after DHR (170±62 U/l vs. 258±146 U/l, 166±67 U/l vs. 287±227 U/l, respectively,  $p < 0.05$ ) when compared to CNP treatment. In PBS treatment, muscle strength at 48h after DHR tended to be larger (133±24 N/kg BW vs. 124±32 N/kg BW,  $p = 0.08$ ) when compared to immediately after DHR. On the contrary, there were no significant differences in fatigue scores between treatments. **CONCLUSION:** Using polyphenol-based soap might attenuate the activities of serum CK after a single bout DHR, and help muscle strength recovery. However, fatigue score of POMS questionnaire didn't reflect this efficacy.

Supported by Hong Kong Small Biomolecules Laboratory.

3302 Board #207 June 2 3:30 PM - 5:00 PM

### Effect of an Alpha-GPC Supplement on Physical Performance in Division 2 Football Players

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(No relationships reported)

Previous research relating to Alpha-GPC supplementation and physical performance has been limited to researching Alpha-GPC as a single ingredient supplement. Further research is needed to investigate the effect of Alpha-GPC in combination with other ergogenic ingredients on physical performance. **Purpose:** The purpose of this study was to investigate the acute effect of a supplement on physical performance in Division 2 football players. **Methods:** 14 male Division 2 football players (20.4 ± 1.0 years) participated in a randomized double blind crossover experiment separated by at least 7 days. Subjects were given either supplement or placebo 60 minutes prior to any physical testing measures. Testing consisted of, maximum vertical jumps, maximum voluntary isometric contractions (MVIC), maximal voluntary concentric contractions (MVCC), and fatiguing contractions. Subjects performed 3 maximum vertical jumps with 1-minute rest between jumps. Four MVICs were performed with the knee extensor muscles while seated on a dynamometer at 90° of hip flexion and knee flexion, with 2-minute rest between trials. Seven sets of 2 MVCCs at various loads (1 Nm; 10%, 20%, 30%, 40%, 50% and 60% MVIC torque) were completed with 30-seconds of rest between each set. During the fatiguing tasks, 120 MVCCs (4 set x 30 reps) were performed with a load equivalent to 20% MVIC through 60° range of motion. Recovery measures consisting of one MVIC and 7 MVCCs were taken 10 minutes post completion of fatiguing task. **Results:** MVIC torque was similar between supplemental and control sessions (243.6 ± 41.1 vs. 240.2 ± 29.7 Nm, respectively,  $P = 0.34$ ). Rate of torque development (highest slope of torque during the first 400 ms during MVIC) was greater for the supplement than the control session (1801 ± 336 vs.

1720 ± 346 Nm/s, respectively,  $P=0.03$ ). Impulse for all MVIC significantly increased at time points 30, 50, 100 and 200 ms during the supplemental session ( $P<0.05$ ). No significant differences were found in vertical jump, power and fatigability between sessions. **Conclusion:** Although maximal strength, power and vertical jump did not improve with supplementation, the significant increases in rate of torque development and impulse could be beneficial for a variety of athletes.

3303 Board #208 June 2 3:30 PM - 5:00 PM  
**Dietary Anti-oxidant Cocktail Supplementation Against Metabolic And Functional Alterations Induced By Physical Inactivity In Humans**

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(No relationships reported)

**PURPOSE:** Recent studies showed several nutrients taken individually, i.e. resveratrol, quercetin,  $\omega$ -3 fatty acids, vitamins and others, partially prevent metabolic alterations induced by physical inactivity. We hypothesized additive effects will be obtained when these nutrients are taken as a cocktail. In a pilot study, we tested the efficacy of such a cocktail, composed of polyphenols (530mg/d),  $\omega$ -3 (2.1g/d), selenium (80 $\mu$ g/d) and vitamin E (168mg/d) during 20 days of enforced physical inactivity coupled during the last 10 days with fructose supplementation (3.5g/kg/d) to trigger metabolic deterioration. **METHODS:** Twenty healthy active (14000 steps/d measured by accelerometer) young men, randomized in a control ( $n=10$ ) and a cocktail supplemented group ( $n=10$ ), were asked to stop exercise and reduce their daily physical activities (2800 steps/d). Body composition, glucose tolerance, substrate oxidation, blood anti-oxidant capacities and *v. lateralis* muscle biopsies were assessed before and after intervention. Analyses used linear mixed models taking into account repeated measures. **RESULTS:** Twenty days of deconditioning reduced by 20% total and type 2-myosin heavy chain cross sectional areas in the control group that was prevented in the supplemented group ( $p<0.01$  for both). While insulin sensitivity was only modestly affected in the two groups, plasma adiponectin was higher in the supplemented than in the control group at the end of the intervention ( $p<0.05$ ). The supplementation counteracted the increase in fasting plasma triglycerides ( $p<0.02$ ) and HDL ( $p<0.0001$ ) induced by reduced activity, was associated with greater fat oxidation ( $p<0.02$ ) and higher muscle FATP1 protein content. The supplemented group had higher blood anti-oxidant capacities ( $p<0.01$ ). **CONCLUSION:** These results are very promising as they can have a number of scientific and clinical implications for both the general sedentary populations and hospitalized bed rested patients.

3304 Board #209 June 2 3:30 PM - 5:00 PM  
**Folic Acid-layered Double Hydroxide (LDH) Nanoparticles To Improve Endurance Capacity In Mice**

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(No relationships reported)

**PURPOSE:** Folic acid possesses a significant antioxidant effect and reduces oxidative stress. Folic acid-layered double hydroxides (LDH) nanoparticles have been successfully prepared in our previous study. In this study, we determined whether folic acid-LDH nanoparticles could improve the endurance capacity in mice, the increase the anti-fatigue and anti-oxidation effect. **METHODS:** Sixty mice were randomly divided into six groups with ten mice each: two control groups, two folic acid treatment groups, and two folic acid-LDH treatment groups. Endurance was measured on a treadmill enclosed in a plexiglass chamber that was outfitted with a shock grid at the rear of the belt to keep the animal running during the test. For the folic acid, folic acid-LDH and control mice groups, the speed was first set at 15 m/min with a 5 incline. The speed was then gradually increased from 15 to 24.6 m/min and was maintained at 24.6 m/min until exhaustion. The creatine kinase (CK) and lactate dehydrogenase (LDH) activities in blood were determined using commercial diagnostic kits. The antioxidative enzymes superoxide dismutase (SOD), catalase (CAT) glutathione peroxidase (GSH-Px) and activities were determined using assay kits. **RESULTS:** In the treadmill test, folic acid-LDH treated mice could prolong the running time by 25% and 49% compared to folic acid and control groups, respectively. Additionally, plasma creatine kinase (CK) levels of exhausted mice were significantly lower in the folic acid-LDH treated group ( $P < 0.05$ ). While lactate dehydrogenase (LDH) level of mice was significantly increased for folic acid-LDH mice ( $P < 0.05$ ). It also improved the endogenous cellular antioxidant enzymes in mice by increasing the activities of SOD, CAT and GSH-Px. Therefore, folic acid-LDH nanoparticles could significantly improve the endurance capacity in mice; it also can alleviate fatigue of the mice and had an anti-oxidative effect. **CONCLUSION:** These results imply that folic acid-LDH antioxidant system increases the endurance capacity and facilitates recovery from fatigue. It 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.

3305 Board #210 June 2 3:30 PM - 5:00 PM

**Effects Of Calcium & Magnesium Lactate Supplementation On Vo2peak & OBLA**

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(No relationships reported)

Professional and recreational athletes use nutritional ergogenic aids to enhance aerobic performance, facilitate training adaptations, and reduce exercise recovery time. While the use of sodium bicarbonate and beta alanine as ergogenic aids have been investigated extensively, support for the use of calcium and magnesium lactate supplementation to improve aerobic performance has been mixed. To the best of our knowledge, the effectiveness of calcium and magnesium lactate supplementation on aerobic performance markers (i.e.,  $VO_{2peak}$  and the onset blood lactate accumulation) has not been investigated. **PURPOSE:** The purpose of this study was to examine the effect of calcium and magnesium lactate supplementation on  $VO_{2peak}$  and the onset blood lactate accumulation (OBLA). **METHODS:** Eighteen healthy individuals (24±5 yrs) participated in a double-blind, placebo controlled study and randomly assigned to one of 2 groups: placebo (PLA,  $n=8$ ), or supplement (SUP,  $n=10$ ). Prior to and following supplementation, participants performed a graded exercise test on a cycle ergometer to volitional failure.  $VO_{2peak}$ , time to exhaustion (TTE), OBLA power, heart rate (HR) at OBLA,  $VO_2$  at OBLA, and rating of perceived exertion (RPE) at OBLA were determined. 2×2 mixed repeated measures analysis of variance (ANOVA) procedures were performed to determine differences in group and time. **RESULTS:** There were no significant differences between PLA and SUP in direct markers of aerobic performance (all  $P>0.05$ ; Table 1). **CONCLUSION:** Lactate supplementation did not present an advantage over a placebo in improving aerobic performance in healthy individuals. The results from this study support those by previous investigators suggesting that there is no physiological rationale for using lactate supplementation to improve performance. Consequently, athletes should explore the use of alternative and/or well-established forms of ergogenic aids to extend the limits of sports performance.

3306 Board #211 June 2 3:30 PM - 5:00 PM

**Astaxanthin Formulation Induces Muscle Strength and Endurance Increases Beyond High Intensity Training in Elderly Subjects**

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**Reported Relationships:** S.Z. Liu: Contracted Research - Including Principle Investigator; AstaMed.

**Purpose:** Reduced muscle strength and endurance is strongly associated with functional decline in older adults. We conducted a randomized, double-blind, placebo-controlled trial of the impact of daily oral astaxanthin treatment with high intensity interval training (HIIT) in the elderly. Astaxanthin is a natural product that combined with vitamin E has both anti-inflammatory and anti-oxidant properties that may improve muscle adaptation to exercise training in the elderly. **Methods:** Healthy males and females ( $n=44$ ), age 65-82 yrs, undertook 3 months (3x/week for 30 min) of HIIT using an incline treadmill protocol (target 85% HRmax). Participants were randomly assigned to formulation (astaxanthin; 12 mg/day and vitamin E; 10 mg/day) or placebo groups. Tibialis anterior muscle (TA) strength and endurance were measured in an exercise tolerance test to fatigue using dorsiflexion exercise. Treadmill and 6-minute walking tests were also performed. **Results:** TA muscle maximal force (MVC) increased by 11% only in the astaxanthin group ( $\Delta 8.7 \pm 4.0$  N mean  $\pm$  SEM,  $P=0.029$ ). Improvement in TA exercise endurance were found only in the supplemented group as measured by an increase in total contractions of 46% ( $\Delta 192 \pm 79$  contractions,  $P=0.015$ ) and in total force generated by 28% in the exercise test ( $\Delta 77 \pm 26$  N,  $P=0.004$ ). Similar improvements in treadmill exercise time, exercise efficiency,  $VO_{2peak}$  (Balke method), and reduced respiratory exchange ratio in addition to greater 6 minute walking distance were observed in both groups ( $P<0.025$  for all). **Conclusion:** In healthy elderly, astaxanthin improved TA muscle strength and endurance with HIIT significantly more than placebo. These results suggest that the anti-inflammatory and anti-oxidant properties from the astaxanthin formulation enhance training adaptations in elderly subjects. An important impact of these findings is the potential to improve exercise tolerance with less frequent or intense training in elderly subjects. Supported by AstaMed NIH/NIA T32 AG000057

3307 Board #212 June 2 3:30 PM - 5:00 PM  
**Evaluating a Second Generation Phytochemical Nrf2 Activator on Proteostasis and Cytoprotective Gene Expression in Vivo**  
 Jaime L. Laurin, Justin J. Reid, Gaia R. Bublitz, Frederick R. Peelor, III, Benjamin F. Miller, FACSM, Karyn L. Hamiton, FACSM. *Colorado State University, Fort Collins, CO.*  
*(No relationships reported)*

Aging is associated with increases in oxidative stress. Redox imbalance occurs when production of reactive oxygen species (ROS) exceeds the capacity of antioxidant enzymes to eliminate ROS. Increased levels of intracellular ROS can compromise proteostasis by causing irreversible damage to proteins. The transcription factor nuclear factor erythroid-derived 2-like 2 (Nrf2) mediates the cellular endogenous antioxidant defense system by regulating antioxidant enzymes that are cytoprotective against ROS. Nrf2 can be activated phytochemically through the supplement Protandim. Previous work from our lab has demonstrated that a phytochemical based Nrf2 activator improves proteostasis in skeletal muscle in vivo. Recently, we have begun to characterize a second generation Nrf2 activator (PB125) that has increased anti-inflammatory action in addition to anti-oxidant properties. Since inflammation can blunt protein synthetic responses, we speculated that PB125 might provide additional benefits on proteostatic processes. **PURPOSE:** The purpose of the present study was to examine in vivo the effects of three different doses (10, 100, and 300 ppm) of PB125 supplementation on Nrf2 activation and proteostasis. **METHODS:** 60 male CB6F1 mice aged 10-11 months were assigned to diets containing low, medium, or high doses of product PB125 in a 5 week feeding study. Mice were isotopically labeled with 8% deuterium oxide (D<sub>2</sub>O) to simultaneously measure protein and DNA fractional synthesis rates (FSR) in liver, heart, and skeletal muscle. Nrf2 activation was assessed through analysis of gene expression profiles via Affymetrix GeneChip microarray. **RESULTS:** Proteostatic mechanisms were increased in the liver mitochondrial fraction in the 10 ppm treatment group (18.9 vs 16.3 FSR%/day, p<0.05). However, there were no differences in proteostatic mechanisms in heart or skeletal muscle. At 100 ppm, there was up-regulation of Nrf2-dependent cytoprotective genes (Akr1d1, Gpx2, Gclm, Fth17b, 3.82, 1.84, 1.42, 1.64-fold increase). **CONCLUSION:** From our data we were able to conclude that all three doses were safe, and that 100 ppm was effective at activating Nrf2. In addition, there was an indication of increased proteostatic processes in the liver, but not heart or skeletal muscle, perhaps due to the healthy status of the mice.

3308 Board #213 June 2 3:30 PM - 5:00 PM  
**The Effects of Vitamin D3 on Musculoskeletal Performance in College Aged Males**  
 David Bellar<sup>1</sup>, Kellie Murphy<sup>1</sup>, Gregory Davis<sup>1</sup>, Lawrence Judge<sup>2</sup>, Randy Aldret<sup>1</sup>. <sup>1</sup>*University of Louisiana at Lafayette, Lafayette, LA.* <sup>2</sup>*Ball State University, Muncie, IN.*  
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*(No relationships reported)*

Vitamin D (Vit D) plays an important role in the musculoskeletal system and additionally can be deficient in some segments of the population. **PURPOSE:** The present study examined the effects 4 weeks of Vit D supplementation versus placebo on musculoskeletal and psychomotor performance. **METHODS:** The participants were 32 college age males (Age: 22±4 y, Height: 177.7±8.3 cm, Weight: 81.5±14.6 kg, BF%: 19.6±7.9, Vit D: 20.0±7.2ng/ml). Participants were randomly assigned to group (Vit D vs placebo) and remained blind to the treatment throughout the study. The treatments consisted of 4000 IU of Vitamin D3 or similarly sized placebo (dextrose) administered daily for 4 weeks. The participants underwent baseline testing for isometric strength, explosive ability and psychomotor performance, which was repeated at week 2 and week 4. Isometric tests consisted of an isometric mid thigh pull (IMTP) on a force plate and an upper body isometric test (UBIST) using a load cell. Peak force during a countermovement jump (CMJ) was also determined via force plate. A psychomotor vigilance test (PVT) was used to measure sustained reaction time. **RESULTS:** For UBIST there was a significant effect of group (F=4.52, p=0.04) but not a significant group\*time interaction (F=0.18, p=0.84; Vit D pre: 553.7±168.3N, post: 585.5±150.2N; Placebo pre: 677.7±182.3N, post: 649.8±236.9N). For IMTP no significant effect of group (F=0.92, p=0.34) nor significant group\*time interaction (F=0.17, p=0.83; Vit D pre: 2596.4±342.3N, post: 2606.9±378.3N; Placebo pre: 2684.0±432.9N, post: 2762.6±440.4N) was found. CMJ analysis did not reveal a significant main effect for group (F=0.75, p=0.39) or interaction effects for group\*time (F=1.63, p=0.21; Vit D pre: 4429.7±1619.0N, post: 4938.5±2374.8N; Placebo pre: 5537.3±3027.0N, post: 6266.9±4577.3N). For PVT (mean reaction time) there was no significant main effect for treatment (F= 1.29, p=0.29) or interaction effects for group\*time (F= 1.08, p=0.35; Vit D pre: 0.304±0.041sec, post: 0.301±0.053sec; Placebo pre: 0.295±0.044sec, post: 0.284±0.029sec). **CONCLUSION:** Four weeks of Vitamin D supplementation was not effective in increasing musculoskeletal or psychomotor performance in college aged males. Further research is needed to clarify the effect of vitamin D on recreationally active persons.

F-60 Free Communication/Poster - Injury  
**Prevention, Recovery, and Rehab in Skeletal Muscle and Connective Tissue**  
 Friday, June 2, 2017, 1:00 PM - 6:00 PM  
 Room: Hall F

3309 Board #214 June 2 3:30 PM - 5:00 PM  
**Core Stability Before and After Pilates Exercise in Young Individuals with Low Back Pain**  
 Minjia Wang, Yuanpeng Liao, Yushi Hu, Haili Ding, Yu Pei. *CHENGDU SPORT INSTITUTE, Chengdu, China.* (Sponsor: Tongjian You, FACSM)  
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**Abstract:** Low back pain (LBP) is a common clinical disease, and most patients require long-term treatment. **PURPOSE:** To observe the change in core stability before and after a 6-week Pilates program in young individuals with low back pain. **METHODS:** Twenty subjects with LBP (age: 22±2 years, 11 males and 9 females) completed a 6-week Pilates exercise intervention. Before and after the intervention, the Y-balance test (YBT) and abdomen bridge test (ABT) were used to assess the core stability of the subjects. During the YBT, which measures the dynamic balance and coordination of core and lower extremity, values on three directions (anterior - A, posteromedial - PM, and posterolateral - PL) of both sides and the difference value(D-value) between the two sides were determined. During the ABT, which measures the core control ability and includes eight levels, the attained level and endurance time of every level were measured. Paired t-tests were performed to compare results before and after the intervention. **RESULTS:** After the 6-week intervention, compared with the baseline values, there were significant improvements in all three directions of the YBT (see table). Specifically, the overall performance score increased significantly on both sides (both p<0.05). Compared with the baseline values, there was an improvement of more than one level and endurance time increased from 95.06±53.50 sec to 117.50±54.99 sec on the ABT (p<0.05). **CONCLUSION:** A 6-week Pilates exercise program improved core stability, as evaluated by YBT and ABT, in young individuals with LBP. Future randomized, controlled studies are needed to confirm these findings.

YBT Result Before and After Intervention

Variables (n=20)	Before (cm)	After (cm)
LA	61.69±7.69	65.86±11.16*
RA	62.19±9.10	65.03±10.24
D-Value	4.11±2.77	2.11±2.47**
LPM	101.17±10.95	105.25±9.28*
RPM	103.31±10.54	105.06±9.08
D-Value	4.69±2.80	1.36±1.53*
LPL	100.19±10.02	102.42±8.55
RPL	99.56±12.30	102.36±10.00*
D-Value	4.31±3.78	3.28±2.87*

\*p<0.05, \*\* p<0.01 compared to before intervention  
 Support by the Sports Medicine key laboratory of General Administration of Sport of China/Sports Medicine key laboratory of Sichuan province Foundation.

3310 Board #215 June 2 3:30 PM - 5:00 PM  
**Microvascular Circulation In Mouse Leg Muscles After A Contusion Injury Examined By Histochemistry Using Lectin**  
 Hisashi Maeda, Tomoyuki Kurose, Seiichi Kawamata. *Hiroshima University, Hiroshima, Japan.*  
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*(No relationships reported)*

Traumatic muscle injury can lead to microvascular perfusion failure; however, the effect of muscle contusion on microvascular circulation is not fully understood due to methodological limitations. We studied microvascular circulation in injured skeletal muscles after a contusion injury by histochemistry using Lycopersicon esculentum lectin. **PURPOSE:** To examine the acute effects of contusion injury on microvascular circulation in mouse leg muscles. **METHODS:** Eighteen ICR male mice (39.0 ± 2.9 g) aged 8 and 9 weeks old were used. Microvascular circulation in leg muscles was examined immediately (n=5), 3 h (n=4), 6 h (n=4) and 24 h (n=4) after contusion injury. Both legs of the mice were injured using a standardized "weight-drop" device with a 250-g weight falling from 15 cm onto the top of the impactor (impact area, radius 6 mm) that directly contacted

the skin over the posterior leg muscles. After the contusion, mice were allowed to recover. One mouse was without contusion and was used as a control. Fluorescein isothiocyanate (FITC)-labeled *Lycopersicon esculentum* lectin was injected into the caudal vein and allowed to circulate for 3 min before sacrifice. Endothelial cells of open and functioning blood vessels were labeled by this lectin for 3 min. Leg muscles were removed, frozen and 3 serial cross-sections (10 µm) were obtained from each specimen using a cryostat. Open and functioning capillaries were detected by immunostaining for lectin using one section, while all capillaries were detected by immunostaining for PECAM-1 (CD31) using an adjacent section. The third section was stained with hematoxylin and eosin for histological assessment. Photographs of these sections were carefully compared.

**RESULTS:** Muscle swelling was observed immediately after contusion. Myofibers were disorganized due to the expansion of interfiber spaces. At 24 h after muscle contusion, disrupted myofibers with infiltrated cells were observed. Some non-flowing capillaries were found within the injured area by immunostaining for lectin from immediately after contusion to 24 h.

**CONCLUSIONS:** The present study clearly demonstrated non-flowing capillaries within the injured muscle area after contusion injury for the first time by histochemistry. This method is useful for examining microvascular circulation after muscle contusion.

3311 Board #216 June 2 3:30 PM - 5:00 PM  
**High Concentration CO<sub>2</sub>-water Immersion Promotes A Recovery From The Muscle Hardness Induced By Resistance Exercise**

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(No relationships reported)

Clinical observations of CO<sub>2</sub>-hot spring (CO<sub>2</sub> ≥1000 ppm) immersion revealed the effects, such as an immersed part reddening, skin blood flow improvements, blood catecholamine decrease, etc. In response to the CO<sub>2</sub>-water bath, the reduction of sympathetic nerve activity may imply the facilitation of muscle fatigue recovery.

**PURPOSE:** We investigated whether the immersion of extremities including agonist muscles into artificially made high concentration CO<sub>2</sub>-water (CO<sub>2</sub> ≥1000 ppm) influences recovery of muscle hardness in fatigue after resistance exercise. **METHODS:** The healthy male college students (n=11, age; 18-19 yrs, height; 168.6±4.5 cm, weight; 66.2±9.3 kg) participated in this study. The subjects were randomly divided into the CO<sub>2</sub>-water foot bath group (n=6) and the tap-water foot bath group (n=5). A laser Blood flow in the immersed skin (BF) and electrocardiogram (ECG) were recorded continuously throughout the experiment. The subjects performed 100 times calf raise resistance exercise and immersed lower legs into tap-water or artificial CO<sub>2</sub>-water at 35 °C for 10 minute after exercise. MG dominant muscle hardness was evaluated using ultrasound real-time tissue elastography and visual analog scale in muscle (VAS) at pre-exercise, immediately exercise, after 10 min recovery. The strain ratio (SR) between the MG and a reference material was calculated. **RESULTS:** BF<sub>skin</sub> in the CO<sub>2</sub>-water foot bath was significantly higher than in the tap-water foot bath (CO<sub>2</sub>-water vs. tap-water, 5.7±2.4 vs. 1.5±0.6 ml·min<sup>-1</sup>·100g<sup>-1</sup>, p<0.05). After 10 min recovery, in the CO<sub>2</sub>-water foot bath compared with the tap-water, SR significantly decreased quicker (1.37±0.38 vs. 0.62±0.07, p<0.05). In addition, VAS after 10 min recovery became smaller in the CO<sub>2</sub>-water than the tap-water (22.2±13.5 vs. 38.8±13.5 mm, p<0.05). **CONCLUSIONS:** The present study suggested that high concentration artificial CO<sub>2</sub>-water foot bath may contribute to rapid recovery from the high intensity exercise-induced muscle hardness.

3312 Board #217 June 2 3:30 PM - 5:00 PM  
**Using DT-MRI and 31P-MRS to Assess Muscle Damage Following Unaccustomed Eccentric Exercise**

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(No relationships reported)

**PURPOSE:** To detect the musculoskeletal structure and metabolism changes in vivo by diffusion tensor magnetic resonance imaging (DT-MRI) and <sup>31</sup>P-Magnetic resonance spectroscopy (<sup>31</sup>P-MRS) after a single bout of eccentric exercise.

**METHODS:** Thirty two male Sprague Dawley rats (body weight 238±15g) were randomly divided into either a sham group (n=8) or a downhill running group (n=24). Rats in the downhill running group ran 120 min on treadmill at a speed of 20 m/min at -16 degrees grade. DT-MRI and <sup>31</sup>P-MRS were performed in right lower limb at pre-exercise (sham), immediately, 24 hr and 48 hr post-exercise at 7T MR. The MR sequence included RARE T2, RARE T1 and EPI-DTI. MRS observational indices included the peak areas of inorganic phosphate concentration (Pi), phosphocreatine

concentration (PCr) and the ratio of Pi/PCr. The morphological changes were confirmed by histological and immunohistochemical methods. One-way ANOVAs and Tukey's test were used to assess the differences among different time points.

**RESULTS:** On diffusion tensor tractography images, a single bout of downhill running significantly disrupted muscle fiber structure. The peak areas of Pi were significantly higher after exercise (pre-exercise: 4.1±0.8 mM; 0 hr post-exercise: 4.7±1.4 mM; 24 hr post-exercise: 6.6±1.9 mM; 48 hr post-exercise: 6.1±1.7 mM; all P<0.01). Muscle PCr did not differ between pre- and post-exercise; consequently, Pi/PCr values were significantly higher following EIMD (pre: 0.14±0.05; 0h post: 0.18±0.05; 24h post: 0.22±0.08; 48h post: 0.2±0.08; all P<0.05). According to the histological detection, Z-band streaming was higher post-exercise compared with baseline (all P<0.05). The histopathological indices of damage coincided with changes in DT-MRI parameters of fractional anisotropy and apparent diffusion coefficient.

**CONCLUSIONS:** The data suggest that exercise-induced muscle damage was accompanied by structural and metabolic alterations in skeletal muscle following a single bout of downhill running. The ability of DT-MRI and <sup>31</sup>P-MRS to accurately detect these changes *in vivo* makes them promising approaches to evaluate skeletal muscle damage after unaccustomed exercise. (This research is supported by the National Natural Science Foundation of China, Grant#: 81301195)

3313 Board #218 June 2 3:30 PM - 5:00 PM  
**Relationship Between Knee Extensor Strength And Dynamic Balance Stability In Partial ACL Injury**

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(No relationships reported)

**PURPOSE:** Anterior cruciate ligament (ACL) injury are known to develop muscular weakness in the quadriceps. Also, ligament injuries contribute to loss of stability and function. The purpose of this study was to assess the correlations between dynamic balance stability and isokinetic extensor strength measurements in subjects after partial anterior cruciate ligament injury.

**METHODS:** We examined 38 men (mean age, 26.3 ± 7.0 years) with partial ACL tear. The isokinetic strength of extensor and flexor muscles was evaluated by using the CSMi isokinetic testing device. The peak torque was determined at speeds of 60°/s and 180°/s. The value of the highest peak torque for each velocity was compared with the uninjured side, and described as a percent of strength deficit. The balance stability was measured with single-leg by using the Biodex Stability System. Correlations between the ability of single-leg balance and knee extensor muscle strength were determined. **RESULTS:** The knee extensor strength deficit of 22.5±18.9% was found in the injured leg that compared to the uninjured leg at 60°/s, and extensor strength deficit was 18.8±17.2% at 180°/s. Single-leg balance stability at 22.1 ±15.8% was required the level of improvement of balance stability. Significant correlations were found between deficient of each extensor muscles in injured knees at 60 and 180°/s and dynamic balance stability (r = 0.61, P = 0.025; and r = 0.58, P = 0.035, respectively).

**CONCLUSION:** The ability of single-leg balance with injured knees appeared to be influenced by knee extensor muscle strength. The results contribute to the evidence indicating the importance of knee strength for dynamic balance stability for partial ACL injury.

3314 Board #219 June 2 3:30 PM - 5:00 PM  
**Knee Extensor Strength is Associated with Femoral Cartilage Thickness in Individuals with ACL Reconstruction**

Mike N. Vakula, Melissa M. Montgomery, Tyler J. Moffit, Kevin Choe, Derek N. Pamukoff. California State University, Fullerton, Fullerton, CA. (Sponsor: Dr. Lee Brown, FACSM)

(No relationships reported)

**PURPOSE:** To (1) determine the relationship between quadriceps function and femoral cartilage morphology in individuals with anterior cruciate ligament reconstruction (ACLR), and (2) compare quadriceps function and femoral cartilage morphology between injured and uninjured limbs.

**METHODS:** Quadriceps function and femoral cartilage was assessed with unilateral ACLR in 20 subjects (women=15, age= 22.3±3.3years, time since ACLR=44.9±32.8 months). Quadriceps function was assessed using peak isometric knee extension torque (PT) and rate of torque development (RTD) at 45 degrees of knee flexion, and peak isokinetic knee extensor torque at 60, 180 and 240°/sec. Femoral cartilage morphology (area and thickness) were obtained via ultrasound imaging at 140° of knee flexion. Partial correlations were used to evaluate the associations between indices of quadriceps function, and cartilage area and thickness accounting for time since reconstruction. Paired samples t-test were used to evaluate interlimb differences.

**RESULTS:** The ACLR limb produced smaller isometric peak torque (2.56±0.42 vs. 2.75±0.30 Nm/kg, p=0.04), slower isometric rate of torque development (38.12±13.27 vs. 47.81±17.99 Nm/sec/kg, p=0.03), and isokinetic peak knee extensor torque at 60°/sec (2.38±0.54 vs. 2.80±0.63 Nm/kg, p≤0.01) compared to the uninjured limb.

No differences were found in isokinetic peak torque at 180 or 240°/sec ( $p=0.06$  and  $0.60$ , respectively). After accounting for time since ACLR, a positive association was found between isometric peak torque and medial femoral cartilage thickness ( $r=0.41$ ,  $p=0.04$ ).

**CONCLUSIONS:** The ACLR limb demonstrated deficits in quadriceps function. We found a moderate association between isometric peak torque and medial femoral cartilage thickness. Our results suggest that restoring quadriceps strength may delay femoral cartilage thinning following ACLR.

3315 Board #220 June 2 3:30 PM - 5:00 PM  
**Musculoskeletal Pain as Predictors of Health Behavior: Implications for an Ergonomic Intervention**

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**Background:** Work-related musculoskeletal disorders (WMSDs) are significant problems in the workplace that are extremely costly to employees, employers, and society. One of the most common symptoms of WMSDs is musculoskeletal pain which has been associated with detrimental effects to health behaviors including a decrease in physical activity levels. Lower levels of physical activity have been associated with elevated levels of obesity which increases the risk for the negative health consequences associated with a higher BMI.

**Purpose:** To compare the prevalence of obesity, musculoskeletal pain, and the difficulty to engage in physical activity of Correctional Officers (COs) to the U.S. adult general population at two time points. Furthermore, to explore the associations between musculoskeletal pain and health behaviors amongst COs.

**Design:** Seventy-seven Correctional Officers from two maximum security correctional facilities in the Northeastern United States were enrolled in the study. The health profiles (musculoskeletal pain, difficulty to engage in physical activity, and BMI characteristics) of participants were collected at two time points (Time 1 (2011) and Time 2 (2013)) and compared to the U.S. adult general population. The health profiles of COs were also used to investigate associations between musculoskeletal pain and the difficulty to engage in physical activity at two time points. Also to explore if musculoskeletal pain at Time 1 predicts the difficulty to engage in physical activity at Time 2.

**Results:** Correctional employees exhibited a significantly higher prevalence of overweight and obesity, musculoskeletal pain, and difficulty to engage in physical activity than the U.S. adult general population at both time points ( $p<.05$ ). Musculoskeletal pain was associated with a difficulty to engage in physical activity at both time points ( $p<.05$ ). Musculoskeletal pain was predictive of the future difficulty to engage in physical activity ( $p<.05$ ).

**Conclusions:** As a result of the musculoskeletal pain, COs report difficulties to engage in physical activity. The results of this study provide a rationale for the implementation of feasible ergonomic interventions in the environment of corrections to alleviate musculoskeletal pain and improve the health behaviors of COs.

3316 Board #221 June 2 3:30 PM - 5:00 PM  
**Effects Of Methol Gel On Delayed-Onset Muscle Soreness (DOMS) In Sedentary Young Adults**

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Delayed-onset muscle soreness (DOMS) is common 24 hr after engaging in resistance training. Topical analgesics containing menthol are often used to treat DOMS but little is known about their effectiveness. **PURPOSE:** To determine how long menthol gel may reduce pain associated with DOMS. **METHODS:** Sedentary young men ( $n=3$ ) and women ( $n=6$ ) (age = 23.9 yr; wt = 70.1 kg) participated in the study and were instructed to refrain from exercise and consuming or applying any type of anti-inflammatory medication 24 hr before, and throughout the duration of, the study. After determining 1-RM, participants performed 10 sets of 10 repetitions of barbell back squats at 60% of their 1RM to elicit DOMS. Squats were performed to a predetermined depth using stacked 5-cm spacers so the femurs were parallel to the floor at the end of the eccentric phase. 24 hr later, a gel containing 4.0% menthol was applied (1ml of gel per 200 cm<sup>2</sup> of surface area) to one quadriceps and the same dose of a menthol-scented placebo gel was applied to the other quadriceps. Application was randomized to each leg and participants were blinded to the gel identity. Prior to application, participants rated pain in each leg using a scale ranging from 0 (no pain) to 10 (pain as bad as it could be). Following application, participants completed this rating scale every 30 min for 8 hr. **RESULTS:** Pain was reported to be exactly the same for both legs at 24 hr (6.67 - severe pain). After application of the menthol gel, pain declined ( $p<0.05$ ) to a minimum at 60 min (pain rating = 5.28; 21% decline) that was classified as moderate

pain. Although pain tended to increase after 1 hr, pain remained less ( $p<0.05$ ) than placebo for 5 hr. **CONCLUSION:** A 4.0% menthol gel reduces DOMS-related pain by ~20% 60 min after application in sedentary young adults and then a lower plateau of pain perception is achieved for 5 hr following application. Our previous study using the same protocol with recreational athletes who had lower ( $p<0.05$ ) levels of pain (4.65) 24 hr after exercise also reported maximum pain relief 1 hr after application. Although a 31% relative decline, their absolute pain scores declined similarly (1.4 points) compared to the current study. Further research is needed to determine whether declines in pain can be attained in less time and/or if a greater decline can be achieved. Supported by Performance Health.

3317 Board #222 June 2 3:30 PM - 5:00 PM  
**Exercise Intervention Effects On Winged Scapula And Postural Pain: A Case Study**

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Researchers have shown that more than 80% of the American workforce has a sedentary lifestyle that can leave people sitting for upwards of 10 hours a day (OECD, 2014). In turn this has a negative influence on posture and back pain. "Molly", a 52 year-old, sedentary individual that has experienced right subscapular pain due to her posture, had developed protracted shoulders and winged scapula. Molly volunteered to take part in an 8-week Community Fitness Partner program as part of Westfield State University's Exercise is Medicine on Campus intervention. A student trainer developed an 8-week total body exercise prescription. **Purpose:** The purpose of the study was to determine if resistance training postural exercises (RTPE), stretches, and self-myofascial release (SMR) could be used to counteract the protracted shoulder posture resulting in her upper back pain. RTPEs have been shown to help healthy population to neutralize the shoulder girdle and improve the overall health of the upper extremity. **Methods:** Initial meetings included goal setting and fitness screening. Subject characteristics include: Height= 1.74m, Body Mass=65kg, BMI=22.4, Resting HR=68bpm, Resting BP= 115/70mmHg and FMS shoulder mobility of left arm grade III and right arm grade II. The program included RTPE, stretching, SMR, and cardiovascular training. After each workout specific exercises, stretches and/or SMR modalities were performed to target her upper back and pectoral area to help with shoulder girdle imbalances. Pre and posttest measures included assisted push-ups, curl ups, and self-awareness of back pain. **Results:** Molly's upper body strength increased from 19 assisted pushups to 35, Curl-ups improved from 23 to 42. Improved alignment of her shoulders were observed in an axillary line with her ear and superior iliac crest. Additionally, she reported changes that included: an increase in overall mood, more energy, reduced upper back pain, improvement in body image and fewer aches throughout the day. **Conclusion:** An 8-week training program consisting of resistance training and specific postural exercises can effectively improve posture and decrease upper back pain. Through a multimodal approach, including strengthening and lengthening of muscles and tendons, posture can be improved which may lead to a decrease in pain.

3318 Board #223 June 2 3:30 PM - 5:00 PM  
**Comparison of Knee Strength And Stability In Primary And Revision Acl Reconstruction**

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**PURPOSE:** The number of primary anterior cruciate ligament (ACL) reconstructions has increased in parallel with graft failures, with a resultant effect on revision surgery. Primary ACL reconstruction is successful for most patients, but some have had persistent giving-way symptoms and recurrent ruptures, such that revision surgery is required. Knee strength deficits are among the consequences of muscle weakness after ACL reconstruction. This study compared knee strength and stability in primary and revision ACL reconstruction.

**METHODS:** This was a cross-sectional study with a total of 78 participants, in whom 38 revision surgeries were performed at a single hospital between April 2013 and May 2016. All revision reconstructions used tibialis anterior tendon allografts. Forty patients underwent primary ACL reconstruction using double-looped semitendinosus and gracilis autografts. Strength and stability results were compared in primary and revision ACL reconstruction. All participants were measured with an isokinetic device to assess the main outcome of knee strength; a KT-2000 arthrometer was used to measure anterior laxity. Knee function status was evaluated using International Knee Documentation Committee and Lysholm scores. Knee strength and stability results were compared for primary and revision ACL at 12 months post operatively.

**RESULTS:** The stability results with revision surgery were inferior to those with primary reconstruction ( $1.5\pm 1.1$  mm vs.  $2.6\pm 1.5$  mm;  $p = .001$ ). However, there were no significant differences in knee extensor deficits at 60°/sec or 180°/sec (respectively,

$p = .213, p = .994$ ) or in flexor muscle strength between primary and revision ACL reconstruction (respectively,  $p = .473, p = .609$ ). The statistical comparison of functional scores in primary and revision surgery showed no significant differences. **CONCLUSIONS:** Knee extensor deficits and flexor muscle strength show no differences in a comparison of revision and primary ACL reconstruction. However, the results for stability were inferior to those of primary ACL reconstruction.

3319 Board #224 June 2 3:30 PM - 5:00 PM  
**Threshold Number Of Low-intensity Eccentric Contractions Of The Elbow Flexors To Induce Muscle Damage**

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No indication of muscle damage is evident after 30 or 60 low-intensity (10% of maximal voluntary isometric contraction strength: MVC) eccentric contractions (LIEC) of the elbow flexors (EF; Chen et al., 2012) or the knee flexors and extensors (Chen et al., 2013, 2015). Nosaka & Newton (2002) reported that a large number of LIEC of the EF (lowering a dumbbell of 9% MVC 1800 times) resulted in significant changes in MVC torque, range of motion (ROM), upper arm circumference, muscle soreness (SOR) and plasma creatine kinase (CK) activity lasting for 4 days post-exercise. It appears that LIEC induce muscle damage when the number of contractions exceeds a certain level, but the level has not been determined. **PURPOSE:** This study investigated the threshold number of LIEC of EF resulting in significant changes in indirect muscle damage markers. **METHODS:** A pilot study showed no indication of muscle damage after 480 LIEC, but muscle damage markers changed significantly after 960 LIEC. Thus, the present study focused the number of contractions between 600 and 960. Fifty-two young men who had not performed resistance training were recruited and assigned randomly to one of the four groups ( $n=13$  per group) based on the number of LIEC performed in the exercise in which a dumbbell set at 10% was lowered repeatedly either 600, 720, 840 or 960 times by the non-dominant arm. Maximal voluntary concentric contraction torque (MVC-CON), ROM, SOR, CK activity and echo-intensity (EI) were measured before, immediately after and for 5 days post-exercise, and their changes were compared among the groups. **RESULTS:** The 600, 720 and 840 groups showed significant ( $P<0.05$ ) decreases in MVC-CON (8-10%) and ROM (2-3%) immediately post-exercise only, without changes in SOR, CK and EI. All variables changed ( $P<0.05$ ) for the 960 group (peak change, MVC-CON: -18%, ROM: 3%, SOR: 20-mm, CK: 410%, EI: 8%) lasting for 3-4 days post-exercise. **CONCLUSIONS:** These results show that no muscle damage is induced when the number of LIEC is less than 840 for EF. It is interesting to investigate further what changed between 840 and 960 contractions to make the muscles susceptible to muscle damage. Supported by MOST, TAIWAN (MOST105-2410-H-003-052-MY3).

3320 Board #225 June 2 3:30 PM - 5:00 PM  
**Circulating Mitochondrial Damage-Associated Molecular Patterns (mtDAMPs) Following Skeletal Muscle Contraction-Induced Injuries: Pilot Endpoint PCR Studies**

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 (No relationships reported)

**PURPOSE:** The purpose of these pilot studies is to validate PCR primer sets intended to describe mitochondrial damage-associated molecular patterns (mtDAMPs, which influence the immune system) in human plasma samples, after the muscle injury evoked by extreme exercise, such as a marathon. We hypothesize that circulating concentrations of mtDAMPs—specifically, mtDNA—are elevated post-marathon relative to pre-marathon. With quantitative PCR, evaluation of the change in mtDAMP levels pre- vs. post-marathon is enabled via comparing these levels to an internal reference (“housekeeping”) gene that is unaffected by exercise. **METHODS:** All procedures were IRB approved and all subjects ( $n=11$ ) provided informed consent. Blood was obtained by antecubital venipuncture at baseline and within 48 hours post-race. Blood was centrifuged, plasma aliquotted, and stored at  $-80^{\circ}\text{C}$  for further analyses. Plasma DNA was isolated using a commercially available mini kit (Qiagen). Primers for human mtDNA (cytochrome B, cytochrome C oxidase subunit III, NADH dehydrogenase), and bacterial 16S rRNA were synthesized by Eurofins Genomics using published sequences. The human sequences have no significant homology with DNA found in any bacterial species published on BLAST. To determine whether levels of 3 candidate housekeeping genes are consistent pre- vs. post-marathon, the housekeeping primer sequences were added to pre- and post-marathon DNA samples, amplified via thermocycling in routine endpoint PCR, and visualized on 1.5% agarose-

EtBr gels. Amplicons of the mtDNA primer sets were similarly assayed. **RESULTS:** Pilot endpoint PCR studies of 3 candidate housekeeping genes (one primer set for beta-actin, and two distinct GAPDH primer sets) indicate that a specific GAPDH primer set provides data which are unaffected by marathon participation, and also indicate that the pattern of these data is consistent among individuals. Additionally, endpoint PCR validated the mtDNA primer sets. **CONCLUSION:** These pilot studies validated the following human primer sets: Housekeeping gene—GAPDH; cytochrome B; cytochrome C oxidase subunit III; NADH dehydrogenase. Supported by the WSSU Research Initiation Program.

3321 Board #226 June 2 3:30 PM - 5:00 PM  
**The Effects Of An Ergonomic Mat on Musculoskeletal Symptoms and Health Behaviors**

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**Background:** Prolonged standing on hard concrete surfaces has been associated with musculoskeletal pain and discomfort of the lower extremities. Musculoskeletal pain negatively affects health behaviors including sleep quality and levels of physical activity. Ergonomics mats have been reported as an effective intervention for reducing the musculoskeletal pain and discomfort of the lower extremities in occupational settings. Understanding the alleviating effects of ergonomic mats on the musculoskeletal symptoms of the lower extremities may aid in the improvement of the musculoskeletal health and health behaviors amongst prolonged standees. **Purpose:** To investigate the feasibility of implementing ergonomic mats in a correctional facility to decrease the perceived musculoskeletal symptoms (pain, discomfort, and fatigue) of the lower extremities amongst Correctional Officers (COs). Furthermore, to evaluate the potential improvement of reported health behaviors (sleep quality, sleep quantity, and physical activity) during the course of an ergonomic mat intervention. **Design:** Seven overweight and obese ( $\text{BMI}<25$ ) Correctional Officers from a correctional facility in the Northeastern United States participated in the 21-day ergonomic intervention. Musculoskeletal symptoms, physical activity levels, and sleep quality were compared with a 2-phase panel evaluation (with and without the ergonomic mat) and a pre-post evaluation. **Results:** The perceived musculoskeletal discomfort and fatigue of the lower back and discomfort of the foot significantly decreased ( $p<0.05$ ) at the follow-up. There were no significant changes in health behaviors. **Conclusion:** Ergonomic mats are practical to implement in correctional facilities. Following implementation, the reported musculoskeletal discomfort and fatigue of the lower back and foot were reduced. Future research should repeat this feasibility study with a larger sample size and longer intervention duration to investigate the effects of ergonomic mats on musculoskeletal health and health behaviors.

3322 Board #227 June 2 3:30 PM - 5:00 PM  
**The Effect Of Cold Water Immersion Treatment On Inflammation Factor and MMP-1 Releasing In Post-exercise Patellar Tendon**

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The patellar tendinopathy is a common overuse injury. After high intensity exercise, patellar tendon tissue releases mass of TNF- $\alpha$ , IL-1 $\beta$ , IL-6 that induce COX-2 and MMP-1 releasing, which correlate to inflammation and tissue degeneration. Cold water immersion (CWI) therapy has been considered an effective way to reduce the inflammation and injury in muscle tissue. **Purpose:** To determine the effect of CWI on TNF- $\alpha$ , IL-1 $\beta$ , IL-6, MMP-1, COX-2 releasing and in post-exercise patellar tendon. **Method:** 66 New Zealand rabbits (18 mon,  $2.8\pm 0.2$  kg) were divided three groups. In high intensity jumping (HIJ) group, 30 rabbits jumped 150 times by low current electrical stimulation, the jumping force were limited between 80-110N. In cold water immersion (CWI) group, 30 rabbits received 15 minutes  $4^{\circ}\text{C}$  CWI treatment on posterior limbs after 150 times jumping. Rest of 6 animals were control (CON) group which identified as baseline. The patellar tendons were harvested at 0 hour, 6 hour, 24 hour, 48 hours after exercise in HIJ group or after treatment in CWI group. TNF- $\alpha$ , IL-1 $\beta$ , IL-6, COX-2 and MMP-1 mRNA expression assessed by RT-PCR. All the data was analysis by two-way ANOVA with multiple-comparison test. **Result:** IL-1 $\beta$  mRNA expression reached peak value at the 0 hour (CWI:  $22.89\pm 5.48$ , HIJ:  $20.47\pm 6.24$  vs. CON:  $0.99\pm 0.40$ ,  $P<0.01$ ), and no significant different between exercise groups. TNF- $\alpha$  mRNA expression reached peak value at the 0 hour (CWI:  $23.21\pm 6.02$ , HIJ:  $39.30\pm 8.17$  vs. CON:  $0.63\pm 0.33$ ,  $P<0.01$ ), and significantly higher in HIJ group at 0 hour (CWI vs. HIJ,  $P<0.05$ ). IL-6 mRNA expression reached peak value at the 0 hour (CWI:  $23.49\pm 5.83$ , HIJ:  $35.40\pm 6.55$  vs. CON:  $0.73\pm 0.22$ ,  $P<0.01$ ), and

significantly higher in HIJ group at 0 hour (CWI vs. HIJ,  $P < 0.05$ ). MMP-1 mRNA expression reached peak value at the 6 hour (CWI:  $12.10 \pm 3.71$ , HIJ:  $13.31 \pm 5.78$  vs. CON:  $0.99 \pm 0.09$ ,  $P < 0.01$ ), and significantly higher in HIJ group at 0 hour (CWI:  $1.40 \pm 0.70$  vs. HIJ:  $8.72 \pm 1.18$ ,  $P < 0.05$ ). COX-2 mRNA expression reached peak value at the 0 hour (CWI:  $7.57 \pm 2.01$ , HIJ:  $18.02 \pm 4.17$  vs. CON:  $0.78 \pm 0.29$ ,  $P < 0.01$ ), and significantly higher in HIJ group at 0 hour and 6 hour (CWI vs. HIJ,  $P < 0.01$ ). **Conclusion:** The CWI treatment transiently reduces the inflammation factors, MMP-1 and COX-2 releasing in patellar tendon after exercise.

3323 Board #228 June 2 3:30 PM - 5:00 PM  
**Altered Joint Loading Affects Cartilage Degeneration and Limb Function in Rats following Knee Meniscal Transection**  
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**PURPOSE:** Either reduced or elevated joint loading has been associated with post-traumatic osteoarthritis (OA); however, which altered loading condition may be more detrimental to cartilage health post-injury remains unknown. This study examined the effects of reduced and elevated joint loading on cartilage degeneration, knee locomotion kinematics, and degree of voluntary activity in rats following medial meniscal transection (MMT).  
**METHODS:** A total of 22 male Lewis rats (weight:  $304 \pm 57$  gm) underwent MMT in their left hind-limbs and were assigned to one of the three conditions: 1) regular loading (N = 7), 2) reduced loading via hind-limb immobilization (N = 8), or 3) elevated loading via daily treadmill running (N = 7). A sham surgery was performed in 7 separate rats. Rats were evaluated pre-MMT and 8 weeks post-MMT for the amount of voluntary daily run time/distance on a running wheel and hind-limb joint kinematics during treadmill locomotion (speed: 30 m/min) using a 3D X-ray motion analysis. Rats were euthanized after 8 weeks and the 3D microstructure and composition of the tibial plateau cartilage and subchondral bone was quantified using contrast-enhanced microcomputed tomography.  
**RESULTS:** When compared to the elevated-loading group at the 8th week post-MMT, the reduced-loading group demonstrated a greater reduction in voluntary run time ( $47.7 \pm 46.8\%$  vs.  $18.0 \pm 69.9\%$ ,  $P = 0.043$ ) and distance ( $57.2 \pm 38.3\%$  vs.  $19.7 \pm 81.2\%$ ,  $P = 0.029$ ). Cartilage data from 4 rats per group indicated that the elevated-loading rats had the greatest lesion/exposed bone area and subchondral bone volume ( $0.50 \pm 0.35$   $\mu\text{m}^2$  and  $1.16 \pm 0.24$   $\text{mm}^3$ , respectively), followed by the regular-loading rats ( $0.43 \pm 0.19$   $\mu\text{m}^2$  and  $1.06 \pm 0.22$   $\text{mm}^3$ ) and reduced-loading rats ( $0.14 \pm 0.17$   $\mu\text{m}^2$  and  $0.97 \pm 0.03$   $\text{mm}^3$ ). All three MMT groups demonstrated a more extended knee position (by about 8-18°) at mid-stance during locomotion when compared to the sham rats.  
**CONCLUSIONS:** Our current findings suggest that while elevating joint loading (via treadmill running) exacerbated post-traumatic OA, reducing joint loading (via joint immobilization) may delay OA progression in MMT rats. However, the difference in cartilage degeneration among different loading conditions may not correlate with the behavior changes in voluntary activity and knee locomotion kinematics.

3324 Board #229 June 2 3:30 PM - 5:00 PM  
**Prevalence of Joint Pain Before and After Bariatric Surgery and Impact on Physical Activity**  
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 (No relationships reported)

Consistent physical activity (PA) is one of the strongest predictors of successful long-term weight loss maintenance. However, joint pain is common among severely obese patients and is a significant barrier to regular PA. **PURPOSE:** Our goal was to compare the prevalence of hip, knee, and back/other pain before and after bariatric surgery and explore interrelationships among joint pain, BMI, and PA. **METHODS:** Data were drawn from a convenience sample of adults undergoing bariatric surgery at an urban academic center. In a phone survey, participants reported whether they had experienced knee, hip, and/or back/other pain prior to surgery, and changes in joint pain post-surgery. We compared BMI and PA by pain status (improved vs. same/worse) using t-tests and chi-square. **RESULTS:** The 285 participants had undergone surgery a mean (SD) of 10 (3) years earlier. At follow up [FU], participants had an average age of 51 (10), BMI of 34.4 (8.4), and change in BMI of -19.0 (9.4); 191 (68%) had a BMI  $\geq 30$ . Prior to surgery, 21-45% reported joint pain; at FU, 123 (43%) reported no pain; 80 (28%); 66 (23%); and 16 (6%) reported pain in 1, 2, or 3 joint regions, and 62 (22%) were on NSAIDs or analgesics. Participants who reported having less joint pain had greater reductions in BMI, and a significantly larger proportion reported being

more active than prior to surgery (Table 1). Those with improved knee and back pain were also more likely to meet recommended PA guidelines. **CONCLUSION:** Joint pain was common among bariatric surgery patients and had improved in 34-40% even 10 years later. Improvements in pain were associated with greater reductions in BMI, greater likelihood of being more active, and of meeting PA guidelines. For the >60% with similar/worse joint pain, effective pain management strategies may be needed to facilitate reaching PA goals.

	Improved	Same/Worse	Mean Difference (95% CI)	P value
<b>Knee (n=164)</b>	n=61 (37%)	n=103 (63%)		
Initial BMI	56.3 (11.1)	53.5 (10.2)	2.8 (-.5, 6.2)	.098
Current BMI	33.3 (7.2)	36.2 (9.3)	-2.8 (-5.5, -.1)	.045
Change in BMI	-22.9 (10.2)	-17.3 (8.2)	-5.6 (-8.5, -2.8)	.000
More active	49 (82%)	53 (52%)		.000
Meets PA guidelines	18 (30%)	14 (14%)		.011
<b>Hip (n=94)</b>	n=32 (34%)	n=62 (66%)		
Initial BMI	57.8 (12.0)	51.7 (11.3)	6.0 (1.1, 11.0)	.018
Current BMI	33.4 (8.0)	35.2 (8.3)	-1.8 (-5.4, 1.7)	.309
Change in BMI	-24.4 (11.2)	-16.5 (9.9)	-7.9 (-12.4, -3.4)	.001
More active	28 (88%)	31 (50%)		.000
Meets PA guidelines	10 (32%)	16 (26%)		.544
<b>Back/Other Joints (n=159)</b>	n=64 (40%)	n=95 (60%)		
Initial BMI	54.2 (11.6)	52.8 (10.2)	1.4 (-2.1, 4.8)	.975
Current BMI	33.2 (8.0)	35.6 (8.3)	-2.4 (-5.1, 0.2)	.070
Change in BMI	-21.0 (10.3)	-17.2 (9.2)	-3.8 (-6.9, -0.7)	.016
More active	50 (78%)	52 (55%)		.003
Meets PA Guidelines	20 (31%)	13 (14%)		.008

3325 Board #230 June 2 3:30 PM - 5:00 PM  
**Cartilage And Subchondral Bone Histomorphometry In Osteoarthritis Knee.**  
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Importance of subchondral bone in the pathogenesis and management of osteoarthritis retain recently the interest of both clinicians and researchers community. In fact, the integrity of articular cartilage relies on subchondral bone to provide mechanical support and nutrition supply. Herein, we investigated the relation between bone and cartilage structures and the vascular supply in human knee OA. **Methods:** 37 osteoarthritic tibial plateaux were collected after a total knee replacement surgery. Samples from macroscopically different ICRS grades were prepared from tibial plateaux. Sample were scanned using the micro-computed tomography at 10µm resolution (Skyscan 1072, Bruker), projections were reconstructed using the manufacturer software. A manual segmentation has been performed on each sample to separate subchondral from trabecular bone and microarchitectural analysis was performed. The same samples were processed for histology, decalcified in 14% EDTA, sectioned into 4µm slides, coloured with HES and scored into 6 groups, based on histological OARSI score. Subchondral bone surface and thickness and articular cartilage surface were calculated. The number of vessels in the subchondral bone area were visually counted by two different operators and a VEGF immunofluorescent staining was performed. **Results:** bone volume fraction, trabecular thickness, spacing, and number were positively correlated OARSI grades. Also, blood vessels significantly increased from grade 1 to 5 ( $p < 0.05$ ). Yet, in grade 6 they significantly decreased ( $p < 0.05$ ). Yet, they were significantly less vessels in grade 6 compared to grade 5. **Conclusion:** Taken together, our data indicate an interplay and dynamic load-bearing structures between subchondral bone and cartilage. Understanding the signaling pathways, the cartilage-bone biochemical unit in joints and the intercellular communication between cartilage and subchondral bone may lead to development of more effective strategies for treating OA patients.

3326 Board #231 June 2 3:30 PM - 5:00 PM  
**Early Unloading and Loading Exercises for Preventing Posttraumatic Osteoarthritis after Anterior Cruciate Ligament Injury**  
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 (No relationships reported)

How to prevent posttraumatic osteoarthritis remains controversial. However, a suitable unloading and/or loading exercise offers stimulus to reduce articular joint inflammation

and facilitate cartilage regeneration. Continuous passive motion (CPM) and active treadmill exercise (TRE) have been shown to increase cartilage repair in knee stability condition. **PURPOSE:** To understand the protective effects of early unloading CPM, and loading TRE after ACL rupture. **METHODS:** Sixteen adult New Zealand White male rabbits were studied and randomly assigned to two groups: (I) CPM group, rabbits performed the CPM exercise for continuously 7 days post ACLT. (II) TRE group, rabbits performed active treadmill exercise at the third week for two weeks after ACLT. All animals received the ACL transection of right knee. Left knee was for the sham group. All animals sacrificed at 4 weeks after surgery. All knees were taken out for whole knee evaluations including gross appearance, histology, and OA quantitative scores as well as inflammatory reactions. **RESULTS:** Regarding gross appearance, the TRE group had more obvious cartilage abrasion than the CPM group. The CPM group demonstrated the better cartilage smooth than the TRE group. The total OA scores in the TRE group (13.14) were significantly higher than the CPM group (7.88) ( $p < .01$ ). Regarding histological aspect, the TRE group showed the more severe cartilage degeneration, while the CPM group showed no degeneration status. On the basis of H&E and Alcian blue stainings, the TRE group showed much cell disorganized, decreased of cartilage cells, and decreased of GAG. In contrast, CPM had smoother surface of cartilage, retained GAG, cell density and oriented arrangement of chondrocyte, indicating protecting articular cartilage. We also found that the CPM group had the least TNF- $\alpha$  and caspase-3, suggesting anti-inflammation and sound chondrocyte growth. However, the TRE group had the significantly increased TNF- $\alpha$  and caspase-3 ( $p < .01$ ), particularly in superficial and middle layers of the cartilage. **CONCLUSION:** CPM in the early stage after ACL injury provides the protection of cartilage. In contrast, active treadmill exercise may lead to osteoarthritis. CPM after acute ACL injury for short-term articular cartilage protection is beneficial, while TRE should be judiciously applied.

3327 Board #232  
Abstract Withdrawn

**F-61 Free Communication/Poster - Musculoskeletal**  
Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3328 Board #233 June 2 2:00 PM - 3:30 PM  
**Rock Climbers' Utilization Of Healthcare In The Management Of Hand Injuries**  
Jillian Gold<sup>1</sup>, Keaton Piper<sup>1</sup>, Ryan Bodkin<sup>2</sup>, Erik Rueckmann<sup>2</sup>, Camille Martina<sup>2</sup>. <sup>1</sup>University of Rochester School of Medicine, Rochester, NY. <sup>2</sup>University of Rochester Medical Center, Rochester, NY.  
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(No relationships reported)

**PURPOSE:** Examine rock climbers' behaviors and perspectives on utilizing healthcare systems for climbing-related hand injuries.

**METHODS:** Participants meeting inclusion criteria were identified at seven climbing locations in the Rocky Mountain and Sierra Nevada ranges. Qualitative data was collected via recorded and transcribed semi-structured interviews. Participants were asked about their healthcare utilization and outcomes for each climbing related hand injury.

**RESULTS:** Twenty-eight climbers were interviewed, with a lifetime injury burden of 88 climbing specific hand injuries. Forty-six injuries occurred when climbers had health insurance. Of those, 78% did not see healthcare professionals. Rationales for not seeking care included (1) trusting one's own and peers' knowledge, (2) trusting medical advice in climbing media, (3) beliefs the injuries would heal on their own, and (4) concern that healthcare providers lack experience managing climbing specific hand injuries. Lack of proper injury management resulted in repeated injury in 42% of the climbers and lasting pain or deformity in 28%. Ten injuries (11%) were evaluated by primary care providers, hand specialists, and/or physical therapists. Climbers sought medical care due to: (1) repeated or worsening injuries, (2) injury requiring urgent intervention such as joint relocation, and (3) knowing a trusted provider. Four were satisfied with the care they received, four were dissatisfied, and two were indifferent.

**CONCLUSIONS:** Climbers in our study avoided seeking medical care for their climbing-related hand injuries. They preferred to use knowledge from within the climbing community and media to self-manage hand injuries. There was a thematic trust gap between the climbers and healthcare systems. Further study could elaborate on short and long-term negative outcomes from not seeking care. Secondly, further study could evaluate how healthcare provider knowledge of climbing specific hand injuries could help close the trust gap.

3329 Board #234 June 2 2:00 PM - 3:30 PM  
**Effects of Athletic Tape, Leukotape P, and Prophylactic Bracing During a Dynamic Postural Control Test**  
Karlee Burns, Will F.W. Wu, Tiffanye Vargas, Mimi Nakajima.  
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(No relationships reported)

**Context:** Athletic tape (AT), leukotape P (LEU), and prophylactic ankle bracing (BR) are commonly used in sport activity where dynamic postural control is important in optimal performance. The relationship between balance and these different types of tape and bracing have not been extensively studied. **Purpose:** The purpose of this study was to examine the effect of no intervention (NO), AT, LEU, and BR on modified Star Excursion Balance Test (SEBT) reach distance. **Participants:** Twenty-four healthy volunteers (9 males, 15 females; age: 22.13  $\pm$  2.37 years; height: 164.99  $\pm$  8.71 cm; mass: 70.06  $\pm$  12.42 kg) who were self-reported recreationally active and have not experienced a lower extremity injury in the past six months participated. **Methods:** NO, AT, LEU, and BR were applied during four randomized trials. Reach distance during a modified SEBT were recorded for individual directions and as composite scores for each leg and standardized by leg length. **Results:** One-way repeated measures ANOVA showed a significance F omnibus value between type of tape and reach distance for right composite score,  $F(3, 20) = 10.071, p = .000$ , right anterior reach  $F(3, 21) = 7.082, p = .002$ , and left anterior reach  $F(3, 21) = 6.231, p = .003$ . Post hoc comparisons revealed that AT condition had significantly less right composite score compared to LEU condition;  $t(22) = -3.85, p = .001$  and BR condition;  $t(22) = -4.12, p = .000$ . Right anterior reach for AT condition was less than NO,  $t(23) = 4.179, p = .000$  and BR condition,  $t(23) = -3.045, p = .006$ . Left anterior reach for AT was also less compared to NO,  $t(23) = 4.579, p = .000$ ; and LEU;  $t(23) = -3.690, p = .001$ . **Conclusion:** AT is often used to address ankle instability, however it may limit dynamic postural control stability. Using other tape or braces may exhibit the same stabilizing effect without impeding dynamic postural control.

3330 Board #235 June 2 2:00 PM - 3:30 PM  
**Effect of Cold Water Immersion or Contrast Water Therapy on Muscle Soreness After Exercise**  
Christine Lauber, Shelby Hickle, Jordayn Jargstorf, Casey West.  
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Sponsor: Matthew Beekley, FACSM; matthewbeekley@depauw.edu  
Tissue damage leads to delayed onset muscle soreness (DOMS), often resulting in pain or discomfort that gradually increases within the first 24 hours post-exercise, and typically peaks at 48 hours post activity. Cold-water immersion (CWI) and contrast water therapy (CWT) are commonly used as interventions for reducing DOMS; however, it remains unclear which treatment is more beneficial. **PURPOSE:** To determine if post-exercise cold-water immersion decreases muscle soreness compared to contrast water therapy at 48 hours post DOMS inducing exercise. **METHODS:** Thirty-nine healthy college student volunteers (20 males; 19 females) with ages ranging from 18 to 23 years ( $M = 20.36, SD = 1.35$ ) agreed to perform 5 sets of 20 drop jumps from a 0.6m box to induce DOMS. Subjects identified perceived muscle soreness on a 11-point (0 = no pain; 10 = most intense pain imaginable) numeric pain rating scale (NPRS) measured at baseline, immediately post exercise, and at 24, 48, 72, and 96 hours post exercise. Subjects were randomly assigned to a CWI (10<sup>o</sup> C) or CWT (1:1 ratio of 40<sup>o</sup> C and 10<sup>o</sup> C) intervention up to the iliac crest for 10 minutes immediately, 24, 48, and 72 hours post-exercise. An independent-samples *t*-test was used to compare muscle soreness between groups at 48 hours with an alpha level of 0.05 for statistical significance. **RESULTS:** There was a statistically significant difference in NPRS scores for the CWI ( $M = 2.90, SD = 1.92$ ) and CWT ( $M = 4.32, SD = 2.41$ );  $t(37) = 2.04, p = 0.049$ , interventions at 48 hours. Further, Cohen's effect size value was  $d = -0.66$ . **CONCLUSIONS:** CWI significantly decreased muscle soreness compared to CWT 48 hours post DOMS inducing exercise. CWI can be considered superior to CWT to decrease muscle soreness associated with DOMS 48 hours post-exercise. Additionally, the effect size indicates the intervention had a moderate effect. These results add to previous literature indicating CWI is more effective than CWT to treat muscle soreness.

3331 Board #236 June 2 2:00 PM - 3:30 PM

**Can Weakness in End-Range Plantarflexion after Achilles Repair Be Prevented?**Karl F. Orishimo, Sidse Schwartz-Balle, Timothy F. Tyler, Benjamin Bedford, Steven J. Lee, Stephen J. Nicholas, Malachy P. McHugh, FACSM. *Nicholas Institute of Sports Medicine and Athletic Trauma, New York, NY.* (Sponsor: Malachy P. McHugh, FACSM)

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(No relationships reported)

**Purpose**

Disproportionate end-range plantar flexion weakness, decreased passive stiffness, and inability to perform a heel rise on a decline after Achilles tendon repair, are thought to reflect increased tendon compliance or anatomical tendon lengthening. Since this was first noted, we have performed stronger repairs and avoided stretching into dorsiflexion for the first 12 weeks after surgery. It was hypothesized that these treatment changes would eliminate end-range plantar flexion weakness and normalize passive stiffness.

**Methods**

Achilles repairs with epitendinous augmentation were performed on 18 patients. Plantar flexion torque, dorsiflexion ROM, passive joint stiffness, and standing single-leg heel rise on a decline were assessed 43±24 months after surgery (range, 9 months-8 years). Maximum isometric plantar flexion torque was measured at 20° and 10° of dorsiflexion, neutral, and 10° and 20° of plantar flexion. Passive dorsiflexion ROM was measured goniometrically. Passive joint stiffness was computed from the increase in passive torque from 10° to 20° of dorsiflexion measured before isometric contractions. Tendon thickness was measured by digital calipers. Plantarflexor EMG was recorded during strength and functional tests. ANOVA and Wilcoxon tests were used to assess weakness and function.

**Results**

Marked weakness was evident on the involved side at 20° plantar flexion (deficit 26±18%;  $P<0.01$ ) with no weakness at 20° dorsiflexion (deficit 6±17%;  $P=0.39$ ). Compared to the noninvolved side, dorsiflexion range of motion was decreased 6±8° and tendon thickness was 7±3 mm greater ( $P<0.001$ ) on the involved side. Passive joint stiffness was similar between the involved and noninvolved sides. Only 3 of 18 patients could perform a decline heel rise on the involved side versus 18 of 18 on the noninvolved side ( $P=0.01$ ). There was no difference in EMG amplitude between the involved and noninvolved sides during all tests.

**Conclusion**

Normalized passive joint stiffness and reduced dorsiflexion ROM were likely due to a stronger, protected repair. EMG data confirmed that end-range weakness was not due to neural inhibition. Weakness with the plantar flexors in a shortened position may be due to inefficient transmission of contractile forces through the thickened tendon when the muscles are in a shortened position.

3332 Board #237 June 2 2:00 PM - 3:30 PM

**A Comparison of Two Equipment Removal and Spinal Restriction Protocols on Cervical Spine and Head Motion during Football Player Stretcher Transfer**Tyler Melnicove, Jennifer Kalash, Steven Leigh. *Montclair State University, Montclair, NJ.*

(No relationships reported)

Current research suggests full spinal immobilization is not effective and is potentially harmful during the treatment of spinal injuries. EMS agencies nationwide have adopted new spinal motion restriction protocols in response to these findings. However, these protocols do not account for the protective equipment worn by many athletes. Removing protective equipment from an athlete is necessary for treatment but causes potentially harmful motion of the head and spine. Optimal time on task for equipment removal is also unknown. **PURPOSE:** To compare the differences in time and head/neck kinematics when transferring a football player with a scoop stretcher between full and partial equipment removal. **METHODS:** A stratified sample of twenty students representing a football team (20.8 ± 1.7 years; 1.71 ± 0.12 m; 84.0 ± 15.9 kg). Participants were fitted with football equipment and placed supine. EMS spinal restriction protocols were conducted with helmet and shoulder pad removal (remove) and face mask removal only (keep). Participants were transferred to an ambulance cot with a scoop stretcher. Time to completion, linear/angular head, trunk, cervical spine, and helmet motion were measured in 3-D with an electromagnetic motion tracking system. **RESULTS:** Time on task was twice as fast during keep versus remove (42 s vs 78 s,  $p < 0.001$ ). Cumulative cervical flexion was about 40% less (407° vs 571°,  $p = 0.038$ ) and cumulative cervical rotation was about 50% less (246° vs 378°,  $p = 0.026$ ) during keep versus remove. Cumulative linear head motion was about 1.5 times greater (0.15 m vs 0.35 m,  $p = 0.018$ ) during keep versus remove. Maximum angular and linear motions were similar between conditions. **CONCLUSIONS:** There was considerable head and neck motion during both removal protocols. Motion was cumulatively greater during full equipment removal. Maximum linear and angular head and neck motion was similar between protocols and any deviation from neutral

could put pressure on the spinal cord. Coupled with faster time of task, these findings suggest face mask removal only, before transferring patient to an ambulance cot, is preferred.

3333 Board #238 June 2 2:00 PM - 3:30 PM

**Vitamin D3 Supplementation and Stress Fracture Occurrence in High-Risk Collegiate Athletes**Kevin A. Williams, Christian Askew, Christopher Mazoue, Jeffrey Guy, Toni M. Torres-McGehee, J. Benjamin Jackson III. *Palmetto Health Richland, Columbia, SC.*

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(No relationships reported)

Previous vitamin D research analyzes the regulation of calcium and phosphate levels, as well as bone mineralization and turnover. Very little is known about vitamin D's role in the prevention of stress fractures in high level athletes. **PURPOSE:** We aim to investigate vitamin D's role in the prevention of stress fractures in collegiate athletes. **METHODS:** *Prospective:* 118 NCAA Division I athletes were recruited from the high risk sports of track and field, cross country, soccer, and basketball. Blood samples were procured in August and February to determine fall and spring baseline 25(OH)D levels. Subjects with serum 25(OH)D <30 ng/ml were supplemented with 50,000 IU of vitamin D3/week for 8 weeks. Treated subjects were re-tested to ensure serum 25(OH)D levels rose to sufficient status. All enrolled subjects were monitored for the development of stress fractures.

*Retrospective:* A retrospective chart review of non-supplemented athletes from the same sports teams was conducted to determine the incidence of any reported stress fractures. **RESULTS:** *Prospective:* 112 of the 118 enrolled subjects were tested in August. 61 were of sufficient status (40.2 ng/ml ±8.28) and 51 were either insufficient or deficient (22.7 ng/ml ±4.89). 104 of the 118 enrolled subjects were tested in February. 56 were of sufficient status (40.7 ng/ml ±9.47) and 48 were insufficient or deficient (21.6 ng/ml ±5.87). 2 stress fractures were diagnosed in 118 currently enrolled subjects (1.69%).

*Retrospective:* 34 stress fractures were diagnosed in 453 subjects from 01/2010-05/2015 (7.51%).

**CONCLUSIONS:** In our population, almost half of the tested athletes proved to be vitamin D insufficient or deficient by the current normative value standards. Despite vitamin D supplementation, hypovitaminosis D was prevalent throughout the winter months. With vitamin D supplementation in this particular year, the stress fracture rate in our particular cohort significantly decreased from 7.51% to 1.65% ( $p=0.009$ ) following vitamin D supplementation.

3334 Board #239 June 2 2:00 PM - 3:30 PM

**Rasch Calibration of the Knee Injury Osteoarthritis Outcomes Score**James L. Farnsworth, II<sup>1</sup>, Todd Evans<sup>2</sup>, Helen Binkley<sup>3</sup>, Minsoo Kang, FACSM.<sup>1</sup> *Buena Vista University, Storm Lake, IA.* <sup>2</sup>*University of Northern Iowa, Cedar Falls, IA.* <sup>3</sup>*Middle Tennessee State University, Murfreesboro, TN.* (Sponsor: Minsoo Kang, FACSM)

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The knee is one of the most commonly injured body regions, accounting for nearly 15% of all sports-related injuries. Patient-reported outcomes such as the Knee Injury Osteoarthritis Outcomes Score (KOOS) have been used to evaluate changes in function following knee injury. Despite its clinical use, ceiling effects have been found across KOOS subscales in the general population. Ceiling effects diminish the clinical usefulness of the KOOS as function improves during recovery. In patients with a high functional ability, such as athletes, it is likely that this problem is even more pronounced. Evaluating the measurement properties of the KOOS in athletes is necessary to determine its clinical value. **PURPOSE:** To calibrate the 42-item KOOS using the Rasch Rating Scale Model. **METHODS:** One-hundred thirty adults (age 29.63 yrs ± 11.32) completed the KOOS. We used the Rasch Rating Scale Model to examine the KOOS. First, model-data fit was evaluated by examining mean square residuals for each item. Second, item difficulty, and person's level of knee-function was estimated. Third, an item-map distribution was evaluated to determine the distribution of knee-function items compared to the person-ability measures. Lastly, the rating scale was evaluated for proper functioning. **RESULTS:** Overall, model-data fit was poor with mean square residuals outside the acceptable range ( $\leq 0.5$  and  $\geq 1.5$ ) for many items. The item difficulties ranged from -3.96 to 0.07 logits, where a higher value represents a more difficult item. However, the mean person ability estimate was 0.0 ± 1.41 logits. The item "Have you modified your life style to avoid potentially damaging . . . your knee" represented the least difficult item, while "Pain with . . . stairs" was the most difficult. Item-map distribution indicated poor item distribution with insufficient items covering higher functioning individuals. In addition, the five-category structure of the KOOS demonstrated poor rating scale function.

**CONCLUSIONS:** The KOOS has limited measurement capabilities for athletes, as the items do not measure the high end of functional ability. For the KOOS to be clinically applicable to athletes, difficult items should be developed.

3335 Board #240 June 2 2:00 PM - 3:30 PM  
**Knee Rotation Related to Knee Angle and Applied Torque**

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 (No relationships reported)

**INTRODUCTION:** Rotational knee laxity is known as an intrinsic risk factor for anterior cruciate ligament (ACL) injury. However, there was no convenient way to measure rotational range of motion (ROM). To this end, we developed the RotorMeter, a simple and non-invasive external device intended to measure rotational ROM of the knee, which we reported to be reliable and valid at the ACSM2016 Annual Meeting.

**PURPOSE:** The purpose of this current study is to use the RotorMeter to clarify the characteristics pertaining to ROM of the knee in healthy subjects under varying conditions.

**METHODS:** A total of 10 healthy women (20 knees) participated in the study (20.8 ± 1.8 years). Torques of 2.5 Nm, 5 Nm and 7.5 Nm were applied at 90°, 60°, and 30° angles of knee flexion and the examiner's apprehension of End-Point-Feel (EPF) was used to measure full range of motion using the RotorMeter. One-way ANOVA was used for statistical analysis.

**RESULTS:** Total (internal + external) ROM of each condition is shown on Figure 1. No laterality was observed at any flexion angle and applied torque. When different torques were applied at the same flexion angle, total rotation significantly increased at all flexion angles with increased torque. Furthermore, with regard to EPF, a significant difference was observed only in comparison with 2.5 Nm. When the same torque was applied at different flexion angles, a significant difference was observed only between 90° and 30° when a torque of 2.5 Nm was applied, whereas when torques of 5 and 7.5 Nm were applied, no significant difference in total rotation was observed at any of the flexion angles.

**CONCLUSION:** Knee ROM increased when greater torque was applied, but it was not affected by the knee flexion angles during the measurement.

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

3336 Board #241 June 2 2:00 PM - 3:30 PM  
**Platelet-rich Plasma Injections For Accelerating Treatment Of Hamstring Tear Injuries**

Ahmed Gaballah<sup>1</sup>, Azza Abdalaziz<sup>2</sup>, Adham Elgeidi<sup>3</sup>, Naglaa Shkrah<sup>2</sup>, Eadric Bressel<sup>4</sup>. <sup>1</sup>*Damietta University, Damietta, Egypt.* <sup>2</sup>*Alexandria University, Alexandria, Egypt.* <sup>3</sup>*Mansoura University, Mansoura, Egypt.* <sup>4</sup>*Utah State University, Logan, UT.*  
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 (No relationships reported)

Platelet-rich plasma (PRP) is an autologous concentration of human platelets and has been used for treatment of tendon, ligament, and muscle injuries. However, it contains deleterious cytokines and growth factors that can cause fibrosis and inhibit muscle healing. PRP therapy has grown in popularity over the past few years but the effect of the PRP with physical rehabilitation is not clear. **PURPOSE:** To assess the effect of physical rehabilitation with PRP injection on treatment of hamstring strain injuries. **METHODS:** Eight physically active males (age 22.7 ± 3.6 yrs) with acute hamstring strain injuries and nine matched controls (age 21.9 ± 2.8 yrs) were recruited as research participants. Approximately 60 mL of blood was drawn from an antecubital venipuncture then centrifuged to approximately 5-6 mL of PRP by a BioMet System. A single dose of PRP was injected into the biceps femoral muscle using ultrasound guidance after 5-7 days of injury and before an 8 wk rehabilitation program. Before and 48 hrs after the PRP injection, the following blood markers were recorded and compared: Vascular endothelial growth factor (VEGF) (0.346 ± 0.182 vs 1.504 ± 0.463 pg/L), platelet-derived growth factor (PDGF) (0.352±0.11 vs 5.72±1.57 pg/L), and Insulin-like Growth Factor-1 (IGF-1) (0.577±0.28 vs 1.101±0.381) (p < 0.05 for all comparisons). Maximal hamstring force (HF) and knee flexion range of motion (ROM) were recorded after an 8-wk physical rehabilitation program. **RESULTS:** There were no significant differences between the PRP and control groups for HF (105.8 ± 3.18 N vs 107.1 ± 1.64 N; p > 0.6), and ROM (148.6 ± 0.78° vs 147.4 ± 0.88°; p > 0.5). **CONCLUSIONS:** Despite the theoretical benefits of PRP to regenerate muscle tissue and expedite return to activity, results indicated that PRP did not affect HF or ROM values when compared to a control group after 8 wk of physical rehabilitation.

3337 Board #242 June 2 2:00 PM - 3:30 PM  
**Functional Outcomes of ACL Reconstruction with Tibialis Anterior Allograft, Hamstring or Quadriceps Tendon Autograft**

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 (No relationships reported)

**PURPOSE:** The quadriceps index is a measure of the relative strength of the involved quadriceps compared to the uninvolved quadriceps. The purpose of this study was to investigate the changes in quadriceps strength in patients undergoing anterior cruciate ligament (ACL) reconstruction using anterior tibial tendon (ATT) allograft and hamstring tendon (HT) and quadriceps tendon (QT) autograft.

**METHODS:** Fourteen patients (mean age: 26.8±5.8 years, BMI: 22.9±2.4 kg/m<sup>2</sup>) with ATT allograft and 15 patients (mean age: 27.1±5.4 years, BMI: 23.8±2.8 kg/m<sup>2</sup>) with HT autograft and 11 patients with QT autograft (mean age: 28.1±4.4 years, BMI: 22.6±3.8 kg/m<sup>2</sup>) were included in the study. All patients (n=40) were received the same reactive neuromuscular rehabilitation protocol after surgery. Quadriceps strength of the patients was measured at 60°/sec and 300°/sec angular speeds, using the Biodex System 3 (Biodex® Corp., Shirley, NY, USA). Functional outcomes of the lower extremity were measured with hop test and International Knee Documentation Committee Scoring System (IKDC) and the fear of movement was assessed with Tampa Kinesiophobia Scale. All measurements were applied at postoperative first year. Kruskal Wallis test was used for the comparison of variables between groups.

**RESULTS:** The quadriceps indices were found similar at 60°/sec (p=0.308) and 300°/sec (p=0.716) angular speeds between the groups. There were no differences in IKDC (p=0.237) and fear of movement (p=0.059) scores between groups.

**CONCLUSIONS:** Patients undergoing primary ACL reconstruction with ATT allograft, HT or QT autografts had satisfactory and similar objective and subjective clinical results. Functional rehabilitation would be the key factor to improve the functional status for different type of graft use in ACL reconstruction patients.

3338 Board #243 June 2 2:00 PM - 3:30 PM  
**Effects of Tourniquet Use during Total Knee Arthroplasty on Global Cytokine Changes Associated with Ischemia Reperfusion Injury**

Timothy R. Macaulay, Brian Wu, Ryan Graff, Ido Badash, Joseph Skeate, Christianne Lane, Ibrahim Mansour, Ravi Rao, Anthony Yi, Jarrad Merriman, George R. Hatch, III, Larry Dorr, Paul Gilbert, E. Todd Schroeder. *University of Southern California, Los Angeles, CA.* (Sponsor: E. Todd Schroeder, FACSM)  
 (No relationships reported)

**Purpose:** The use of tourniquets during total knee arthroplasties (TKA) has been debated given the possibility that prolonged application of a tourniquet may result in ischemia-reperfusion injury (IRI), potentially contributing to post-operative muscle atrophy. The goal of this study was to elucidate the influence that tourniquet use may have on the induction of IRI in muscle tissue following TKA surgeries. We hypothesized that tourniquet use during TKA causes larger global increases in pro-inflammatory cytokines, indicating the occurrence of IRI.

**Methods:** 50 patients undergoing TKA surgeries were separated into 3 groups: no tourniquet (NoT; n=17), operative tourniquet (OT; n=15), and tourniquet during implant cementation (TDC; n=18). Induction of IRI was evaluated by measuring changes in fifteen cytokines present in blood samples collected from an antecubital vein immediately before and after surgery. Pre- to post- surgery changes in cytokine concentrations were compared between groups.

**Results:** Compared to immediately before surgery, cytokine levels generally decreased after surgery in the NoT and OT groups, but increased in the TDC group. Despite these differences, pre- to post- operation changes in IL-1β, IL-10, IFNγ, IL-4, IL-5, IL-7, IL-8, Eotaxin, IP-10, MCP-1, MIP-1α, MIP-1β, RANTES, and TNFα concentrations were not significantly different between groups. However, significant differences were found for IL-12, a pro-inflammatory cytokine (p=0.01). After surgery, IL-12 concentrations decreased in the NoT (pre: 72.8 ± 89.8 pg/mL, post: 41.3 ± 28.6 pg/mL) and OT (pre: 92.1 ± 142.2 pg/mL, post: 82.9 ± 167.4 pg/mL) groups, and increased in the TDC group (pre: 52.0 ± 85.1 pg/mL, post: 63.0 ± 116.7 pg/mL). However, Cohen's d effect sizes between groups were small (NoT vs OT = 0.08; NoT vs TDC = 0.12; OT vs TDC = 0.18).

**Conclusions:** Using global changes in pro-inflammatory cytokine levels as an indicator of IRI, these data suggest that the use of a tourniquet does not significantly contribute

to induction of IRI in TKA surgeries. However, additional studies comparing local plasma cytokine changes near the tourniquet site and utilizing larger sample sizes are necessary to determine if tourniquets should be used in TKA without inducing IRI.

**3339 Board #244 June 2 2:00 PM - 3:30 PM**  
**To What Extent is Weakness after ACL Reconstruction due to Central Inhibition versus Muscle Atrophy? A Magnetic Stimulation Study.**

Takumi Fukunaga, Malachy P. McHugh, FACSM, Christopher D. Johnson, Stephen J. Nicholas. *Northwell Health Lenox Hill Hospital, New York, NY.* (Sponsor: Malachy P. McHugh, FACSM)  
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 (No relationships reported)

**PURPOSE:** Quadriceps weakness is common after ACL reconstruction. Studies using electrical stimulation suggested that limited central nervous activation may have a role in the weakness. The purpose of this study was to test for deficits in quadriceps strength and activation, using magnetic stimulation, in patients at 3 mo and 6 mo post ACL reconstruction.

**METHODS:** Ten patients (7M/3F; age 34.7±8.3 yrs; BMI 26.0±4.8 kg/m<sup>2</sup>) who had ACL reconstruction with BPTB autograft were recruited. Patients underwent standard physical therapy after surgery. At 3 and 6 mo post-op, patients' knee extension maximum voluntary isometric contraction (MVIC) was measured. All tests were done bilaterally at 30° and 65° of knee flexion on a dynamometer. MVIC was augmented with a superimposed burst magnetic stimulation to the femoral nerve. The stimulator coil was placed over the femoral nerve and a 3-sec, 35-Hz pulse train was delivered at 100% intensity after 2 sec of MVIC. Peak torque before (T<sub>pre</sub>) and after (T<sub>post</sub>) stimulation delivery was measured, and central activation ratio (CAR) was calculated using the formula: CAR = T<sub>pre</sub>/T<sub>post</sub>. MVIC and CAR were analyzed using 3-way repeated measures ANOVA (time x side x angle).

**RESULTS:** Patients had marked deficits in MVIC (side effect P<0.001), with improvement from 3 mo to 6 mo (side x time P=0.015) that was more apparent at 65° vs 30° (side x time x angle P=0.022): at 3 mo, MVIC deficit was 34.6±14.1% at 30° and 34.7±8.6% at 65°; at 6 mo, MVIC deficit was 27.0±13.0% at 30° and 22.0±12.2% at 65°. CAR was lower on the involved side vs the noninvolved side (side effect P=0.02) and this effect was more prominent at 3 mo vs 6 mo (side x time P=0.026): combining the angles, mean CAR on the involved and noninvolved sides, respectively, was 91.4±7.6% and 97.5±5.3% at 3 mo, and 93.0±7.8% and 95.8±6.8% at 6 mo. **CONCLUSIONS:** At 3 and 6 mo after ACL reconstruction, there were significant deficits in quadriceps strength and activation. The levels of activation were high (>90%) for both sides at both time points. The substantial strength deficits at these postoperative time points may be largely due to muscle atrophy with only a limited contribution from central inhibition. Rehabilitation interventions to normalize quadriceps strength should emphasize hypertrophic stimuli as opposed to neuromuscular activation strategies.

**3340 Board #245 June 2 2:00 PM - 3:30 PM**  
**Magnetic Resonance Imaging Detection of Meniscal Injuries in Pediatric and Adolescent Patients with ACL Tears**

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**PURPOSE:** Prior research has shown decreased sensitivity and negative predictive value of meniscal injury detection using MRI in the setting of acute anterior cruciate ligament (ACL) tears in an adult population. This has yet to be investigated in a younger population. The objective of this study was to assess the diagnostic ability of MRI in detecting meniscal injuries for pediatric and adolescent patients undergoing arthroscopic ACL reconstruction.

**METHODS:** From August 2012 - June 2016, 175 arthroscopic ACL reconstructions were performed at our institution. A total of 83 patients were included in our final analysis. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of meniscal tears on MRI were calculated. ANOVA and two-sample t-tests were used to compare event rates between medial meniscal (MM) and lateral meniscal (LM) tears.

**RESULTS:** The median age of our cohort was 15 (range: 7-18). Figure 1 shows the accuracy of MRI for patients with arthroscopically confirmed meniscal tears with a concurrent ACL tear. There were 25 (30.1%) cases in which a meniscal injury not detected on MRI was discovered arthroscopically (MM: 5 knees, LM: 19 knees, both: 1 knee). These false negative MRIs were more commonly a LM tear (p<0.001) and of the vertical tear type (13/25 tears, 52.0%). The posterior horn was the most common

location for a missed LM tear (p<0.001). In comparison to an adult cohort studied previously (median age: 32, range: 16-61), the MRIs of our patients with LM tears had a decreased NPV (p<0.001).

**CONCLUSIONS:** For our younger patients with ACL injuries, there were 25 (30.1%) cases in which preoperative MRI failed to detect a meniscal tear. LM tears in the posterior horn were more commonly missed on MRI versus MM tears. Also, a vertical tear was the most commonly missed tear type. In comparison to an adult cohort, the MRIs of pediatric and adolescent patients with LM tears had a decreased NPV.

Figure 1: Sensitivity, Specificity, PPV, and NPV of 1.5T and 3.0T MRI

		Arthroscopic Finding		
		Tear Present (+)	Tear Absent (-)	Total
MRI Finding	Tear Present (+)	47	5	52
	Tear Absent (-)	25	6	31
	Total	72	11	83
Sensitivity		65.3%		
Specificity		54.5%		
PPV		90.4%		
NPV		19.4%		

**3341 Board #246 June 2 2:00 PM - 3:30 PM**  
**Body Mass Index is Associated with Cartilage Turnover in Individuals with ACL Reconstruction**

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Obesity is a risk factor for idiopathic knee osteoarthritis, yet little is known regarding how body mass index (BMI) affects metabolic changes that increase the risk of post-traumatic osteoarthritis (PTOA) **PURPOSE:** Determine the association between BMI and the type II cartilage turnover ratio in individuals with a unilateral anterior cruciate ligament reconstruction (ACLR). **METHODS:** Forty-five individuals with unilateral ACLR (31 female; 21.8±2.9 yr; 25.6±4.2 kg/m<sup>2</sup>; 48.3±38.2 months post ACLR) that had been cleared for unrestricted physical activity participated in this study. Physical activity level prior to ACLR (Tegner score) as well as current level of disability (International Knee Documentation Committee Index [IKDC]) were assessed. BMI (kg/m<sup>2</sup>) was calculated from objectively measured height and mass. Following 20 min of rest, serum was obtained to measure Type II cartilage turnover (C2C:CPII), which was quantified as the ratio of degradation (collagen type II cleavage product [C2C]) to synthesis (collagen type II C-propeptide [CPII]). Sera were put on ice to clot then spun at 4000 rpm at 4°C for 10 minutes. After centrifugation, sample aliquots were stored at -80° until analysis. Spearman rank order correlations (ρ) were used to determine the bivariate association between BMI and C2C:CPII. Secondary, partial correlations (r) were used to determine associations after controlling for covariates (IKDC and Tegner). All analyses were then repeated with males and females assessed separately. **RESULTS:** Overall greater BMI was associated with greater C2C:CPII (ρ =0.30, P=0.048). After controlling for covariates, we found a similar association between BMI and C2C:CPII (Partial r=0.42, P=0.009). In females, greater BMI was moderately associated with greater C2C:CPII before (ρ =0.51, P=0.004) and after controlling for covariates (Partial r=.50, P=0.01). There was no association between BMI and C2C:CPII (ρ =0.03, P=0.93) in males only. **CONCLUSIONS:** Greater BMI may influence greater collagen turnover in those with ACLR, potentially increasing the risk for developing deleterious cartilaginous alterations that are consistent with PTOA onset. By maintaining a lower BMI or reducing BMI, individuals, especially females, may be able to positively affect the cartilage turnover ratio following ACLR.

**3342 Board #247 June 2 2:00 PM - 3:30 PM**  
**Quadriceps Muscle Strength Recovers Faster Than Hamstring Strength After ACL Reconstruction With Hamstring Tendon Autograft**

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 (No relationships reported)

Strength measurements are extensively performed following anterior cruciate ligament (ACL) reconstruction to better understand the strength recovery of the patients over time and to make the patients return to their sports safely.

**PURPOSE:** The aim of this study was to investigate the quadriceps and hamstring strength recovery after ACL reconstruction with hamstring tendon autograft (HTG). **METHODS:** Fifty individuals (Age: 27.3±7.6 years; body mass index: 24.8±3.7 kg/m<sup>2</sup>) who had undergone ACL reconstruction with HTG were included in the study. All participants attended a regular six-month rehabilitation program. Quadriceps and hamstring isometric strength was measured at first, third and sixth months after surgery. Limb symmetry index [(involved/uninvolved limb strength)×100] (LSI) was used to define the muscle strength recovery. Two-way (muscle X time) repeated measures of ANOVA was performed for statistical analysis.

**RESULTS:** Muscle by time interaction was found significant for LSI ( $F_{(2,98)}=4.43, p=0.01$ ). Quadriceps LSI was lower than hamstring LSI at first month ( $p=0.02$ ) but no difference was observed between quadriceps and hamstring LSI at third ( $p=0.62$ ) and sixth months ( $p=0.64$ ) postsurgery. Both quadriceps and hamstring LSI gradually increased after ACL reconstruction ( $p<0.001$ ). (Table 1)

**Table 1.** Quadriceps and hamstring strength recovery after ACL reconstruction

	First month	Third months	Sixth months	p value
Quadriceps (%)	49.35±17.17	79.27±14.97	84.09±12.55	<0.001
Hamstring (%)	55.04±12.13	77.87±12.19	85.19±11.29	<0.001
p value	0.02	0.62	0.64	Not applicable

**CONCLUSION:** Quadriceps strength decrement was greater than the hamstrings' at first month postsurgery when compared to contralateral limbs' strength. However, quadriceps and hamstring LSI's were found similar at third and sixth months postsurgery which showed quadriceps strength recovered faster than hamstring strength. Although the participants attended a regular ACL neuromuscular training program, their LSI for strength could not reach 90% at 6 months after surgery when patients usually return to sport.

3343 Board #248 June 2 2:00 PM - 3:30 PM

**Knee Flexor Strength and Activation Levels During Testing After ACL Reconstruction with a Semitendinosus Graft.**

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(No relationships reported)

**PURPOSE:** Assessment specific to medial (MH) vs. lateral (LH) hamstrings may be indicated after graft harvesting from semitendinosus for anterior cruciate ligament (ACL) reconstruction. The purpose of the study was to assess strength and muscle activation levels of MH and LH during isometric strength testing where knee flexion was coupled with medial (MR) vs. lateral (LR) rotation of the tibia in elite athletes 1-5 years after ACL reconstruction, contrasting outcome measures with the non-surgical limb.

**METHODS:** Maximal isometric strength of 35 athletes (18 male, 17 female) was tested with a Kin Com dynamometer at 40° and 80° of knee flexion. Participants maintained concurrent volitional MR or LR of the tibia to facilitate preferential activation of the MH and LH components, respectively. Maximum values within each of a total of four 5 second trials were thereby collected for both lower limbs. Pre-amplified, wireless surface electrodes were used to collect muscle activity of each hamstring component during testing. Maximum values of smoothed data were identified within each test condition, the highest of which was used for normalization purposes. A mixed model repeated-measures ANOVA was used for analysis and alpha set at 0.05.

**RESULTS:** A significant interaction of limb by test position by sex was found for strength ( $p=0.016$ ), as males had lower strength values for the surgical side only at 80° whereas females had lower strength at both 80° and 40° with no effect of tibial rotation. Muscle activation data did not specifically reflect this interaction found in strength measures. However, analysis of MH data showed a significant test position by sex interaction ( $p=0.003$ ) across limbs, due to lower MH activation levels found at 40° compared to 80°, a difference not found for males.

**CONCLUSIONS:** Males and females may use different strategies during rehabilitation. Inhibition of MH activation may contribute to lower strength output during testing and influence readiness of return-to-sports.

3344 Board #249 June 2 2:00 PM - 3:30 PM

**The Modified Thomas Test: Does It Matter How It Is Performed?**

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(No relationships reported)

The Modified Thomas Test is a clinical physical therapy test used to examine hip extension, typically in patients presenting with low back or hip pain. Multiple versions are described, with little consensus on which is the most useful with respect

to measurement error, practicality, and patient comfort. **PURPOSE:** To compare the repeatability of the most commonly described variations of the Modified Thomas Test. **METHODS:** Two trained, blinded testers, measured hip extension in 10 volunteers (age: 20-30 years), over two consecutive days. For each volunteer, testers performed six different versions of the Modified Thomas Test. Test variations included: two start positions (perched or supine on plinth), and three positions of the contralateral hip (hip ninety degrees, lumbar spine neutral or hip fully flexed). Additionally, two methods of measuring the hip angle with an inclinometer were used (lateral or anterior thigh). **RESULTS:** No differences were observed between testers, sides, or measurement method, however significant differences in start position (perched:17°; supine:14°) and contralateral hip position (hip ninety:21°; lumbar spine neutral:15°; hip fully flexed:10°) were observed. Notably, there were no differences in repeatability of methods or testers, with mean errors between 3.4 - 4.0° for repeated measures of all test versions. **CONCLUSIONS:** Given that the different versions of the Modified Thomas Test exhibit similar levels of repeatability, it seems reasonable to recommend that clinicians use the simplest, safest and most comfortable version of the test. That is, having patients starting by lying supine on the bed and holding their contralateral hip in 90° of flexion.

3345 Board #250

June 2 2:00 PM - 3:30 PM

**Competitive Bass Anglers: A New Concern in Sports Medicine**

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**Background:** Angling is a popular pastime for many Americans. Competitive angling involves sport fishing against other anglers while targeting a specific species of fish. Due to the rapidly growing popularity of high school competitive bass angling in Alabama and the similarity of the casting motion to that of overhead athletes, we sought to examine the prevalence of sports-type injuries in this population.

**Hypothesis:** High school anglers who regularly compete will have a high prevalence of sports-type injury; likely due to the similarity of casting motion to the motions of many overhead athletes.

**Study Design:** Cross-sectional study

**Methods:** In spring 2016, an anonymous survey was distributed across two large scale competitive high school fishing tournaments, allowing for a broad sampling of anglers throughout the state of Alabama. Survey items included demographic information, relevant past medical history, and various pains associated with the shoulder, elbow and wrist. Results were recorded and analyzed electronically using Microsoft Excel and IBM SPSS statistical software.

**Results:** A total of 257 surveys were recorded. The mean age of participating anglers was 15 years old. The majority (42%) of anglers fished year round. On average, anglers casted nearly 1,000 more times while competing versus fishing recreationally. Approximately 15% of anglers experienced shoulder, elbow, and wrist pain. The most common factors associated with pain

included higher tournament cast counts, number of competitive years, number of tournaments/year, number of tournaments, and use of light weight lures. **Conclusion:** Roughly 15% of high school competitive anglers experience upper extremity pain. Knowledge of angling factors associated with pain allow for the creation of a modifiable routine to help reduce pain in affected anglers and prevent pain in healthy anglers.

3346 Board #251

June 2 2:00 PM - 3:30 PM

**Comparison Study On Early Postoperative Functional Exercises Of Simple Olecranon Fracture**

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(No relationships reported)

Olecranon fracture of the elbow joint is one of the common injuries, especially intra-articular fracture. Due to the anatomical characteristics of the elbow joint, it is easy to cause dysfunction after trauma. Therefore, early postoperative rehabilitation can maximize the recovery of limb function. Early and appropriate active or passive joint activities, not only can draft joint capsule, ligaments, tendons and soft tissue surrounding the joint but also can prevent contracture and improve joint nutrition metabolism. **Purpose** Currently, both active functional exercise and passive functional exercise are used clinically, but there is no uniform standard about how to practice early functional exercise of postoperative olecranon fractures properly. The purpose of the study further compared active and passive functional exercise in order to choose the appropriate training method. **Methods** Seventeen postoperative patients (age: 45.3±15.7 years, 8 males, 9 females) with simple olecranon fractures were randomly divided into two groups ( Group A: 9 cases; Group P: 8 cases) and evaluating effects of the two groups with JOA Elbow-Performance after different functional trainings during early rehabilitation stage, respectively (A: active functional training; P: passive functional training). **Results** All 17 subjects completed the study. On the second postoperative day (1<sup>st</sup> assessment), all patients had to test JOA. The total JOA scores

of two groups showed that there was no significant difference between two groups (A: 49.2±9.3, poor; P: 54.6±10.9, poor,  $p=1.09>0.05$ ). Over four-week-exercise period (2<sup>nd</sup> assessment), A was better than P. There was a significant difference of JOA scores (A: 94.3±2.9, excellent; P: 79.3±6.9, good,  $p=0.00<0.01$ ). However, the improvement rates of A and P had no significant difference ( $p=0.26<0.05$ ). Improvement rate = (2<sup>nd</sup> assessment - 1<sup>st</sup> assessment)/1<sup>st</sup> assessment. **CONCLUSION** Both active functional training and passive functional training are beneficial to postoperative patients with simple olecranon fractures, but active functional training method is the first choice.

3347 Board #252 June 2 2:00 PM - 3:30 PM

### Sedentary Behaviour in People with Total Knee Arthroplasty and Those Awaiting Surgery

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(No relationships reported)

High levels of sedentary behaviour are associated with functional decline, elevated blood pressure, weight gain, and increased risk for metabolic conditions in people with osteoarthritis independent of time spent in moderate-to-vigorous physical activity. While physical activity levels do not change substantially after total knee arthroplasty (TKA), the effects on sedentary behaviour have not been investigated. **PURPOSE:** To compare sedentary behaviour patterns in people with osteoarthritis awaiting TKA and individuals recovered from TKA. **METHODS:** Sedentary behaviour was measured with the 7-day Sedentary and Light Intensity Physical Activity Log (SLIPA), the Longitudinal Aging Study Amsterdam Sedentary Behavior Questionnaire (LASA-SB), and 7 day accelerometry (ActiGraph GT3X+, < 100 activity counts/min) in 32 participants awaiting TKA and in 38 individuals one year after TKA (69.9 ± 5.3 SD and 67.9 ± 7.3 yrs of age respectively). T-tests and Mann-Whitney Rank Sum tests were used to detect differences between groups. A one-way RM ANOVA was used to detect differences between measures of sedentary time. **RESULTS:** There were no differences between pre- and post-operative groups for GT3X+ wear time (13.9 ± 1.1 hours/day vs. 14.4 ± 1.1 respectively,  $p=0.09$ ), total sedentary time (9.3 ± 1.4 hours/day vs. 9.2 ± 1.4,  $p=0.62$ ), and number of sedentary bouts/day ≥ 30 min in duration (median 3.4 [1.9 IQR] vs. 3.1 [2.0],  $p=0.37$ ). In addition, SLIPA and LASA-SB scores did not differ between groups ( $p=0.17$  and  $p=0.14$  respectively). Measures of sedentary time (combined groups) were all statistically different from one another: GT3X+ 9.2 ± 1.4 hours/day, SLIPA 6.7 ± 2.5 hours/day, LASA-SB 10.3 ± 3.7 hours/day (all comparisons  $p<0.05$ ). **CONCLUSIONS:** Self-reported and objective measures of sedentary behaviour do not differ between people on the wait-list for TKA and one-year recovered from TKA. This suggests that after TKA there is still an increased risk for physical disability and cardiovascular health conditions related to high levels of sedentary behaviour. In addition to promoting increased physical activity after TKA, individuals would benefit from education regarding strategies to reduce sedentary behaviour.

## F-62 Free Communication/Poster - Performance

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3348 Board #253 June 2 3:30 PM - 5:00 PM

### Variations in Verbal Encouragement Modify Isokinetic Performance at High Speeds

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(No relationships reported)

Verbal directions and encouragement are common in exercise testing; however, the verbiage used during each is rarely controlled despite the likelihood it may affect the participant's performance. **PURPOSE:** To examine the effects of four variations in verbal encouragement verbiage on isokinetic performance during alternating concentric knee extensions and flexions. **METHODS:** Fourteen healthy participants (8M, 6F, height = 1.73 ± .09 m, mass = 70.0 ± 20.2 kg, age = 24.2 ± 3.9 y) completed four isokinetic knee extension and flexion testing sessions on a Biodex isokinetic dynamometer. Each session consisted of 5 repetitions at 1.05 rad·s<sup>-1</sup> (60°·s<sup>-1</sup>), 10 reps at 3.14 rad·s<sup>-1</sup> (180°·s<sup>-1</sup>), and 15 reps at 5.24 rad·s<sup>-1</sup> (300°·s<sup>-1</sup>), separated by 5 min passive recoveries. Participants received the same methodological instructions before each session. Variations in verbal encouragement, however, were randomized during each testing session using the following statements: (1) "as fast as you can" (FAST); (2) "as hard as you can" (HARD); (3) "as hard and as fast as you can" (BOTH); and (4) no verbal encouragement (NONE). Repeated measures ANOVAs were conducted to evaluate differences in isokinetic performance metrics. **RESULTS:** FAST produced

significantly higher total work ( $M_{diff} = 172.2$ ,  $SE = 44.3$ ,  $p = .011$ ), relative work (work/body weight) ( $M_{diff} = 9.0$ ,  $SE = 2.3$ ,  $p = .009$ ), work first third ( $M_{diff} = 71.0$ ,  $SE = 19.2$ ,  $p = .016$ ) and average power ( $M_{diff} = 32.0$ ,  $SE = 7.5$ ,  $p = .006$ ) than NONE during knee flexion at 300°/s, with no further differences for any speed or movement direction. **CONCLUSION:** Verbal encouragement stating "as fast as you can" is recommended to increase work and power during high speed isokinetic knee testing since it consistently produced the best performances.

3349 Board #254 June 2 3:30 PM - 5:00 PM

### Physiological Adaptation, Safety And Finishing Rate To Half Ironman Training For Age Group Triathletes

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Within the past few years, long distance triathlon has gained in popularity amongst the general population, which is by itself good news, since it leads to adopting an active lifestyle. Amateur athletes engaged in such a demanding challenge must prepare themselves wisely in order to achieve their goals without injury. Coaches establish training programs based upon their knowledge, personal experience and on approved training principles. Up to now, no training programs or methods have been evaluated scientifically in order to evaluate its effect on health and on success rate for age group athletes. **PURPOSE:** To evaluate a triathlon training program on the success rate of completing a half Ironman in neophyte amateur athletes. **METHODS:** A triathlon training program was conducted by the research team from February to June 2016 to follow age group athletes for their preparation to the Mont-Tremblant half Ironman. The training program adapted by a certified coach/registered kinesiologist included endurance and strength training in specific areas of running, cycling and swimming. Each participant did a full fitness assessment that included body composition, aerobic and musculoskeletal testing in January and two weeks prior to the event. Training volume was noted each week and injuries were reported to the team's physical therapist. **RESULTS:** Out of the 31 amateur triathletes (19 Males and 12 Females; mean age of 40 ± 9 years old; body weight of 74 ± 12 kg and a height of 172 ± 10 cm), only one did not complete the event. For a mean training volume of 410 ± 201 min per week, the mean finishing time was 6 hours 28 minutes and two participants obtained a qualification for the World Championships. Maximal oxygen consumption (46 ± 8 to 49 ± 7 ml/kg/min,  $p < 0.05$ ) as well as maximal power output (293 ± 62 to 308 ± 57 W) were significantly increased by the training program. Ventilatory thresholds were also significantly increased (158 ± 40 to 175 ± 40 W,  $p < 0.05$ ). No significant changes were observed in body weight (% of body fat and % lean mass), maximal grip strength and flexibility tests. Seven cases of minor injuries were reported during the six months of training. **CONCLUSION:** A 24 week training program adapted by a certified coach/registered kinesiologist is safe and provides a high success rate for amateur athletes that aim to finish a half-Ironman triathlon.

3350 Board #255 June 2 3:30 PM - 5:00 PM

### Kinematics of Softball Hitting Off of a Tee versus Front Toss

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(No relationships reported)

Hitting a baseball or softball is one of the most difficult skills in sport. Use of a batting tee as a training technique is viewed as principle for establishing and improving basic fundamentals of hitting.

**PURPOSE:** To determine lower extremity (knee flexion, pelvis rotation) and trunk (flexion, lateral flexion and rotation) kinematics hitting off a tee and hitting front toss. It was hypothesized that there would be no difference in lower extremity and trunk kinematics between the two conditions. **METHODS:** Nineteen National Collegiate Athletic Association (NCAA) Division I collegiate softball players (20.51 ± 1.53 yrs; 68.99 ± 7.68 kg; 166.87 ± 6.00 cm) participated. Participants were instructed to execute five maximal effort swings hitting from a tee and five maximal effort swings hitting front toss from a pitcher at 9.14 m (30 ft). The hitting motion was divided into five events: stance (ST), load (LD), foot contact (FC), ball contact (BC), and follow-through (FT). **RESULTS:** Data failed the test of normality; therefore, a Wilcoxon signed-rank test was used to determine if there were median differences in hitting kinematics between two hitting conditions during each hitting event. Results revealed kinematic differences in trunk flexion at load ( $z = -2.55$ ,  $p = 0.01$ ). No other significant results were found between hitting events and examined variables during

each condition. **CONCLUSION:** Though there were minimal kinematic differences in the two hitting conditions, these differences were at swing initiation and not exhibited beyond ball contact. These findings are beneficial for this population as decreased variability in swing mechanics across various conditions is desired. Therefore, it is suggested that future research continue to examine hitting mechanics from not only a kinematic approach but also from a kinetic and performance approach.

3351 Board #256 June 2 3:30 PM - 5:00 PM  
**Handedness (right Or Left Handed) Effect On Bilateral Transfer To Non-dominant Hand**

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Bilateral transfer is a common source of experimental study in motor learning. It is suggested that successful transfer from a non-dominant hand to dominant exists in the area of speed. However, there may be a difference between left and right-handed individuals in the interhemispheric transmission of visuomotor information. Left handed may have lower accuracy in trials.

**PURPOSE:** The focus of this work was to quantify the amount of bilateral transfer of subjects and determine if there is preferred dominant hand for the greatest amount for transfer.

**METHODS:** Participants first completed a handedness survey to establish laterality. They were then asked to trace a printed star pattern as quickly and accurately as possible while gazing at a mirror image of the pattern. The pattern for tracing was as follows: 1 time with non-dominant hand, 7 times for dominate hand, 1 time for non-dominant hand with 30 second breaks in between. Errors were measured by marks made outside of the star pattern. The distance outside the line was measured with a ruler.

**RESULTS:** A total of 14 college age students were enrolled in this study, 50% (N=7) were female, and 35% (N=5) were left handed. Significant differences were found in the pre to post test scores in both the number of errors (means  $\pm$  standard deviation, significance) pre = 18.14  $\pm$  8.68, post = 6.93  $\pm$  4.12,  $p=0.0001$  and time to complete the task in minutes (means  $\pm$  standard deviation, significance) pre = 1:48  $\pm$  0:03, post = 1:00  $\pm$  0:02,  $p=0.005$ . When stratified by dominant hand (left or right), only time to complete task was significantly different ( $p=0.04$ ); whereas, the number of errors was not significantly different ( $p=0.09$ ).

**CONCLUSIONS:** This study suggests that there may be significant skill transfer from the dominant to non-dominant hand. It does appear that perfection of a task (number of errors) is as easily transferred, regardless of which hand is dominant. The later may have implications for athletics whose participation in sports requiring perfection of movement is important.

3352 Board #257 June 2 3:30 PM - 5:00 PM  
**The Physiological Responses Of A Mandibular Repositioning Mouthguard And Their Effects On Athletic Performance**

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**PURPOSE:** The purpose of this study is to understand the physiological responses of a mandibular repositioning mouthguard on athletic performance. We hypothesize that MG designs that produce anatomically desirable jaw adjustments for an increase in the upper airway may have the ability to elicit ergogenic effects thereby improving respiratory capacity and athletic performance.

**METHODS:** Twenty-four active participants volunteered for this study and were randomly counterbalanced submitted to six performance tests and 3D volumetric imaging with both conditions, without mouthguard (NMG) and with the mouthguard (MG).

**RESULTS:** The results demonstrated that the mandibular repositioning mouthguard has a significant effect on both aerobic ( $p < 0.01$ ) and anaerobic performances ( $p < 0.05$ ). The MG condition increased the pulmonary ventilation by 9% and maximal aerobic capacity by 5%. In addition, the MG condition increased anaerobic power production by 3% and decreased the 20- and 40-meter sprint time by 4% and 2% respectively. All results were statistically significant ( $p < 0.05$ ). Imaging results demonstrated a 7% increase of the upper airway volume when comparing the MG to NMG conditions ( $p < 0.05$ ).

**CONCLUSIONS:** Our results support our hypothesis that jaw-repositioning custom-made mouthguards can induce an increase in oropharynx width in the upper airways and these changes may be the cause for an increase in athletic performance.

3353 Board #258 June 2 3:30 PM - 5:00 PM

**Inspiratory Muscle Performance is Significantly Related to Agility and Speed in Collegiate Tennis Players**

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The Illinois Agility Test (IAT) measures sport agility by combining multi-directional skills with sprints. The Test of Incremental Respiratory Endurance (TIRE) evaluates inspiratory muscle strength and endurance via Maximal Inspiratory Pressure (MIP) and Sustained Maximal Inspiratory Pressure (SMIP). The relationship between athletic agility and inspiratory muscle performance (IMP) is unclear. **PURPOSE:** To examine the association between IMP and IAT results of Collegiate Tennis Players (CTP). **METHODS:** IMP of 7 male CTP (mean  $\pm$  SD age = 20.3  $\pm$  0.8 years, height = 186.2  $\pm$  3.4 cm, and weight = 77.7  $\pm$  6.5 kg) and 8 female CTP (age = 20.9  $\pm$  0.8 years, height = 168.9  $\pm$  6.2 cm, and weight = 64.7  $\pm$  6.5 kg) was assessed via TIRE with the best of 3-5 trials providing MIP [measured from residual volume (RV)] and SMIP (measured from RV to total lung capacity). The IAT was performed twice with a 10-min rest between trials. The first and last intervals of the IAT comprised sprints to and from cones set 10 m apart, while the second interval involved weaving back and forth through four cones placed 3.3 m apart. A custom mobile app and tablet were used to time each IAT interval. **RESULTS:** MIP and SMIP of men were significantly ( $p < .05$ ) greater than women (134.5  $\pm$  19.4 vs. 99.5  $\pm$  35.3 cm H<sub>2</sub>O and 791.1  $\pm$  193.9 vs. 471.7  $\pm$  162.8 PTU, respectively). Men were significantly ( $p < .05$ ) faster during all IAT intervals and had a significant ( $p < .05$ ) negative correlation between MIP and last sprint times of both trials ( $r = -.77$  and  $-.89$ , respectively). In women, significant ( $p < .05$ ) negative correlations existed between weaving time and SMIP of the first trial ( $r = -.77$ ) and MIP and SMIP of the second trial ( $r = -.93$  and  $-.89$ , respectively). **CONCLUSIONS:** IMP was significantly correlated to IAT time in CTP but gender differences existed. The correlation between MIP and last sprints in men suggests that men depend on IMP for speed. MIP and SMIP were related to the weave interval in women suggesting that women depend more on IMP for agility. Stronger correlations existed between IMP and IAT during the second IAT trials suggesting that greater IMP provides less susceptibility to performance decrement associated with fatigue. Greater IMP may provide greater balance and contribute to greater agility in women and speed in men, resulting in improved performance in CTP.

3354 Board #259 June 2 3:30 PM - 5:00 PM

**An Analysis of Governed vs Different Focal Points on Vertical Jump Performance in Males**

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Previous research has suggested that overhead goals (i.e. overhead focal point) can have a positive impact on drop jump performance. It stands to reason that with an increase in jump height, there is an increase in power output. However, there appears to be limited research on focal points and their impact on vertical jump (VJ) performance. **PURPOSE:** To compare the potential differences between no set focal point, a set focal point (i.e. governed), and a sport specific focal point on VJ performance in no less than average fit males. **METHODS:** Thirty-four average fit college aged males participated in this study. After descriptive data and reach height was recorded, subjects completed an 8-min warm-up on a leg cycle ergometer followed by 4-min of passive recovery (i.e. standing still). Subjects then completed 4 practice (i.e. familiarization trials) counter-movement jumps (CMJ) utilizing a VJ measurement device. Upon completion of 2-min of passive recovery the subjects then completed, in a counter-balanced order, 3 different jump series consisting of 4 maximal effort CMJs with 30-sec between each jump. The various jump series were as follows: No Set Focal Point (FPN), Focal Point (FP), and Sport Specific Focal Point (FPS). The highest jumps for FPN, FP, and FPS were compared using ANOVA statistical techniques with an alpha level of 0.05. **RESULTS:** FPS (69.19  $\pm$  9.40 cm) was significantly different ( $p = 0.001$ ) than FPN (67.77  $\pm$  10.08 cm). Also, FPS was significantly different ( $p = 0.0003$ ) than FP (67.92  $\pm$  9.92 cm). Conversely, there was no significant difference ( $p = 0.308$ ) between FPN and FP. **CONCLUSION:** The results suggest that individuals who use a sport specific focal point tend to jump higher than those who use no set focal point or a governed focal point. Therefore, it may be prudent to suggest that a sport specific focal point, as selected by the subject, should be utilized during VJ assessment. Future studies should assess the impact of a sport specific focal point on VJ performance using male athletes who participate in sports with jumping movements.

3355 Board #260 June 2 3:30 PM - 5:00 PM

**The Effect of Sport Specific, Governed, and Non-Controlled Focal Point on Female Vertical Jump Performance**Robert T. Sanders, Andy Bosak, Christopher Carver, Austin Smith, Jonathan Houck, Matthew Sokoloski, Jared Feister. *Liberty University, Lynchburg, VA.* (Sponsor: James Schoffstall, FACSM)*(No relationships reported)*

Few studies have assessed factors that directly impact vertical jump performance in females. Prior studies investigated varying warm-up protocols as a means to enhance jump performance without seeking to manipulate the target (i.e. sport specific focal point, non-controllable, or governed focal point) that the female subjects focused on to complete the jumps. A previous focal point vertical jump study utilizing male subjects suggested that vertical jump performance increased when using a sport specific focal point. However, this has not been assessed using a female population to the best of the researchers' knowledge. **PURPOSE:** To determine if a sport specific focal point contributes to an increase in jumping performance compared to non-controllable (i.e. no set focal point), and a governed (i.e. set focal point) in averagely fit females. **METHODS:** Thirty averagely fit female participants had descriptive data collected (i.e. age, HT, WT, BF). Participants completed an 8 min warmup, which avoided static movements, and then received a 4 min passive recovery. After completing four familiarization jumps in a counter movement manner participants completed four jumps per each jump trial with thirty seconds of rest between jumps and 2 min of passive rest between each trial. The jump series protocol consisted of three separate counterbalanced trials which included a sport specific (FPS), governed (FP), or non-controllable focal point (FPN). FPN, FP, FPS were compared using ANOVA with significance determined at an alpha level of 0.05. **RESULTS:** FPS (51.56 cm 8.69 cm) was significantly different ( $p = .0005$ ) versus FP (50.67 cm 8.70 cm) and FPN (50.50 8.83 cm). Also, there was no significant difference ( $p = .245$ ) between FPN and FP. **CONCLUSION:** It appears that using a sport specific focal point may elicit a higher jump in averagely fit females as compared to the jumps when females utilized a non-controlled focal point or a governed focal point. Further research is necessary in order to evaluate the use of a sport specific focal point on vertical jump performance with females who participate in jumping sports (i.e. basketball, volleyball) at the high school, collegiate, and professional level.

3356 Board #261 June 2 3:30 PM - 5:00 PM

**Is Breakthrough Power an Effective Assessment of Team Performance of University Rugby Football ?**Masanori Takemura<sup>1</sup>, Koji Kurita<sup>2</sup>, Setsuo Komatsu<sup>3</sup>, Arijit Banerjee<sup>4</sup>, Hayato Yamamoto<sup>5</sup>, Mitsuharu Kaya<sup>6</sup>, Junzo Tsujita<sup>7</sup>. <sup>1</sup>*Ichihashi Clinic, Kobe, Japan.* <sup>2</sup>*Physical Conditioning Production, Osaka, Japan.* <sup>3</sup>*Tenri University Rugby Football Club, Tenri, Japan.* <sup>4</sup>*Amagasaki-city Board of Education, Amagasaki, Japan.* <sup>5</sup>*Yamamoto Trainers Project, Kyoto, Japan.* <sup>6</sup>*Hyogo University of Health Science, Kobe, Japan.* <sup>7</sup>*Institute of Health & Sports Medical Science, Osaka, Japan.*  
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**PURPOSE:** We reported in a previous study (ACSM's 60th Annual Meeting) that kinetic energy ( $\text{kg}\cdot\text{m}^2/\text{s}^2$ ) calculated from body weight (kg) and 30m sprint (m/s; maximum value), called breakthrough power (BT), was good as a performance assessment of running with body contact during rugby. The purpose of this study was to determine if the BT of individual players can explain team performance in rugby football.

**METHODS:** For four years the top level teams of university rugby football in Japan were investigated retrospectively (the number of players of 86 [regular 16, reserve 70] in 2010-11 season, 60 [18, 42] in 2011-12, 96 [19, 77] in 2012-13, and 113 [19, 94] in 2013-14). Every season, number of players of regular and reserve (individual player's performance level) were included in the high BT group (number of the regular players of the season) and in the low BT group. Odds ratio and Fischer's exact test were calculated, and compared to team performance of the Japan university championship. **RESULTS:** Odds ratio (p value as Fischer's exact test) of each season was 28.6 (0.00) in 2010-11, 19.24 (0.00) in 2011-12, 8.40 (0.00) in 2012-13, and 2.88 (0.09) in 2013-14. The adjustment of odds ratio that standardized the player total number of each season to 60 players at the minimum of four seasons was 17.16 (0.00), 19.24 (0.00), 3.95 (0.05), and 0.99 (1.00), respectively. Apart from 2013-14, the regular player group had higher BT than the reserve group. Team result finished second in the Japan university championship in 2010-11 and 2011-12, but defeated in the first round of the championship in 2012-13, and defeated in the qualifying round in 2013-14. In the season when odds ratio was high, i.e. most players with high BT participated in a game as regular players, team result was high.

**CONCLUSIONS:** In the 2013-14 season, the contribution of breakthrough power, i.e. fitness level to assessment of player performance (regular or reserve) was low, thus

team fitness was low. As result, the team performance was low. Thus the contribution of fitness factor to assessment performance level is important in rugby football. Breakthrough power is an effective assessment of team performance of university rugby football.

3357 Board #262 June 2 3:30 PM - 5:00 PM

**Relationships Between Squat Strength, Velocity, And 40-yard Dash Time In College Softball And Football Players**Michael F. Carter, Lindy M. Rossow, Christopher A. Fahs. *Lindenwood University Belleville, Belleville, IL.* (Sponsor: Michael G. Bembien, FACSM)*(No relationships reported)*

One-repetition maximum (1RM) back squat and 40-yard dash time are common performance assessments in college athletes. Measuring bar velocity during the concentric portion of barbell exercises can be a useful tool to provide feedback for regulating resistance training intensity. Average bar velocity during a 1RM back squat is lower in experienced squatters compared to novice squatters but it is unknown if bar velocity during a 1RM back squat is related to strength or speed in athletes. **PURPOSE:** To determine the relationships between 1RM back squat strength, bar velocity, and 40-yard dash time in college softball and football players. **METHODS:** Thirteen college football ( $22 \pm 1$  yrs) and eight college softball players ( $20 \pm 1$  yrs) performed the 40-yard dash and 1RM back squat protocol while peak and average concentric bar velocities were measured. Height (m), body mass (kg), squat experience (years), squat frequency (days/week), and femur length (cm) were also measured. Squat relative 1RM was calculated as 1RM (kg) divided by body mass. Independent samples t-tests were used to compare data between athletes (softball vs. football) and Pearson correlations were used to determine the relationship between variables. **RESULTS:** Absolute squat 1RM ( $153.7 \pm 28.8$  vs.  $86.8 \pm 18.8$  kg) was greater in football players compared to softball players ( $p < 0.001$ ) but relative 1RM squat ( $1.45 \pm 0.34$  vs.  $1.24 \pm 0.22$ ), 1RM average bar velocity ( $0.30 \pm 0.05$  vs.  $0.29 \pm 0.06$  m/s), 1RM peak bar velocity ( $0.71 \pm 0.20$  vs.  $0.76 \pm 0.19$  m/s), and 40-yard dash time ( $5.40 \pm 0.57$  vs.  $5.70 \pm 0.40$  s) were similar between football and softball players ( $p > 0.05$ ). 40-yard dash time was inversely correlated with relative 1RM squat ( $r = -0.720$ ;  $p < 0.001$ ) and peak 1RM bar velocity ( $r = -0.612$ ;  $p = 0.003$ ). **CONCLUSIONS:** These data suggest that faster athletes were relatively stronger and had a greater maximum bar velocity during the 1RM back squat. Measurement of peak bar velocity during back squat 1RM testing may be a useful indicator of speed in college athletes.

3358 Board #263 June 2 3:30 PM - 5:00 PM

**Carbohydrate Mouth Rinsing Procedure during Repeated-sprints Exercise in Fasted State: Effects on Physical and Cognitive Performance**Karim Chamari<sup>1</sup>, Anissa Cherif<sup>1</sup>, Romain Meeusen, FACSM<sup>2</sup>, Joong Ryu<sup>3</sup>, Lee Taylor<sup>1</sup>, Karim Kammoun<sup>4</sup>, Mohamed Amine Fenni<sup>5</sup>, Abdulaziz Farooq<sup>1</sup>, Abdul Rashid Aziz<sup>6</sup>, Bart Roelands<sup>2</sup>. <sup>1</sup>*Aspetar, doha, Qatar.* <sup>2</sup>*Bruxelles University, Bruxelles, Belgium.* <sup>3</sup>*Aspire, doha, Qatar.* <sup>4</sup>*ISSEP Ksar-Said, Tunis, Tunisia.* <sup>5</sup>*Sousse University, Sousse, Tunisia.* <sup>6</sup>*Singapore University, Singapore, Singapore.* (Sponsor: Dr Randall Wilber, FACSM)

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Intermittent fasting (IF) is used for many reasons across the globe. Three-days IF (3-d IF: no eating/drinking during daylight hours) has been shown to reduce physical and cognitive performance in a repeated sprint effort session. Carbohydrate (CHO) mouth rinse (CHO-MR) has shown efficacy in attenuating some of these decrements for different efforts (i.e., endurance exercise), yet CHO-MR has not been utilized within a repeated sprint (RS) exercise 3-d IF paradigm with associated cognitive performance assessment. **PURPOSE:** Determine carbohydrate mouth rinsing (CHO-MR) effects on physical and cognitive performance during repeated-sprints (RS) after 3 days of intermittent fasting (abstaining from eating/drinking during daylight hours). **METHOD:** In a randomized, counter-balanced and double-blinded manner, 15 active healthy males performed a RS-protocol (RSP) [2 sets (5x5-s maximal sprints interspersed with 25-s rest periods and 3-min of recovery between sets) on an instrumented motorized treadmill with embedded force plates] in three conditions [Control (CON)(no-MR), Placebo-MR (PLA-MR; 0% maltodextrin), and CHO-MR (10% maltodextrin)]. Participants rinsed their mouth with either 10-mL of PLA-MR or CHO-MR solution for 5-s before each sprint in the PLA-MR and CHO-MR conditions. Reaction time (RT) tasks (simple and complex) were assessed pre-, mid- and, post-RSP. ANOVA with repeated measures was used to analyze the data. **RESULTS:** There was no statistical main effect of CHO-MR on sprints (i) mean power, (ii) mean speed, and (iii) vertical stiffness compared with PLA-MR and CON conditions. There was also no statistical main effect of CHO-MR on simple- and complex-task (i) accuracy,

(ii) movement time, and (iii) reaction time. **CONCLUSION** Though CHO-Mouth rinsing has been shown to be effective at improving performance in other exercise modalities, the present study showed that frequent CHO mouth rinsing did not affect sprint performance or reaction time during an intensive repeated sprint protocol.

3359 Board #264 June 2 3:30 PM - 5:00 PM  
**Difference in Power Measures Across Age-Cohorts**  
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Muscular power declines 6-10% per decade throughout life. It is unknown, however, when the decrease is most apparent. Therefore, it's important to examine the difference in power amongst different age cohorts. **PURPOSE:** The purpose of this study was to examine the difference in power output measures among adults over the age of 18 years, separated into age decade cohorts (18-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80-89 years). **METHODS:** A total of 160 men and women participated in the study (40.6 ± 20.1 years; 71.1 ± 14.0 kg), spanning in age from 18-86 years. Power was assessed using the Tendo power analyzer during a sit-to-stand (STS) task. Participants sat on a standard height (0.47 m) chair, arms crossed over their chest and performed five separate STS trials, rising from a seated to full standing position as quickly as possible; one-minute rest periods provided between each trial. The Tendo was positioned on the floor in alignment with the participant's heel and the Kevlar string attached to the participant's hip with a carabiner clip and belt. With each STS task, peak (PPOW) and average (APOW) power, as well as peak (PVEL) and average (AVEL) velocity were recorded in watts (W) and meters per second (m/s), respectively. PPOW, APOW, PVEL, and AVEL were recorded for each stand, with the average taken. **RESULTS:** One-way ANOVA analysis indicated a significant difference between groups for PPOW, APOW, PVEL, and AVEL measures ( $p < .05$ ). Younger subjects produced significantly greater PPOW and APOW than individuals in age cohorts over 40 years ( $p < .05$ ). When assessing PVEL and AVEL, the younger age cohorts produced significantly greater values than the older age cohorts ( $p < .05$ ). **CONCLUSION:** Findings indicate muscular power to be significantly greater among younger cohorts ( $\leq 40$  years), as compared to older cohorts ( $> 40$  years); however, among older cohorts, there was no significant decline in power. This gives an indication that decline in muscular power may occur around the age of 40, which is when the decline becomes less apparent. Based on findings, preservation of muscular power is necessary before 40 years of age.

3360 Board #265 June 2 3:30 PM - 5:00 PM  
**Lunar Phases Effects On Short-term, Explosive Physical Performance Among Young Trained Athletes**  
 Youssi Narimen<sup>1</sup>, Mohamed Arbi Mejri<sup>1</sup>, Amri Hammami<sup>2</sup>, Omar Hammouda<sup>3</sup>, Anis Chaouachi<sup>1</sup>, Karim Chamari<sup>4</sup>. <sup>1</sup>National Center of Medicine and Science in Sport, Tunisia, Tunisia. <sup>2</sup>Faculty of Medicine Sousse, Sousse, Tunisia. <sup>3</sup>Université Paris Ouest Nanterre La Défense, Paris, France. <sup>4</sup>Aspetar, doha, Qatar. (Sponsor: Prof. Joann Eickhoff Shemek, FACSM)  
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Beliefs in lunar effect on human physiology and behavior started back in ancient times. Outcomes recently revealed that (i) aggressive behavior increased around full moon (FM), and (ii) a physical fitness index increased in sedentary students at new moon (NM) and FM compared to other moon phases. This has been attributed to the alteration of cardiovascular parameters (i.e., heart rate (HR) and blood pressure (BP)) which were affected by the gravitational pull of the moon. However, there was no attention on the effect of lunar cycle (moon illumination and Gravitational pull) on physical performance in athletes. **PURPOSE:** to evaluate whether short-term explosive performance can be influenced by the different phases of lunar cycle. **METHODS:** Methods: Fourteen young male taekwondo athletes (Age: 16.9±0.7years, Height: 159.7±50.6 cm, Body Mass: 62.85±7.84 kg, Body Fat: 10.9±4.7) performed: squat jump (SJ), countermovement jump (CMJ), and 10-m sprint tests to assess explosive physical performance during the different phases of the lunar cycle (NM, FQ (First Quarter), FM, and LQ (Last Quarter)). The testing sessions at the different moon phases were performed in a counterbalanced order. Tests' order was kept the same (SJ, CMJ, then 10-m sprint) and all sessions were performed at evening times (6:00 to 8:00 p.m.) on the first day of each concerned lunar phase. Each parameter was measured over two consecutive lunar months in the calendar (April and May 2016). Astronomical data (lunar phases) were acquired from the United States Naval Observatory astronomical applications department data services (<http://aa.usno.navy.mil/data/>).

**RESULTS:** ANOVA showed that there was no significant lunar cycle effect for all explosive tests measures  $F_{(3, 93)}=1.834$ ;  $p>0.05$ ;  $\eta_p^2=0.124$ .

**CONCLUSIONS:** Moon phases did not affect evening explosive performances (mainly phosphagens' pathway based efforts) among young trained athletes. Therefore, it seems that moon phase / illumination do not have an effect on short term physical performance in young trained adolescents. Future studies may evaluate whether High Intensity (predominance of the "glycolytic pathway" in addition to the "phosphagen's pathway") and Endurance (predominance of "oxidative phosphorylation"), performances would be affected by lunar cycle in athletes.

3361 Board #266 June 2 3:30 PM - 5:00 PM  
**The Effects Of Lower Body Fatigue On Vertical Jump Ground Reaction Forces**  
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 (No relationships reported)

**PURPOSE:** Ground reaction forces may be used as an indicator of lower body performance and fatigue. It is known that a decrease in muscular force-generating capacity is an indicator of fatigue. Therefore, the purpose of this investigation is to determine the effects of lower body fatigue on ground reaction force measures. **METHODS:** Nineteen recreationally trained males and females (age 22.84 ± 1.77yrs; height 168.82 ± 10.22m; weight 68.70 ± 14.87kg) participated in a combined familiarization and testing session. During familiarization, participants signed an informed consent and anthropometrics were recorded. Participants then performed a dynamic warm-up and were familiarized with two types of vertical jumps and fatiguing protocol. Three trials for both the static jump (SJ) and countermovement vertical jump (CMVJ) were performed on a force plate, pre and post Bosco fatigue test. The dependent variables calculated from the force plate were rate of velocity development (RVD), peak force (PF), impact force (IF), peak velocity (PV), and peak power (PP). Paired-sampled t-tests were used to analyze pre/post differences for each dependent variable. **RESULTS:** There was a significant difference between pre and post PF ( $p=0.003$ ; pre=1,523.68 ± 360.65N; post= 1,464.03 ± 342.24N), IF ( $p=0.001$ ; pre= 1,175.02 ± 1142.37N; post= 1355.05 ± 987.34N), peak velocity ( $p=0.002$ ; 2.63 ± .36; post= 2.38 ± .51m/s), and PP ( $p=0.001$ ; pre= 3373.09 ± 1088.92m/s; post= 2922.89 ± 1100.00m/s) measures for CMVJ. There was a significant difference between pre and post measures for SJ peak force ( $p=0.001$ ; pre= 1298.95 ± 261.97N; post= 1230.60 ± 261.97N). **CONCLUSIONS:** For CMVJ, the Bosco protocol significantly decreased PF, IF, PV, and PP. The fatigue protocol also significantly decreased PF for SJ. This is due to the decrease in force generating capacity in lower-body musculature following fatigue. A decrease in force production may lead to an overall increase in injury risk. As force production decreases, so does ability to maintain proper mechanics. This study shows performing a fatiguing activity, such as the 60s Bosco protocol, significantly alters force production in recreationally trained populations, indicating that programming high-intensity multi-joint activities before maximal vertical jump performance can lead to muscle fatigue.

3362 Board #267 June 2 3:30 PM - 5:00 PM  
**The Relationship Between Bilateral Asymmetries And Explosive Lower-Body Performance**  
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**PURPOSE:** Bilateral symmetry of the lower extremities may be a critical component of lower-body explosive performance. Therefore, the purpose of this investigation was to determine the relationship between bilateral asymmetry and explosive lower-body performance.

**METHODS:** Forty-five recreationally trained males and females (age, 23.04 ± 2.36 y; height, 166.45 ± 24.40 cm; mass, 73.86 ± 13.33 kg) volunteered to participate in this study. Day one (familiarization), participants filled out an informed consent and physical activity readiness questionnaire followed by familiarization of vertical jump, sprinting, and isokinetic torque protocols. Day two (testing), participants performed a dynamic warm-up followed by 3 countermovement vertical jumps utilizing the Vertec® and force plates to obtain maximum vertical jump height and peak force. Maximal vertical jump height of the three trials was used for analysis. Participants performed 3 trials with 2 min rest in between of a 40-yard sprint with timing gates positioned at 20 and 40 yards. The fastest times of the three trials were used for analysis. Isokinetic torque was assessed with the Biodex System 4 Isokinetic dynamometer to measure concentric isokinetic torque of both hamstrings and quadriceps, with 5 repetitions on each leg. The maximum isokinetic torque from each leg was used for analysis and bilateral quadriceps (BQ%) and hamstrings (BH%)

percent differences were calculated and used for analysis. Pearson's  $r$  correlations were conducted to analyze the relationship between hamstring and quadriceps percent differences and lower body explosive performance variables.

**RESULTS:** There was no significant correlation between BQ% and total sprint time ( $r = -.02$ ;  $p = .85$ ), vertical jump height ( $r = .06$ ;  $p = .68$ ), and peak power ( $r = -.13$ ;  $p = .36$ ). There was no significant correlation between BH% total sprint time ( $r = .22$ ;  $p = .14$ ), vertical jump height ( $r = -.001$ ;  $p = .99$ ), and peak power ( $r = -.26$ ;  $p = .08$ ).

**CONCLUSIONS:** No relationship was observed between bilateral asymmetry and any lower body explosive performance in this particular population. The lack of a relationship may be due to the type of participants involved in the investigation; since they were recreationally trained there may be varied training experience.

3363 Board #268 June 2 3:30 PM - 5:00 PM  
**The Importance of Skating Economy to Performance on a Repeated Shift Test in Ice Hockey**

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 (No relationships reported)

Ice hockey is a sport characterized by repeated high intensity bouts, with the ability to resist fatigue both between and within bouts conferring competitive advantage. However, there is no evidence to support skating economy as a factor in fatigue resistance.

**PURPOSE:** To determine the importance of skating economy to fatigue during repeated high-intensity efforts of a simulated ice hockey shift.

**METHODS:** Forty-five collegiate and Junior A male ice hockey players (aged 18-24 years) performed a continuous protocol graded exercise test to volitional exhaustion using a skate treadmill, as well as an on-ice repeated shift test. Breath-by-breath data for  $\dot{V}O_2$  and respiratory exchange ratio were collected and used to derive energy expenditure (EE) averaged over the final 10 seconds of each stage. Economy was determined as the slope of the regression line relating  $\dot{V}O_2$  and EE against skating speed separately. Participants who completed fewer than three stages of the graded exercise test were excluded to increase reliability of regression slope measures. Participants also completed eight bouts of maximal ice skating through a course designed to simulate the duration and skating skills of a typical shift, with three separate TC Speed Trap-II wireless timing gates used to determine first half, second half, and total fatigue decrement as calculated by a percent decrement score (Decrement Score =  $(100 \times [\text{Total Sprint Time} \div \text{Ideal Sprint Time}] - 100)$ ). Each bout lasted approximately 23 seconds, with 90 seconds of passive recovery allowed between bouts. Partial correlation was used to determine the association between economy measures and decrement during the repeated shift test.

**RESULTS:** Twenty-six participants met the inclusion criteria and were included in the data analysis. Skating economy measures (both relative  $\dot{V}O_2$  and EE) were moderate and statistically significant correlates of total fatigue decrement ( $\dot{V}O_2$ :  $r = 0.46$ ,  $p < 0.05$ ; EE:  $r = 0.44$ ,  $p < 0.05$ ), but not with first or second gate decrement.

**CONCLUSION:** Our results indicate that skating economy may play an important role in fatigue resistance over repeated on-ice sprints designed to simulate a typical shift. This may lend support to the use of technical skating coaches and training techniques to enhance skating economy as a valid way to improve ice hockey performance.

3364 Board #269 June 2 3:30 PM - 5:00 PM  
**The Influence Of Pace On Performance During A Five-week Online Fitness Competition.**

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**Purpose:** To determine the influence of exercise pace on individual performance during an annual five-week online fitness competition. **Methods:** Competition pacing data was collected from individuals with more than six-months of experience during the first (16.1;  $n = 12$ ) and last (16.5;  $n = 8$ ) weeks of the competition. For 16.1, competitors completed as many repetitions as possible (AMRAP) in 20 minutes of a circuit that included: 25-ft. overhead walking lunges (L1), 8 bar-facing burpees, 25-ft. overhead walking lunges (L2), and 8 chest-to-bar pull-ups (PU). For 16.5, competitors completed a workout with a 21-18-15-12-9-6-3 descending repetition scheme with barbell thrusters (BT) and bar-facing burpees (BB). Pearson product-moment correlation coefficients were calculated between the average (AVG), fastest (FST), and slowest (SLW) times to complete each exercise and round (RD), in addition to the competitors' score for 16.1 (total repetitions) and 16.5 (time to completion). Significantly correlated variables were entered into a stepwise linear regression to determine the best indicator for success. **Results:** Significant ( $p < 0.05$ ) relationships were observed between 16.1 score and  $PU_{AVG}$  ( $r = -0.83$ ),  $L1_{FST}$  ( $r = -0.61$ ),  $L2_{FST}$  ( $r = 0.75$ ),  $PU_{FST}$  ( $r = -0.66$ ), and  $PU_{SLW}$  ( $r = -0.86$ ). Of these,  $PU_{SLW}$  was most influential

of 16.1 score ( $r^2 = 0.74$ ,  $p = 0.001$ ). Significant ( $p < 0.05$ ) relationships were observed between 16.5 score and  $BT_{FST}$  ( $r = -0.78$ ),  $BB_{FST}$  ( $r = -0.78$ ),  $RD_{FST}$  ( $r = -0.88$ ),  $BT_{SLW}$  ( $r = -0.79$ ),  $RD_{SLW}$  ( $r = -0.93$ ),  $BT_{AVG}$  ( $r = -0.85$ ), and  $RD_{AVG}$  ( $r = -0.97$ ).  $RD_{AVG}$  was most influential of success for workout 16.5. **Conclusion:** These data suggest that pacing affected score during these two workouts. Specifically, for a 20-minute AMRAP that included pull-ups, lunges, and burpees, the pace of the pull-ups was most influential. However, maintaining a low average round time was most important during a workout with a descending repetition scheme. It is unknown whether these strategies would be consistent in other, similarly-designed workouts.

3365 Board #270 June 2 3:30 PM - 5:00 PM  
**The Effect Of Drop Jump Height On Post-activation Potentiation As Measured By Vertical Jump Performance**

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Post-activation potentiation (PAP) is an enhanced contractile response within the muscles due to prior voluntary activation that has the potential to be used as a warm-up strategy prior to short, high intensity activities. **Purpose:** The purpose of this study was to compare the effects of two different drop jump heights on PAP as measured by subsequent vertical jump performance. **Methods:** 76 male and female NAIA collegiate athletes (19.9±0.2 yrs) completed three different testing session protocols. During the first session, the participants performed a pre-treatment vertical jump test and were familiarized with drop jumps. The second and final testing sessions included five drop jumps with rebound from an 18 and 30 inch box followed by a post-treatment vertical jump test. Three t-tests were performed in order to compare data from both treatments to the pre-treatment vertical jump data and the two treatments to each other. **Results:** The mean pre-treatment vertical jump was 22.2±0.6 inches while the 18 inch treatment mean was 21.3±0.6 inches and the 30 inch treatment mean was 21.8±0.5 inches. Two-tailed t-tests comparing the vertical jump after the varying drop jump heights did not show any significant differences. Delta in vertical jump height between the two treatment groups were also examined, revealing no significant changes in jump height. **Conclusion:** Neither of the drop jump treatments were found to significantly influence vertical jump performance when compared to the pre-treatment vertical jump heights. Therefore, these results do not support the use of this volume of 18" or 30" drop jumps to induce PAP in collegiate level athletes.

3366 Board #271 June 2 3:30 PM - 5:00 PM  
**Effect of Crank Arm Length on Oxygen Consumption and Mechanical Efficiency During Forward Grinding**

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In America's Cup yacht racing grinding is a major factor for boat handling. Resent changes in race regulations concerning number and anthropometry of crew members as well as the need for maintaining hydraulic pressure for boat maneuvering may emphasize the importance of optimizing grinding equipment for optimal aerobic efficiency during grinding. **Purpose:** To investigate the effect of crank arm length on oxygen consumption, mechanical efficiency and perceived exertion during forward grinding. **Methods:** Eight trained male subjects participated (Age: 31.3 ± 11.5 yrs; Body weight: 85.7 ± 9.5 kg; Height: 185.4 ± 3.1 cm; Arm span: 187.9 ± 7.4 cm; Grinding  $\dot{V}O_{2peak}$ : 49.0 ± 1.4 ml  $O_2$   $kg^{-1}$   $min^{-1}$ ). Whole body oxygen uptake, mechanical efficiency (net and gross), rate of perceived exertion (local and overall) and time to exhaustion (TTE) were compared during grinding with two different crank arm lengths (Standard: 228.6 mm vs. Long: 298.6 mm). Testing was performed as an incremental discontinuous test, consisting of 3-minute bouts of forward grinding at 70 revolutions per minute separated by a 1-minute pause. Testing started at 90 W and was increased by 30 W until exhaustion. Oxygen uptake was measured using the Jaeger Oxycon Pro metabolic cart and grinding was performed at a Harken® prototype grinding ergometer (Olesen et al. Eur. J. Sport Science, 2015). Prior to the two test sessions resting metabolic rate was measured in supine position. Data were analyzed using a two-factor ANOVA repeated measures and paired t-test. **Results:** The standard crank arm length elicited lower oxygen consumption ( $p < 0.05$ ) and was more efficient ( $p < 0.05$ ) than the long crank arm length at workloads < 180 W. Interestingly, rating of perceived exertion for local muscular fatigue (local RPE) was significantly higher ( $p < 0.05$ ) for the standard crank arm length at workloads > 90 W and TTE for the standard crank arm length was significantly shorter (1078 ± 44 sec vs 1144 ± 53

sec;  $p < 0.05$ ). **CONCLUSION:** The long crank arm is less efficient than the standard crank arm at lower workloads. Conversely, lower local RPE at high exercise intensities and superior TTE were found with the long crank arm. The authors wish to thank Harken® for building the prototype of the grinder ergometer. No other conflicts of interest, financial or otherwise.

3367 Board #272 June 2 3:30 PM - 5:00 PM

### The Relationship Between Academic Stress and Skeletal Muscle Performance

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(No relationships reported)

Student athletes are required to perform both in the classroom and on the field; balancing these commitments can be stressful. It is common to question the burden of athletic demands on student scholarship. However, the inverse is seldom asked: how do scholastic stresses affect athletic performance? **PURPOSE:** To test the effect of psychological stress on skeletal muscle performance in college students. **METHODS:** We enrolled 23 recreationally active students (10 men, 13 women) from a D1 university. Skeletal muscle function was assessed via quadriceps extension and hamstring flexion using a Cybex HUMAC NORM dynamometer. Psychological stress was measured with the Cohen Perceived Stress Scale. Subjects were evaluated at two time points: a high stress period (exams) and a low stress period (no exams). A history of injury excluded subjects from participation; nightly sleep, history of exercise, and recent exercise were controlled. Independent variables were stress, sex, age, weight, BMI, academic load, and participation in organized sports (club or intramural). Dependent variables were peak torque (ft/lb) and time to achieve peak torque (sec). Differences in muscle performance between high and low stress periods were assessed with t-tests. Linear regressions analyzed the effect of psychological stress on muscle performance. **RESULTS:** Subjects were  $20.2 \pm 1.1$  years old, had peak flexor torque of  $87.4 \pm 19.7$  ft/lb (achieved in  $0.58 \pm 0.12$  sec), and peak extensor torque of  $145.2 \pm 37.5$  ft/lb (achieved in  $0.58 \pm 0.15$  sec). T-tests found no differences between low and high stress periods in peak torque or time to achieve peak torque ( $p > 0.090$ ). Linear regression found increases in psychological stress to correlate with improvements in the overall rate of force development ( $p = 0.004$ ). The effect was strongest with flexors: for each point that stress increased, time to achieve peak torque was 2.4% faster ( $p = 0.002$ ). **CONCLUSION:** Despite a small sample size, these findings suggest psychological stress may enhance force development. A possible mechanism could be sympathetically-mediated potentiation of calcium release. While academic stress presents many challenges for student-athletes, it does not appear to be detrimental to muscular performance.

3368 Board #273 June 2 3:30 PM - 5:00 PM

### Effect of Cleat Position during Cycling on Running Performance in Elite Triathlete

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(No relationships reported)

**PURPOSE:** To evaluate the effect of cycle shoes cleat position during cycling on subsequent running time in simulated duathlon in elite triathletes. **METHODS:** Nine male national team caliber triathletes ( $25.9 \pm 2.4$  yrs,  $69.1 \pm 4.4$  kg,  $176.1 \pm 3.7$  cm) participated in two occasions of simulated duathlon. In each occasion, they cycled 20 km on a fixed bicycle immediately followed by running 5 km on a treadmill. During cycling, they wore cycle shoes of either traditional cleat position (TCP) or middle cleat position (MCP, approximately 5 cm behind of TCP). During cycling and running, they changed and controlled the speed as well as the cycle gear combinations. The testing order was balanced. They were asked to perform their best. During the exercises, distance, time, speed, the transit time, and heart rate (HR) were recorded. The distance of running was divided into three phases; as 0-2, 2-4, and 4-5 km, and the time record was compared. **RESULTS:** The total time record of the exercises excluding the transit was  $3126 \pm 137$  in TCP and  $3096 \pm 103$  sec in MCP ( $p > 0.05$ ). The cycling time was  $1956 \pm 69$  in TCP and  $1967 \pm 54$  sec in MCP ( $p > 0.05$ ). The running time was  $1170 \pm 88$  in TCP and  $1129 \pm 66$  sec in MCP ( $p > 0.05$ ). The running time was faster in MCP than TCP by 5.4% at the phase of 0-2 km ( $460 \pm 24$  in MCP vs.  $486 \pm 40$  sec in TCP,  $p < 0.05$ ), but not at 2-4 km ( $447 \pm 25$  in MCP vs.  $462 \pm 37$  sec in TCP,  $p > 0.05$ ). The average HR was  $166.7 \pm 8.8$  in MCP and  $165.5 \pm 7.0$  bpm in TCP during cycling, and  $175.3 \pm 11.6$  in MCP and  $175.4 \pm 8.1$  bpm in TCP during running. No differences were found in HR during the exercises. **CONCLUSION:** The cleat position did not change the total time record of simulated duathlon in elite triathlete. However, the time record of early stage of running following cycling was faster when they cycled with the shoes of middle cleat position. It appears that cleat position during cycling have some influence on muscle recruitment during running in trained elite triathletes.

3369 Board #274 June 2 3:30 PM - 5:00 PM

### Electrolytes Drink Increases Performance During Repeated Exhaustive Exercise Tests

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(No relationships reported)

**Purpose:** To investigate the effects of electrolyte drink on subsequent exhaustive exercises, 14 male-university students voluntarily participated. They were healthy and passed medical screening and physical exam prior to three exercise tests of at least 1 week apart. **Methods:** Two consecutive exhaustive exercise tests, with 2 hours recovery period in between, were done within a day. After the first exhaustive exercise, subject was randomly intervened by drank one of the followings fluids: a) water (WT), b) placebo (PLA, only sucrose 7%, dextrose 4%) and sports drink (SD, NaCl 0.13%, KCl 0.03%, sucrose 7%, dextrose 4%). During 2 hrs recovery period, the amount of energy drink given was divided into 3 parts: first at 50% body weight (BW) at immediately after finished glycogen depletion, then at two sessions of 25%BW at 30 minutes and 60 minutes respectively Exhaustive exercise testing was conducted on cycle ergometer. This study was approved by Mahidol University IRB. Statistical analysis was done using two-ways repeated ANOVA at  $p < 0.05$ . **Results:** Increasing in most of cardiorespiratory variables (heart rates, stroke volumes, cardiac outputs, end-diastolic volumes, total peripheral resistance, breathing frequencies, tidal volumes, minute ventilations, maximum oxygen consumptions and carbon dioxide productions) are not significantly different among the groups with an exception of ejection fraction where SD was higher than WT ( $p < 0.05$ ). Estimations of substrate utilizations revealed that fat oxidation was higher in WT ( $p < 0.05$ ) where carbohydrate oxidations in PL and SD were higher than WT ( $p < 0.05$ ). On the second exhaustive exercise, SD had significantly higher time to exhaustion and work done than WT and PLA ( $p < 0.05$ ). **Conclusion:** In addition to carbohydrate alone, sports drink-containing electrolytes found to increase endurance performance on the subsequent exercise. The presence of these electrolytes are found to enhance carbohydrate absorption in human gastrointestinal tract and may possibly act as co-enzymes in metabolic pathways. Supported by T.C. Pharmaceutical Industries Co.Ltd. Thailand.  
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3370 Board #275 June 2 3:30 PM - 5:00 PM

### The Effect of Green Tea Extract on Fat Oxidation during 1hour Arm Cycle Exercise

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#### Purpose:

Decaffeinated Green Tea Extract (GTE) supplementation can increase fat oxidation during leg exercise, but many people cannot perform leg exercise. The purpose of this study was to investigate the effect of GTE supplementation on fat utilization during 1h arm cycle exercise. We hypothesized that GTE supplementation will increase lipolysis and fat oxidation.

#### Methods:

This was a randomized, controlled, triple blind study with a crossover design. 8 healthy adults (4 females, 23-37yrs) performed an incremental arm cycle test to exhaustion followed by 4 time trials at fixed workloads. After an 8h fast subjects did 1h of arm cycling at 50%  $W_{peak}$ . Subjects were randomly assigned to either decaffeinated GTE (650mg, 611mg EGCG) or placebo (PLA) for 4wks. Subjects then repeated the 1hr arm cycle trial. A 4wk washout period was followed by the corresponding crossover trial. 5ml of blood were drawn pre and post exercise while respiratory gases were collected continuously. Plasma glycerol and free fatty acid (FFA) concentrations were assessed with commercially available analysis kits. The study was powered at  $1-\beta > 95\%$ , with  $\alpha = 0.05$  given a reported effect size of  $F = 3.39$  for the time by treatment interaction.

#### Results:

Mean  $VO_2$  during all 1hr trials showed no significant differences ( $83.89 \pm 19.25$  L/min,  $p = .460$ ). Similarly, mean total energy expenditure (EE) showed no differences across all trials ( $264.58 - 266.15$  kcal,  $p = .420$ ). The percentage of total EE from fat oxidation was higher after GTE supplementation compared to PLA, but this difference was not significant ( $22.83 \pm 11.57$  to  $25.38 \pm 11.3\%$  vs.  $23.39 \pm 9.97$  to  $20.69 \pm 8.9\%$ ,  $p = .532$ ). There were no significant changes in g/min of fat oxidized between treatments before and after supplementation (GTE =  $.11 \pm .08$  to  $.12 \pm .06$  vs. PLA =  $.10 \pm .05$  to  $.09 \pm .04$ ,  $p = .220$ ). Blood Glycerol concentration increased post exercise in all trials, with no significant differences between treatments ( $8.55 \pm 3.44$  mg/dl to  $8.47 \pm 2.6$  vs.  $10.05 \pm 2.86$  to  $8.99 \pm 3.51$  mg/dl,  $p = .527$ ). FFA concentration was also increased post exercise for both groups with no significant difference between treatments ( $8.30 \pm 3.8$  mg/dl to  $8.69 \pm 2.59$  vs.  $9.06 \pm 4.49$  to  $7.16 \pm 3.79$ ,  $p = .234$ ).

#### Conclusion:

These results suggest that there is no effect of 1m GTE supplementation on fat utilization during 1hr arm cycle exercise at 50%  $W_{peak}$ .

3371 Board #276 June 2 3:30 PM - 5:00 PM  
**The Effects Of Varying Levels Of Crossfit Experience On VO<sub>2</sub>max**  
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 (No relationships reported)

High intensity interval training (HIIT) training has been shown to improve maximal oxygen uptake (VO<sub>2max</sub>). CrossFit is an adapted high intensity, strength and conditioning program implementing multi joint movements. Recent studies have demonstrated how CrossFit can lead to improved aerobic fitness; however, these results are reported from studies lasting a maximum of 3 months.

**PURPOSE:** The aim of this study was to investigate the effect on VO<sub>2max</sub> from the length of CrossFit participation.

**METHODS:** The participants were 22 male subjects, age 34.8 ± 8.0 months, with at least two months of CrossFit training prior to enrolling in this study. Two groups were formed based on continuous participation in the CrossFit program above 18 months. The participants underwent a VO<sub>2max</sub> graded exercise maximal exertion test using a modified treadmill protocol. Subjects warmed up for 3 minutes at 8km/h and 0% grade, then started running at 9km/h with 0.5Km/h increase every 30 seconds until exhaustion. Exhaustion was defined as three of the four criteria: plateau of VO<sub>2</sub> for at least two consecutive readings, RPE higher than 18, RER > 1.1 and maximal heart rate (HR) within 10 beats of the age predicted maximum HR. The VO<sub>2</sub> data was collected using the ParvoMedics TrueOne 2400 Metabolic System.

**RESULTS:** The two groups were significantly different in their training participation; 31.6 ± 8.5 months compared to 9.1 ± 4.1 months, P < 0.001. The experienced individuals had a greater VO<sub>2max</sub> (51.3 ± 5.5 ml/kg/min) compared to the novice individuals [45.3 ± 4.8 ml/kg/min (P = 0.02)]. A forward regression analysis indicated that weight alone was a significant predictor for VO<sub>2max</sub> (adjusted R<sup>2</sup> = 0.47, P < 0.001). This group difference appears to be mediated primarily by body weight, as individuals exposed longer to CrossFit were leaner (88.0 ± 9.4 kg) compared to the novice individuals (97.5 ± 14.7 kg, P = 0.03).

**CONCLUSIONS:** These results suggest that CrossFit provides the appropriate stimulus to increase an individual's VO<sub>2max</sub> over time. This could be due to increased cellular oxidative metabolism caused by the high intensity nature of the exercise and the ability of more experienced CrossFit athletes to endure workouts at a greater intensity. Most of these adaptations seem to be mediated by the effects of the training program on body weight.

3372 Board #277 June 2 3:30 PM - 5:00 PM  
**Relationship Between Marathons Completed and Libido in Endurance-Trained Males**  
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 (No relationships reported)

High levels of endurance training are known to depress testosterone production in males, (EJAP 2003;89:480), which plays an important role in libido maintenance. Research suggests that endurance exercise training (EET; intensity, duration in years) may impact libido status in endurance trained males (MSSEx 2016;48:267). **PURPOSE:** This study examined libido status among EET men with varying levels of marathon participation (at least 1 to > 5). **METHODS:** A cross-sectional survey design was used to collect data. Respondents completed the survey via the Qualtrics™ online survey portal. Of the 1,366 respondents, 1,077 were valid (≥ 18 yr age, males, complete data sets). A total of 594 had completed marathons and were included in this analyses. Validity checks were conducted on the data. EET was assessed with components of the IPAQ and Baecke questionnaires. Questions from 3 validated sources (Androgen Deficiency in the Aging Male, Sexual Desire Inventory, Aging Male Symptoms Scale) were selected to make up the libido questionnaire, which was reviewed by a fertility specialist to ensure content validity. Total libido score (TLS) was calculated as the sum score of these questionnaire items. TLS was categorized into high, normal, and low libido categories. A between-groups ANOVA was performed to examine the number of completed marathons (1, 2, 3, 4, 5, >5) and TLS.

**RESULTS:** Individuals who completed >5 marathons had a significantly lower TLS (p<0.05; Mean difference [CI], -10.0% [-5.8, -14.2%]) than those who completed 1 marathon. In addition, a cross-tab analysis showed that 30 of the 41 individuals (73.2%) who were in the low TLS category had completed > 5 marathons.

**CONCLUSION:** Findings suggest the EET necessary for performing multiple marathons may be a factor contributing to lower libido in endurance trained men.

3373 Board #278 June 2 3:30 PM - 5:00 PM  
**Lactate Response During High Frequency Pitching Among Baseball Players**  
 Ching-Yu Tseng<sup>1</sup>, Sun-Chin Yang<sup>2</sup>, Chia-Chi Wang<sup>3</sup>. <sup>1</sup>*Fu Jen Catholic University, New Taipei City, Taiwan.* <sup>2</sup>*Shih Hsin University, Taipei, Taiwan.* <sup>3</sup>*Shih-Hsin University, Taipei, Taiwan.* (Sponsor: Kuo, Chia-Hua, FACSM)  
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**PURPOSE:** To determine lactate and glucose responses during a high frequency pitching in adult pitchers.

**METHODS:** Seven pitchers voluntarily participated in this randomized counter-balanced trials. Each pitcher threw 15 fastballs per inning at their best effort for 7 innings. Rest interval trials were 8, 12, and 20 sec between pitches. Blood lactate and glucose concentrations were measured at the end of each inning.

**RESULTS:** Plasma lactate and glucose levels remained stable over the course of 7 innings during the 20-sec trial. Significant increases in lactate occurred only during the 8-sec trial at the end of 6<sup>th</sup> and 7<sup>th</sup> innings. Increases in glucose among pitchers were modest, and no significant difference among trials was observed.

**CONCLUSIONS:** The increased lactate response during the high frequency throwing (8-sec pace) trial may be associated with greater motor unit recruitment of throwing muscle than the low frequency trials (12-sec and 20-sec trials).

3374 Board #279 June 2 3:30 PM - 5:00 PM  
**Knee Isokinetic Strength And Fat Free Mass Correlate To Anaerobic Output Among Air Force Operators**  
 Meleesa Wohleber<sup>1</sup>, Andrew Simonson<sup>1</sup>, Mita Lovalekar<sup>1</sup>, Deirdre Rafferty<sup>2</sup>, Timothy Sell<sup>3</sup>, Andrew Reinert<sup>4</sup>, Christopher Connaboy<sup>1</sup>. <sup>1</sup>*University of Pittsburgh, Pittsburgh, PA.* <sup>2</sup>*University of Colorado, Aurora, CO.* <sup>3</sup>*Duke University, Durham, NC.* <sup>4</sup>*University of Montana, Missoula, MT.*  
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Air Force Special Tactics (ST) Operators have unique tactical demands requiring optimal body composition, strength, and anaerobic energy to perform operationally relevant tasks, i.e. casualty carry or sprints between cover positions. Identified modifiable injury risk factors such as body composition and strength could affect anaerobic performance. **PURPOSE:** To determine relationships of fat free mass and knee isokinetic strength to anaerobic power and capacity in ST Operators.

**METHODS:** A total of 158 ST Operators (Age = 27.57 ± 4.95yrs, Height=177.60 ± 5.92cm, Mass=84.23 ± 8.33kg) participated. Subjects underwent right and left knee flexion (RKF, LKF) and extension (RKE, LKE) strength testing using an isokinetic dynamometer. A BodPod measured fat mass (FM) and fat free mass (FFM). A Wingate testing protocol for anaerobic power (PAnP) and capacity (MANP) was conducted using the Veletron. The variables included RKF, LKF, RKE, LKE (average peak force), FM, FFM, PAnP and MANP. Non-parametric statistical analysis was utilized with Spearman's rho significance set at p < 0.05 *a priori*.

**RESULTS:** Pairwise correlations were statistically significant for RKF and PAnP/MANP (r=0.449, p=0.001/r=0.454, p=0.001), LKF and PAnP/MANP (r=0.515, p=0.001/r=0.503, p=0.001), RKE and PAnP/MANP (r=0.511, p=0.001/r=0.443, p=0.001), LKE and PAnP/MANP (r=0.525, p=0.001/r=0.419, p=0.001), FFM and PAnP/MANP (r=0.731, p=0.001/r=0.803, p=0.001).

**CONCLUSIONS:** Air Force ST Operators' isokinetic knee strength and FFM significantly correlated to anaerobic power and capacity. Additional muscle fiber recruitment availability and increased torque generation at the knee could explain these anaerobic output relationships. Optimizing anaerobic pathways could improve Operator tasks requiring short bouts of energy and movements needing power. Knee strengthening and gaining lean mass while decreasing fat mass could reduce injury risk for the Operator. Human performance programming addressing knee strength, body composition, and anaerobic power could positively affect tactical readiness. Opinions, interpretations, conclusions, and recommendations are those of the author and not necessarily endorsed by the Department of Defense, US Air Force, or US Air Force Special Operations Command. Supported by AFMC/AFRL FA86501226271

3375 Board #280 June 2 3:30 PM - 5:00 PM  
**Effects Of Gaelic Football Match Play On Markers Of Muscle Damage, DOMS And Neuromuscular Performance**

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(No relationships reported)

**PURPOSE:** This study examined the alterations in circulating creatine kinase (CK) levels, leukocyte trafficking, delayed onset muscle soreness (DOMS), neuromuscular function and sprint performance in response to Gaelic football match-play.

**METHODS:** Participants (n=30, age 17.41 ± 0.78 yr, height 176.42 ± 7.13 cm, and mass 72.03 ± 6.49 kg) played a single competitive 15-a-side Gaelic Football game of 60 min duration. Blood samples were taken before the game, immediately post game (Post), 24 h post game (+24 h), 48 h post game (+48h) and 72 h post game (+72 h). Subjective muscle soreness, sprint performance and muscle power were measured Post, +24 h, +48h and +72 h. Heart rate and movement patterns were continuously measured throughout the game using telemetry and GPS tracking, respectively. Heavy to severe impacts were classified as acceleration G-forces ≥ 7 recorded via portable accelerometry.

**RESULTS:** Participants covered an average distance of 6.1 ± 1.1 km during match play. The majority (72%) of the distance involved walking and jogging. High speed and maximal running accounted for 10% of the total distance. There were a total of 155 impacts ≥ 7 G-forces. CK levels were significantly higher than baseline immediately post-game and 12h+ and returned to pregame values at +36 h. Compared to pre-match values circulating leukocytes and granulocytes were significantly higher than pre-game values post game and decreased significantly below pre-games values at +12h, +36 h and +60 h. Circulating lymphocyte numbers were significantly decreased below pre-game levels at +36 h. Compared to pre-game values, there was a significant decrease in peak force at +12 h and +60 h and a significant decrease in 5 m and 20 m sprint times at +12 h, +36 h and +60 h. Compared to pre-games values there was no changes in any of the other measured neuromuscular performance indices (flight time, jump time and jump height performance) at any time point. DOMS scores were significantly higher than pre-games values at +12h and +46 h and lower (p<0.05) than pre-game values at +60 h. There was no significant relation between impact and CK levels.

**CONCLUSIONS:** Competitive Gaelic football match results in significant changes in CK levels, DOMS, leukocyte trafficking, peak force development and 5 m and 20 m sprint performance.

3376 Board #281 June 2 3:30 PM - 5:00 PM  
**Relationships between Maximal and Rapid Velocity Characteristics of the Leg Extensors and Vertical Jump Performance**

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(No relationships reported)

Maximal voluntary contractions (MVCs) of the leg extensors on an isokinetic dynamometer have recently been used to evaluate maximum velocity (Vmax) and rate of velocity development (RVD) in young adults. It has been hypothesized that Vmax and RVD characteristics of the leg extensors may be important predictors of athletic performances for movement activities such as balance recovery and running. However, limited data exist regarding how these parameters associate with vertical jump performance. **PURPOSE:** To examine the relationships between vertical jump height and maximal and rapid velocity characteristics of the leg extensors in healthy young men. **METHODS:** Fifteen young men (mean ± SD: age = 23 ± 3 years; height = 176 ± 8 cm; mass = 80 ± 9 kg) performed three countermovement vertical jumps (CMJs) followed by two MVCs of the leg extensors using an isokinetic dynamometer programmed in isotonic mode. CMJ height was measured based on flight time during the CMJs using a jump mat. For each MVC, participants sat in an upright position and were instructed to extend the right leg as "hard and fast as possible" against a controlled resistance of 20% of the individual's isometric maximum strength. RVD was calculated as the linear slope of the velocity-time curve from the onset of velocity to the point where the velocity reached 2°-s<sup>-1</sup> below the maximum velocity. Vmax was the maximum velocity attained during the MVC. Pearson product-moment correlation coefficients (r) were used to evaluate the relationships among CMJ height and Vmax and RVD. **RESULTS:** A significant positive relationship was observed between CMJ height and RVD (r = 0.656, P = 0.008); however, no relationship was observed between CMJ height and Vmax (r = 0.487, P = 0.065). **CONCLUSION:** The present findings of a significant relationship between CMJ height and RVD of the leg extensors suggest that rapid velocity capacities of the lower extremity musculature may play an important role in vertical jump performances in young adults. Based on these findings, coaches and practitioners may consider implementing training programs aimed at increasing leg extensor RVD, which may be beneficial for improving vertical jump height and possibly overall athletic ability.

3377 Board #282 June 2 3:30 PM - 5:00 PM  
**Determining the Impact of Anthropometric Factors on Rock Climbing Performance**

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Rock climbing is an increasingly popular fitness activity; however, little information is available regarding the physical characteristics associated with climbing walls of differing difficulty. **Purpose:** The purpose of this study was to determine which anthropometric factors had the greatest affect on overall rock climbing performance using three different difficulties of rock walls. **Methods:** Fourteen recreational rock climbers participated in this study (9 males, 5 females, Age: 21.9+/-2.6y, Height: 176.8+/-11.1cm, Weight: 73.4+/-18.7kg). Prior to climbing, all participants were assessed on push-ups, sit-ups, pull-ups, vertical jump, and sit and reach performance. Participants then climbed the three different rock walls (easy = 5:6, medium = 5:8 and hard = 5:9) each wall for 10 minutes. The overall climbing performance is represented through the number of successful climbs, average distance traveled, and RPE scale. **Results:** A stepwise regression test showed BMI was significantly (p<0.001) related to average distance covered for all walls. Total number of successful accents at the easy wall were predicted by pull-ups (p<0.001) & age (p<0.05); while vertical jump (p<0.01) was the sole predictor for the medium difficulty wall; and success for the hard wall was most related to sit-and-reach scores (p<0.05). As the difficulty of climbing wall increased, so did the average RPE. The remaining anthropometric factors showed little predictive capacity. **Conclusion:** Lower BMI, leg strength, and flexibility are key anthropometric factors in overall rock climbing performance; however, quality of climbing experience may also play an equally critical role based on the level of difficulty of the wall.

3378 Board #283 June 2 3:30 PM - 5:00 PM  
**Comparing Balance and Power to Baseball Throwing Velocity in Collegiate Baseball Pitchers**

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(No relationships reported)

In baseball, one game or a season can depend greatly on the pitcher's performance. A pitcher's success can be greatly affected by velocity and their ability to maintain that velocity throughout the game. A better understanding of what physical attributes and training protocols affect a pitcher's velocity would be helpful in designing training programs. **PURPOSE:** To examine variables that may potentially impact baseball throwing velocity (BTV). **METHODS:** 12 Division I collegiate baseball pitchers (height=186.7±9.3 cm, weight=91.2±12.4 kg and age=20.5±2.3 years) underwent assessments for upper and lower body power and balance. Lower body power data was collected using the vertical jump test VERTEC (Jump USA, Sunnyvale, CA), and an incline 4.5 kg medicine ball chest press to measure upper body power. Balance was assessed using the BIODEX Balance System SD (Biodex, Inc, Shirley, NY) and measured in the one legged follow through position of the pitch. BTV was collected while pitcher's participated in actual games, off speed pitches were not used in this analysis and the number and type of pitches thrown varied depending upon the circumstance of the game, BTV was recorded using a Stockersport II (Applied Concepts INC, Plano TX) radar gun.

**RESULTS:** Overall power output was highly correlated to BTV (r<sup>2</sup>=0.51, p=.006) with the majority of that correlation coming from lower body power (r<sup>2</sup>=0.47, p=.01) and upper body (r<sup>2</sup>=0.33, p=.039). Body weight also correlated with BTV (r<sup>2</sup>=0.74, p=.001), neither height (r<sup>2</sup>=0.16, p=.167) or balance (r<sup>2</sup>=0.07, p=.365), anterior/posterior (r<sup>2</sup>=0.087, p=.33), and medial/lateral (r<sup>2</sup>=0.11, p=.208) correlated with BTV. Game BTV was significantly decreased when comparing innings 1-3 to innings 4-6 respectively (x=88.06 mph, x=86.57 mph; p=.039).

**CONCLUSIONS:** There is a strong correlation between power and BTV, more specifically lower body power. With no correlation between height and balance with BTV, but a strong correlation with weight. In addition, fatigue appears to negatively impact BTV. Based on these findings it appears that baseball pitchers may benefit from a conditioning program focused on lower body power to increase the velocity of their pitches. Future investigations could help establish if this type of training could also reduce the impact of fatigue on BTV in the later innings of a game.

3379 Board #284 June 2 3:30 PM - 5:00 PM

**Effects of Speed and Agility Training on Combine Performance in Young Male Athletes**

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**PURPOSE:** Examine the effects of 9 wks of speed and agility training (SAT) on combine test performance in 7 to 13-year-old male athletes.

**METHODS:** Forty-six boys (7.6 to 13.4 years; height = 152.3 ± 9.9 cm, mass = 44.5 ± 12.1 kg) participated in this study by completing 3 testing sessions: combines 1 and 2 (C1 and C2) were separated by up to 4 days for familiarization and test-reliability, while combine 3 (C3) was performed 9 wks after C2. Combine measures included vertical jump (VJ, cm), broad jump (BJ, cm), pro-agility drill (PA, s), L-cone drill (LC, s), and 40-yd sprint (S40, s) with 10- and 20-yd splits (S10 and S20, s). The SAT group (n = 23) participated in a 9-wk SAT camp with 1 session-wk<sup>-1</sup> (1.5 hr-session<sup>-1</sup>). The control (CON) group (n = 23) was age-matched, did not perform the SAT, but maintained their regular sports activities.

**RESULTS:** There was no difference in sports participation hours reported between the SAT and CON groups (p = 0.17). There were no *group × time* interactions (p ≥ 0.12), no main effects for *group* (p ≥ 0.28), but there were main effects for *time* for BJ and PA (p ≤ 0.01). There were systematic improvements in PA, LC, and S10 (p ≤ 0.01) from C1 to C2, but not VJ, BJ, S20 or S40 (p ≥ 0.06). Intraclass correlation coefficients (ICC<sub>3,1</sub>), coefficients of variation (CV, %), standard errors of measurement (SEM), and minimum detectable changes (MDC) were [test: ICC (CV, SEM, MDC)] VJ: 0.91 (8.6%, 3.4 cm, 9.5 cm); BJ: 0.89 (6.8%, 10.5 cm, 29.2 cm); PA: 0.89 (3.7%, 0.22 s, 0.61 s); LC: 0.84 (4.5%, 0.42 s, 1.18 s); S10: 0.68 (6.8%, 0.15 s, 0.42 s); S20: 0.91 (3.8%, 0.14 s, 0.40 s); S40: 0.72 (7.7%, 0.52 s, 1.44 s). Over the 9 wks, 1 boy exceeded the MDC for BJ and LC; 5 exceeded MDC for S10; and 3 exceeded MDC for S20. Seventeen boys exceeded the SEM for VJ; 16 exceeded the SEM for BJ; 11 exceeded the SEM for PA; 12 exceeded the SEM for LC; 15 exceeded the SEM for S10 and S20; 2 exceeded the SEM for S40.

**CONCLUSIONS:** The SAT (1 session-wk<sup>-1</sup>; 9 wks) did not enhance combine performance beyond normal sports participation in young male athletes. Sensitivity, as evaluated by reliability and boys exceeding the MDC (and SEM) after a familiarization session and the 9-wk intervention period, was greatest for the VJ, BJ, PA, LC, S10, and S20 tests. Future studies aiming to examine combine performance enhancement training in youth athletes may consider using these tests.

**F-63 Free Communication/Poster - Physical Activity and Health in Youth**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3380 Board #285 June 2 2:00 PM - 3:30 PM

**A Comparison of Infant Physical Activity in Daycare vs Homecare Environments**

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The impact a childcare environment has on a child's cognitive and behavioral development has been widely studied. Differences have been found between children primarily cared for at home by a stay-at-home parent (homecare) compared to a child who attends full-time daycare. Positive findings can be found in both environments with homecare children potentially showing less aggressive and impulsive behaviors and daycare children achieving cognitive development milestones earlier. However, little work has assessed a child's, particularly an infant's (<12 months old) physical development (i.e., physical activity level) in both environments. **PURPOSE:** To compare the level of infant physical activity in homecare vs daycare environments. **METHODS:** Twelve homecare infants (age = 6.5 ± 0.5 month, weight = 8.20 ± 1.17 kg and length = 66.54 ± 2.66 cm) and fourteen daycare infants (age = 6.5 ± 0.5 month, weight = 8.71 ± 1.34 kg, and length = 68.94 ± 3.02 cm) were recruited to participate in the study. Infant physical activity was assessed using Actigraph GT9X Link accelerometers. Infants wore two accelerometers, left wrist and ankle, for two consecutive weekdays. Accelerometer data from typical daycare hours from 8 am to 5 pm were only utilized for the data analyses. Two-day total (i.e., 18 hours) ankle and wrist vector magnitude counts (VMC) were used as the physical activity indicator.

Statistical analyses were performed using independent sample t-tests for homecare and daycare infants. **RESULTS:** Homecare infants had significantly lower VMC ( $t(24) = -1.20, p = 0.036$ ) at the wrist (VMC=1689546.13) compared to daycare infants (VMC=2091775.09). However, there was not a significant difference in physical activity at the ankle ( $t(24) = -0.542, p = 0.800$ ) between homecare infants (VMC=1300498.16) and daycare infants (VMC=1438831.43). **CONCLUSION:** Daycare infants appear to be achieving more physical activity than homecare infants. Further research studies are needed to understand this variation and to determine why infants may be achieving more physical activity in the daycare environment. Future research should consider utilizing larger sample sizes as well as assessing variables such as infant to caregiver interaction and the type of infant play.

3381 Board #286 June 2 2:00 PM - 3:30 PM

**Construct Validity And Test-retest Reliability Of The International Fitness Scale (ifis) In Colombian Children And Adolescents Aged 9-17.9 Years: The Fuprecol Study**

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**PURPOSE:** There is a lack of instruments and studies in Spanish for evaluating physical fitness, and this hampers establishing the current status of this important health indicator regarding the Latin population, especially in Colombia. The aim of the study was two-fold: to examine the validity of the International Fitness Scale (IFIS) on a population-based sample of schoolchildren from Bogota, Colombia; and to examine the reliability of the IFIS in children and adolescents from Engativa, Colombia.

**METHODS:** Participants comprised 1,875 Colombian youths (56.2% girls) aged 9 to 17.9 years old. We measured adiposity markers (percentage of body fat, waist-to-height ratio, skinfold thicknesses and body mass index), blood pressure, lipids profile, fasting glucose, and physical fitness levels (self-reported and measured). A validated cardiometabolic risk index score was also used. An age- and sex-matched sample of 229 schoolchildren, originally not included in the study sample, fulfilled the IFIS twice for reliability purposes.

**RESULTS:** Our data suggest that both measured and self-reported overall fitness levels were associated inversely with percentage of body fat indicators and a cardiometabolic risk index score. Overall, schoolchildren who self-reported "good" and "very good" fitness had better measured fitness levels than those who reported "very poor" and "poor" fitness (all p<0.001). Test-retest reliability of IFIS items was also good, with an average weighted kappa of 0.811.

**CONCLUSIONS:** Our findings suggest that self-reported fitness, as assessed by the IFIS, is a valid, reliable, and health-related measure, and it can be a good alternative for future use in large studies with Latin schoolchildren from Colombia.

3382 Board #287 June 2 2:00 PM - 3:30 PM

**The Continuous Metabolic Syndrome Score, Physical Activity, and Inflammation in Adolescents**

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Recent reports suggest that metabolic syndrome (MetS) may emerge as early as childhood or adolescence, but no universal definition of MetS is available for these age groups. Continuous metabolic syndrome (cMetS) scores—standardized-normalized z scores based on the 5 components of MetS—take into account the severity of a single risk factor, and subclinical values. This composite score may more appropriately distinguish cardiovascular risk when compared to the traditional dichotomous outcome. **PURPOSE:** To investigate the use of cMetS scoring in a sample of adolescents, and determine associations with physical activity (PA) and inflammation. **METHODS:** As part of a larger study, a subset of 16 y.o. (N=107; 57% female; 68% Caucasian) completed a blood draw, anthropometric (BMI, waist circumference (WC)), and blood pressure measurements. Self-reported PA was assessed using the Godin Leisure-Time Exercise Questionnaire. Blood was analyzed for metabolic and immune markers; glucose, triglycerides (TG), c-reactive protein (CRP), and HDL were used in the present analyses. The cMetS score was calculated as the sum of the z scores based on sample means and standard deviations of each of the 5 factors that make

up MetS (glucose, TG, HDL-inverse, WC and mean arterial pressure). Correlations were performed to assess associations between cMetS, individual MetS components, PA, BMI and CRP. **RESULTS:** Consistent with previous findings, MetS was low in our sample (6/107). Of the 45 participants with the highest cMetS scores, 44 did not achieve clinical MetS criteria. Neither total nor strenuous PA were associated with cMetS, however PA was correlated with WC ( $r = -0.49$ ,  $p < 0.001$ ). Higher levels of CRP ( $r = 0.38$ ,  $p < 0.001$ ) and increased concurrent BMI ( $r = 0.534$ ,  $p < 0.001$ ) were associated with higher cMetS scores. **CONCLUSION:** In populations where clinical MetS is low, cMetS may provide increased resolution and reflect a more global assessment of cardiovascular risk. This is supported in our findings, which show that cMetS scores were not necessarily indicative of the number of clinical MetS risk factors in adolescents. Since cMetS is unrelated to self-reported PA, future work should attempt to identify whether associations exist with other health behaviors or objective PA measures.

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3383 Board #288 June 2 2:00 PM - 3:30 PM  
**Physical Activity, Body Mass Index And Cardio-Metabolic Risk In U.S. Adolescents**

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**PURPOSE:** Examine clustered metabolic risk (cMetS) score in adolescents classified as not overweight/active (NOA), not overweight/not active (NONA), overweight/active (OA), and overweight/not active (ONA). **METHODS:** Sample (n=875) included adolescent (12-17 years) participants in the 2007-2012 National Health and Nutrition Examination Survey. The cMetS score included triglycerides, high-density lipoprotein cholesterol, fasting blood glucose, and mean arterial pressure. Age- and sex- specific body mass index percentiles were utilized. Activity data included self-reported frequency of moderate-to-vigorous physical activity (PA). Adolescents reporting  $\geq 60$ min/d of PA were considered "active". A six-year fasting sample weight was applied to the analyses. Findings were adjusted for age, sex, and race/ethnicity. **RESULTS:** The cMetS scores were significantly ( $p < 0.05$ ) higher in OA and ONA adolescents when compared to NOA ( $\beta = 1.08$  and  $\beta = 1.57$ , respectively). In ONA males, cMetS was significantly ( $p < 0.01$ ) higher when compared to NOA males. In OA and ONA females, cMetS scores were significantly higher ( $p < 0.05$  for both). **CONCLUSIONS:** The cMetS scores were higher in OA and ONA adolescents when compared to NOA.

3384 Board #289 June 2 2:00 PM - 3:30 PM  
**Muscular Strength And Endurance And Cardio-metabolic Health In Low-income Hispanic Children**

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 (No relationships reported)

The predictive relationship between muscular strength and endurance and cardio-metabolic health, independent of aerobic fitness, is not clear in disadvantaged Hispanic children. **PURPOSE:** The purpose of this study was to examine the predictive relationship between muscular strength and endurance and clustered cardio-metabolic risk, controlling for aerobic fitness, in Hispanic children from low-income schools. **METHODS:** Participants were 320 Hispanic children (Mean age =  $10.1 \pm 1.1$  years; 164 girls, 156 boys) recruited during the 2014-2015 and 2015-2016 academic years from five low-income schools from the state of Utah in the U.S. Muscular strength and endurance was assessed using the push-up and curl-up tests and estimated  $\text{VO}_2$  peak was calculated from the Progressive Aerobic Cardiovascular Endurance Run. A clustered metabolic syndrome composite score (MetS) was calculated from cardio-metabolic health measurements consisting of HDL cholesterol, triglycerides, waist circumference, blood glucose, and mean arterial pressure (MAP). Multi-level general linear mixed effects models were used to examine the predictive relationship between muscular strength and endurance and MetS, controlling for the effect of aerobic fitness and the clustering of children within classrooms and schools. **RESULTS:** Children who were in the middle and upper tertiles for muscular strength and endurance associated with a lower (more favorable) MetS score (middle tertile:  $\beta = -2.59$ , 95% C.I. [-4.23, -0.95],  $p < 0.05$ ; upper tertile:  $\beta = -1.57$ , 95% C.I. [-3.20, -0.16],  $p < 0.05$ ). **CONCLUSION:** The results suggest that higher levels of muscular strength and endurance have a protective effect on cardio-metabolic risk, independent of aerobic fitness, in Hispanic children from low-income schools.

3385 Board #290 June 2 2:00 PM - 3:30 PM  
**The Association Between Physical Activity And Health Risk Behaviors in Brazilian Adolescents**

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Adolescence is a critical period where major physical and psychologic changes occur. It is also a period where several lifelong health related behaviors are adopted and established. Behaviors such as unhealthy eating, tobacco use, alcohol use, and physical inactivity are related to major causes of morbidity and mortality among young and adults. Physical activity (PA) is an important behavior during adolescence not only because it is associated with general health, but also because it may be associated with other health-related risk behaviors.

**PURPOSE:** To examine the association of physical activity with health risk behaviors in adolescents from Curitiba- Brazil.

**METHODS:** A cross-section study was carried out with a representative sample of 928 (mean age  $14.06 \pm 1.91$  years old, 467 girls) adolescents enrolled in 14 randomly selected public schools from Curitiba, Brazil. The Brazilian version of the Youth Activity Profile survey evaluated PA levels and the YRBS survey evaluated fruit, vegetable, alcohol, and tobacco consumption in the past 30 days. The Adolescent Sedentary Questionnaire evaluated total screen time. Binary Logistic regression measured the association between PA levels and risk behaviors after controlling for gender, age, BMI status, income status, and parent educational level.

**RESULTS:** PA was inversely associated with low fruit consumption (OR = .50, 95% IC = .38 - .66,  $p < 0.001$ ), low vegetable consumption (OR = .55, 95% IC = .42 - .73,  $p < .001$ ), and high screen Time ( $\geq 3$  hours/day) (OR = .79, 95% IC = .65 - .96,  $p < .001$ ). Additionally, PA was positively associated with the consumption of at least one dose of alcohol in the past 30 days (OR = 1.47, 95% IC = 1.15 - 1.88,  $p < .001$ ), and with the excessive consumption of alcohol (OR = 1.73, 95% IC = 1.29 - 2.33,  $p < 0.001$ ). PA was not associated with Tobacco consumption (OR = 1.01, 95% IC = .67 - 1.52,  $p = .96$ ). **CONCLUSION:** The results indicated that adolescents with higher PA levels consumed more fruits and vegetables and spent less time in front of electronic screens. However, adolescents with higher levels of PA were also more likely to report alcohol consumption in the past 30 days. The social characteristics of alcohol consumption may explain its positive relationship to PA.

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3386 Board #291 June 2 2:00 PM - 3:30 PM  
**Understanding the Relations between Physical Activity and Obesity among Chinese Children and Adolescents**

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**Purpose:** The purpose of this study was to examine the relations between self-reported physical activity and obesity among children and adolescents in China.

**Methods:** The participants are 18424 students (51.9% boys, 49.1% girls) aged 8-18 years old in grades 3 to 12 from six provinces in China. They were divided into three groups by age: 8-12, 13-15, and 16-18. Physical activity level (PAL) was measured by Physical Activity Questionnaire for Children and Adolescents in Chinese (PAQ; Chen, 2008; Li, 2015; Jing, 2016). The summary scores of the PAQ were classified into three PAL categories "low (PAQ $\leq 2$ ), medium (2<PAQ $\leq 3$ ), and high (PAQ >3)". In addition, physical fitness including high and weight were measured according to national standards of physical fitness during physical education classes. Weight status was classified into four categories "malnutrition, normal, overweight and obese" using BMI cut-points. Descriptive analysis, independent t-tests, ANOVA and Chi-square were used in the study.

**Results:** The distribution of PAL decreased for girls with age and the PAL of boys was significantly higher than girls in all three groups ( $t = 9.12$ ,  $t = 18.91$ ,  $t = 16.72$ ,  $p < 0.01$ ). The percentage of PAL of girls in the low category dramatically increased from 15 years (47%) to 18 years (66%). Significant differences in PAL were found across obesity classifications (for 8-12,  $f_{boys} = 12.39$ ,  $f_{girls} = 6.86$ ; for 13-15,  $f_{boys} = 11.88$ ; for 16-18,  $f_{boys} = 7.66$ ,  $f_{girls} = 6.69$ ,  $p < 0.001$ ) except girls aged 13-15 years ( $F = 1.42$ ,  $p > 0.05$ ). Furthermore, the distribution of PAL in obesity classifications presents like a "U" that shows values of PAL were higher in the classifications of malnutrition and obesity than values in normal and overweight. Obesity status was significantly related to PAL (for 8-12,  $\chi^2_{boys} = 34.86$ ,  $\chi^2_{girls} = 28.07$ ; for 13-15,  $\chi^2_{boys} = 27.80$ ; for 16-18,  $\chi^2_{boys} = 21.56$ ,  $\chi^2_{girls} = 29.04$ ,  $p < 0.01$ ), but not girls aged 13-15 ( $\chi^2 = 5.81$ ,  $p > 0.05$ ).

**Conclusions:** PAL was significantly related to weight status in Chinese children and adolescents. Boys demonstrated higher levels of PA across all age groups. Girls demonstrated a 19% decrease in PAL across 15 to 18 years of age.

3387 Board #292 June 2 2:00 PM - 3:30 PM  
**The Correlations Between Types of Families and Physical Activity Levels of Adolescents in Shanghai, China**  
 Fan Xiang<sup>1</sup>, Zhu Zheng<sup>2</sup>, Zhuang Jie<sup>2</sup>, Liu Yang<sup>2</sup>, Tang Yan<sup>2</sup>, Chen Pei jie<sup>2</sup>, Cao Zhen bo<sup>2</sup>. <sup>1</sup>Shanghai Jiao Tong University, Shanghai, China. <sup>2</sup>Shanghai University of Sport, Shanghai, China. (Sponsor: Mitsuru Higuchi, FACSM)  
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Previous studies have indicated that families can influence adolescents' physical activity. The fifth census in China (2010) showed that 65.3% of the families in China are nuclear, but few studies have explored the association between the various types of families and the physical activity (PA) levels of adolescents in China using a large sample survey.

**PURPOSE:** To determine the correlations between types of families and the PA levels of adolescents aged 9-19 years while accounting for background demographic factors, such as age, gender, and socioeconomic status, in Shanghai, China.

**METHODS:** In 2014, 9-11-year-old ( $N=13,237$ ), 12-14-year-old ( $N=11,157$ ), and 15-19-year-old ( $N=8,819$ ) adolescents and their guardians were randomly sampled from 17 districts in Shanghai, China. The adolescents' moderate-to-vigorous physical activity (MVPA) levels, information about the type of family, and the guardians' sociodemographic factors were collected via a questionnaire completed by the adolescents and guardians.

**RESULTS:** Analysis of covariance revealed that, after controlling for socioeconomic status and the age of the adolescents, 9-11-year-old boys from two-parent families spent more minutes per week in MVPA ( $297.4 \pm 120.4$ ) than those who live with their grandparents ( $286.9 \pm 120.1$ ) and those from single-parent families ( $284.6 \pm 129.4$ ,  $P < 0.05$ ). Regarding the girls aged 12-14 years, those who live with their grandparents spent more minutes per week in MVPA ( $274.4 \pm 105.7$ ) than those from two-parent families ( $271.9 \pm 105.1$ ) or single-parent families ( $257.3 \pm 107.0$ ,  $P < 0.05$ ). Regarding the adolescents aged 15-19 years, we did not find significant differences between the boys and girls. Logistic regression analysis showed that 9-11-year-old adolescents those who live with their grandparents had 28% for boys (OR 0.72, 95% CI 0.61-0.84) and 16% for girls (OR 0.84, 95% CI 0.72-0.98) decreased odds of did not reach the recommended level ( $\geq 60$ min/day MVPA), respectively, compared with those who from single-parent families. **CONCLUSION:** Being from a single-parent family and living with grandparents are two important factors that influence adolescents' MVPA levels in Shanghai, China.

3388 Board #293 June 2 2:00 PM - 3:30 PM  
**Self-Reported Physical Activity of High School Students in Southern Maine**  
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Knowledge of high school students' physical activity (PA) can assist in identifying areas of programmatic need within physical education (PE) and for out of school programs. **PURPOSE:** The purpose of this study was to assess the PA levels and patterns of high school students in southern Maine. **METHODS:** Participants were 142 students (86 females, 56 males) from 4 high schools in southern Maine (one urban, one suburban, two rural). Mean age was 14.9 years with 87% of the sample in grade 9. The validated Physical Activity Questionnaire for Adolescents (PAQA) was used in this study to assess PA. The PAQA asks participants to recall their PA during the previous 7 days. Surveys were administered to students enrolled in PE and were part of a larger study examining attitudes toward PA and PE. **RESULTS:** Mean overall score for the PAQA was  $2.62 \pm 0.60$  (1=low PA, 5=high PA), with a range of 1.18 to 4.29. Males were slightly more active than females overall ( $2.75 \pm 0.72$  vs  $2.53 \pm 0.66$ ,  $p = 0.068$ ) and reported more PA during evenings ( $2.96 \pm 1.37$  vs  $2.50 \pm 1.29$ ,  $p = 0.044$ ) and the weekend ( $2.70 \pm 1.08$  vs  $2.32 \pm 1.00$ ,  $p = 0.036$ ). Students in urban ( $3.98 \pm 0.81$ ) and suburban schools ( $4.30 \pm 0.76$ ) reported significantly greater activity in PE classes than rural students ( $3.54 \pm 0.86$ ) ( $p < 0.05$ ) while students in rural schools ( $1.65 \pm 1.23$ ) reported greater activity during lunch than urban ( $1.23 \pm 0.43$ ) and suburban students ( $1.12 \pm 0.39$ ) ( $p < 0.05$ ). Jogging, walking, basketball, and soccer were the most cited activities overall. Females preferred walking, jogging, dance and skipping rope while males preferred jogging, basketball, walking and soccer. Overall, 10% reported daily activity while 14% reported no activity. In PE, 73% reported doing vigorous activity quite often. At lunch, 80% reported sitting. After school, 46% were very active while 28% reported no activity. During evenings, 29% reported being very active while 29%

reported no activity. Over the weekend, 52% reported being very active 2 or more times, with 21% reporting no activity. **CONCLUSIONS:** These findings provide information on high school students' PA from a sample of southern Maine schools. In addition to PA levels and patterns, knowledge of student preferences for PA would help in PA program development both in PE and for out of school programs.

3389 Board #294 June 2 2:00 PM - 3:30 PM  
**ICT USE Influence on Activity Pattern & Body Composition Of University Students In Kwara State**  
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The use of ICT is a prominent aspect of students' lifestyle in tertiary institutions. ICT creates efficiency in performing tasks but encourages sedentariness, alters body composition and may affect health. **PURPOSE:** To determine influence of ICT use on physical activity pattern and body composition of tertiary institution students. **METHODS:** The study design was Ex-post facto. Multistage sampling was used to select 2,442 students with mean age 22.8 years from three tertiary institutions in Kwara state, Nigeria. Body composition was determined using height scale, body fat/hydration monitor scale (brand number 7032497) and two birds non-elastic tape rule. Validated ICT Use and Physical Activity Questionnaire (IUPAQ) (Rho of .71) was used to assess level of ICT use and physical activity pattern. Approved Ethical Clearance from University of Ilorin and informed consent were duly obtained. Inclusion criteria were penultimate and final year students. Percentage, Mean, and Standard Deviation described the data. Hypotheses were tested at 0.05 alpha level using PPMC, ANOVA and Multiple Regression. **RESULTS:** Many of the students did not perform the recommended physical activity ( $n = 1,065$ ; 43.6%) and their physical activity pattern was sedentary-based (14 hours per day). Average ICT time per day was 9 hours (65%) of which mobile phone time was 4 hours (25%). Strong positive relationship existed between ICT use and sedentariness  $r = .84$ ,  $p = .001$ ; physical activity pattern and ICT use  $p = .001$ ,  $r^2 = 15\%$ ; and ICT use and body composition  $p = .001$ . Sedentariness was the highest predictor of excessive ICT use  $Beta = .120$ ,  $p = .001$  & BMI predictor of risk factor  $Beta = .156$ . However, light to vigorous intensity physical activity levels indicated low predictive ability of ICT use  $p > .05$ ; Significant difference in the level of ICT use based on age range,  $p = .001$  and type of institution of participants  $p = .001$  existed. **CONCLUSION:** Prolonged ICT use causes sedentariness and alters body composition with BMI as the highest predictor of risk. This study advocates for institutional physical activity awareness for regulated ICT use campaign.

3390 Board #295 June 2 2:00 PM - 3:30 PM  
**Physical Activity, Sedentary Time and Cardiorespiratory Fitness in Brazilian Children**  
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**PROPOSE:** to evaluate physical activity (PA), time expended in sedentary activities and cardiorespiratory fitness (CF) in boys and girls before and after 3 months of regular school.

**METHODS:** children were evaluated at school after summer vacation and 3 months after regular classes. Weight (kg), height (m), maturational stage was evaluated. CF was evaluated by determining the maximum volume of oxygen during the Test Come and Go 20 meters by Léger. In addition, a questionnaire about PA and screen time during 3 days (3-DPAR instrument) was applied. Data are expressed as average and standard deviation. T Student and Wilcoxon tests were applied to estimate the difference between averages. Level of significance of 5 % was adopted. **RESULTS:** 319 students were included, 146 boys (age  $13.6 \pm 1.2$  yrs) and 173 girls (age  $13.6 \pm 0.9$  yrs). For girls, first  $VO_{2max}$  was  $43.5 \text{ ml/kg/min}$  and second was  $48.3 \text{ ml/kg/min}$  ( $p < 0.002$ ). For boys, respective numbers were  $45.8 \text{ ml/kg/min}$  and  $49.8 \text{ ml/kg/min}$  ( $p > 0.05$ ). No significant difference was found among boys and girls. No difference was found for PA  $> 300$  min/week between the two evaluations and among boys and girls. In time spent with sports, only girls increased significantly from the first to the second assessment ( $p < 0.001$ ). Boys spent more time in sedentary activities (TV, computer and video game) and increased this time between initial evaluation and re-evaluation ( $p < 0.001$ ). **CONCLUSION:** Girls became more active after school start, with increment of  $VO_{2max}$  and less time in sedentary activities.

3391 Board #296 June 2 2:00 PM - 3:30 PM  
**Daily Musculoskeletal Pain Affects Health And Sports Performance Negatively In Youth Athletes**

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In sports, musculoskeletal pain (MSP) is often studied from the perspective of sport specific injuries, why little is known about the prevalence of daily or multisite MSP that does not affect participation in sports. It is also unclear if daily or multisite MSP is a risk factor for worse health-related quality of life (HRQoL) and worse sports performance in youth athletes.

**PURPOSE:** To study how HRQoL and sports performance is affected by daily MSP in youth athletes that are able to participate in sports.

**METHODS:** 136 Swedish youth athletes attending a sport school (13 to 14 years, boys n=83, girls n=53) completed the EQ-5D measuring HRQoL (range 0 to 1, worst to best), a pain questionnaire including current pain (yes/no), pain in 18 body regions (never to rarely/monthly to weekly/more than once a week to almost daily), and pain intensity in the last week (0 to 10, best to worst), anthropometric measures to estimate biological age, and sports performance tests (grip strength, 20 meter sprint, and countermovement jump(CMJ)).

**RESULTS:** 109 to 117 of the 136 students answered the different pain questions. 53 of 113 (47%) reported current MSP, and 28 of 109 (26%) experienced MSP 'more than once a week to almost daily' from one or more body regions (frequent MSP group), while 28% (n=30) stated 'never to rarely' in MSP (no MSP group). Boys in the frequent MSP group reported worse HRQoL, higher pain intensity, performed worse in all sports performance tests, and had a younger biological age than boys in the no MSP group. Girls in the frequent MSP group reported worse HRQoL and higher pain intensity than the girls in the no MSP group. No other differences were found (table).  
**CONCLUSIONS:** Every other youth athlete attending a sport school reported current MSP and one out of four reported almost daily MSP. MSP affects HRQoL negatively in both boys and girls, and sports performance negatively in boys. The prevalence of MSP in youth athletes is concerning since pain in younger ages may predict pain in adult ages.

3392 Board #297 June 2 2:00 PM - 3:30 PM  
**Appropriate Physical Activity on Mental Health in Early Adolescents**

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The appropriate intensities, amount and details of physical activity (PA) for mental health (MH) have not yet been elucidated for adolescents.

**PURPOSE:** To investigate the PA factors (intensity, time, activity details [ADs]) that affect MH characteristics, such as depression tendency (DT), in early adolescence

**METHODS:** The International Physical Activity Questionnaire, including ADs and the Depression Self-Rating Scale for Children, was conducted on 6,969 children (grades 5–8) in Japan. Decision tree analysis was applied to four groups (primary- and secondary-school students for each gender) in order to investigate the effect of PA on DT. The dependent variable was the factor score of decline of fun and activity ( $F_{DFA}$ ) and depression mood ( $F_{DM}$ ). The independent variables were amount of time of vigorous-intensity PA (VPA, min/week), moderate-intensity PA (MPA, min/week), walking time (WT, min/week), sedentary behavior on the weekdays ( $SB_w$ ) and on holidays (min/day), VPA + MPA (MVPA), MVPA + WT (total MVPA), and ADs.  
**RESULTS:**

For the results of  $F_{DFA}$  excluding ADs, the first classification variable was VPA for primary-school boys (PB), total MVPA for primary-school girls (PG) and secondary-school boys (SB), and MVPA for secondary-school girls (SG). The branch points for  $F_{DFA}$  improvement were as follows: PB 4 h 40 min for VPA; PG 5 h and 12 h 45 min for total MVPA; SB 13h 30min and 21h 30min for total MVPA; SG 3h 30min and 21 h for MVPA. When ADs was included in the analysis, the results were same as those for PB and PG but significantly differed for SB and SG. ADs was the only classification variable for SG and was the second classification variable for SB; and sports activities were better than cultural activities for SB & SG.

For the results of  $F_{DM}$ , MPA contributed for PB,  $SB_w$  for PG, and WT for SG, but these branch points were not confirmed. ADs were associated with  $F_{DM}$  for SB, and sports activities were better than cultural activities.

**CONCLUSION:**

MVPA is a determinant for reduction of DT, such as  $F_{DFA}$ , in early adolescence. ADs are an important factor for secondary-school students. Recommended MVPA time is minimally 5 h/week for all early adolescents, >10 h/week for primary-school children, and >21 h/week for secondary-school students.

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3393 Board #298 June 2 2:00 PM - 3:30 PM  
**Physical Activity and Diet Behavior Patterns of U.S. Adolescent Girls with Different Weight Status**

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**Purpose:** The study was to identify the physical activity and diet behavior patterns of U.S. adolescent girls with different weight status.

**Method:** Data was derived from the 2012 National Youth Fitness Survey. A representative/weighted sample of 7,785,784 girls, aged 12-15 yr. old responded to both the physical activity and diet behavior and nutrition questionnaires. ANOVA analysis was applied to determine the difference in physical activity patterns and eating behaviors among girls with different weight status (underweight, normal weight, overweight, and obese defined by the CDC percentile classifications).

**Results:** Significant differences were detected in the physical activity and diet behaviors patterns, and the results are displayed in the table below:

	Under-weight	Normal weight	Over-weight	Obese	Total	F	p-value
Vigorous-intensity work (min)	71.54±35.33	81.72±54.62	0	0	97.86±91.52	3168.29	<.001
Moderate-intensity work (min)	32.78±15.95	58.65±45.41	60.37±36.81	51.29±9.92	57.06±47.28	22446.75	<.001
Sedentary activity (min)	530.97±132.19	506.04±154.50	522.75±125.89	489.72±156.12	508.88±150.59	8608.16	<.001
# of times/week get school lunch	3.16±2.24	3.17±2.24	3.96±1.56	4.17±1.40	3.29±2.18	45525.19	<.001
# of times/week get school breakfast	1.09±2.06	1.28±2.08	1.64±2.07	.65±1.23	1.28±2.06	15198.79	<.001
# of meals not home prepared/week	2.29±2.62	1.87±1.85	1.98±2.04	.99±1.08	1.88±1.92	31966.502	<.001
# of ready-to-eat foods in past 30 days	.27±.95	.88±2.91	1.00±2.51	1.35±1.61	.87±2.74	12704.638	<.001
# of frozen meals/pizza in past 30 days	3.23±3.85	2.61±4.06	1.86±3.00	2.42±2.67	2.57±3.91	14507.226	<.001

**Conclusion:** Overweight and obese girls tended to have less vigorous work and more ready-to-eat food.

3394 Board #299 June 2 2:00 PM - 3:30 PM  
**The Effect of Bullying on Health Behaviors in Adolescents**

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**PURPOSE:** To examine the association of bullying with physical activity, sedentary behaviors, and participation in organized sports in a sample of adolescents living in Ireland. **METHODS:** The sample consisted of 7, 314 adolescents (13 years of age; 55 % female) who were part of the Growing Up in Ireland (GUI) study, a national study that focused on a broad range of adolescents' characteristics, experiences, and development. Adolescents completed a series of questionnaires assessing whether participants had been victims of bullying, and their feelings associated with bullying (fear, isolation, and anger). Participants also reported amount of time engaging in vigorous physical activity (VPA), sedentary behaviors (SB) (watching the television, playing computer games, and playing video games), playing an organized sport (SPORTS), and the number of friends who engage in these activities with participants. Multiple regression analysis was used to examine the association of bullying with

VPA, SPORTS, and SB. Significance was set at  $\alpha \leq 0.05$ . **RESULTS:** Engaging in greater amounts of VPA was associated with lower levels of SB ( $\beta = -0.03$ ,  $p < 0.0001$ ), and a greater number of friends ( $\beta = 0.20$ ,  $p < 0.0001$ ), however, bullying did not affect participation in VPA. Increased participation in sports was associated with lower levels of SB ( $\beta = -0.02$ ,  $p < 0.0001$ ) and a greater number of friends ( $\beta = 0.09$ ,  $p < 0.0001$ ), however, participants who reported bullying were less likely to participate in sports ( $\beta = -0.12$ ,  $p < 0.002$ ). Greater time spent in SB was associated with increased anger as a result of being bullied ( $\beta = 0.64$ ,  $p = 0.03$ ). **CONCLUSION:** Greater attention should be paid to the prevention of bullying in schools. In addition to the negative psychological effects on adolescents, bullying may deter adolescents from participation in sports, and indirectly increase time spent in SB.

3395 Board #300 June 2 2:00 PM - 3:30 PM  
**The Relationship between Outdoor Time and TV Viewing Time With Children's Physical Activity At Child Care**

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Childhood obesity is a public health concern with the trajectory into adult obesity. Increasing moderate-to-vigorous physical activity (MVPA) and decreasing sedentary behavior (SB) are associated with lowered childhood obesity. Environmental factors, such as outdoor time and TV viewing time (TVVT), may contribute to MVPA and SB in preschool children. The child-care environment influences MVPA and SB, and is an area for improving activity patterns. **PURPOSE:** The purpose of this study is to determine the relationship between outdoor time and TVVT with physical activity in preschool children at the child-care center, while adjusting for classroom similarities. **METHODS:** An observational study at child-care centers was conducted during 2011-2014. Outdoor time was defined as time children spent in an outdoor play space, and TVVT was defined as time children spent watching TV. Outdoor time and TVVT were observed on two days using a digital wrist watch. Physical activity intensity and duration was measured for the entire school-day using waist-worn accelerometers. Data were recorded in 15-second epochs and analyzed with age-specific cut points to determine intensity. Dependent movement variables included minutes of SB, light physical activity (LPA), MVPA, and total steps. Hierarchical models were adjusted for weather, and used for the clustering of children within the classroom. **RESULTS:** Participants ( $n=202$ ) of 34 classrooms were  $3.7 \pm 0.7$  years old, 51% male, and 60% Caucasian. Children took  $4453 \pm 1655$  steps,  $310 \pm 83$  minutes of SB,  $36 \pm 13$  minutes of LPA and  $19 \pm 10$  minutes of MVPA. Outdoor time was observed in 87% of classrooms for  $77 \pm 65$  minutes, and TVVT was observed in 52% of classrooms for  $57 \pm 39$  minutes. In hierarchical modelling, outdoor time was associated with SB ( $p < 0.01$ ), LPA ( $p < 0.01$ ), MVPA ( $p < 0.01$ ) and steps ( $p < 0.01$ ). At the classroom level there were mixed results on the impact of outdoor time, some classrooms with higher outdoor time exhibited higher LPA, MVPA and steps, while others engaged in more SB. TVVT was only associated with MVPA ( $p < 0.01$ ), with differing directions of association at the classroom level. With higher TVVT, some classrooms showed more and others less MVPA. **CONCLUSIONS:** Investigating the differences between classrooms and the role of the teacher may help increase children's physical activity.

3396 Board #301 June 2 2:00 PM - 3:30 PM  
**Time Segment Specific Physical Activity During School Hours In Six- Nine- And 15-year-olds**

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It is recommended that youth spend  $\geq 60$  min/d in physical activity (PA) of moderate-to-vigorous intensity (MVPA). Because the vast majority of children attend school, this environment can provide an ideal arena for PA promotion and it has been argued that schools should provide opportunities to accumulate  $\geq 30$  min/d of MVPA (i.e.,  $\geq 50\%$  of recommended daily minimum). However, the current knowledge of MVPA accumulated during school is limited by small sample sizes, short duration of observation and inaccurate segmentation of periods during the school day. **Purpose:** To examine time segment specific MVPA during school hours, using accurately segmented accelerometer data collected over a full school week in a representative, population-based sample of 6-, 9-, and 15-year-olds attending a diverse sample of schools. **Methods:** We used accelerometer data (ActiGraph GT1M/ GT3X+) from a sub-sample of the PA among Norwegian Children Study. Participants attended 34 different schools (82 classes) that provided class schedules describing the exact start

and end time of the school day, recess periods and physical education (PE) classes. To classify time segment specific MVPA, we summed all 10 sec epochs within the different time segments containing  $> 333$  activity counts (vertical axis). We applied random effects linear regression models, accounting for the clustered nature of the data. **Results:** Among 6- ( $n=166$ ), 9- ( $n=296$ ) and 15-year-olds ( $n=323$ ), 57%, 35% and 9% accumulated  $\geq 30$  min of MPVA per school day, respectively. Boys accumulated significantly more MVPA than girls during school hours, recess and PE (adjusted for wear time (WT) and month,  $p \leq 0.011$ ). We found an inverse association between age and school hour MVPA ( $p < 0.001$ ), whereas the association was inverted and J-shaped with age (adjusted for WT, month and sex,  $p < 0.001$ ) for recess MVPA. We found no association between age and MVPA during PE ( $p \geq 0.154$ ). **Conclusion:** Low proportions of 6-, 9- and 15-year-olds accumulated  $\geq 30$  min of MVPA during school hours, and girls accumulated less MVPA than boys throughout the school hours in all age groups. Our results indicate that self-organised MVPA (recess), but not teacher organized MVPA (PE), declines with age. This suggest that schools should provide opportunities for structured PA during recess, especially for adolescents and girls.

3397 Board #302 June 2 2:00 PM - 3:30 PM  
**Day-to-day Reciprocal Associations Between Sleep Health, Physical Activity, And Sedentary Behavior In Adolescents**

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Physical activity (PA) has been continuously examined as one of the modifiable lifestyle factors influencing sleep health in adolescents. However, the evidence is inconclusive and scarce data are available exploring temporal, bidirectional relationships between PA, sedentary behavior (SB), and sleep health in this population. **PURPOSE:** This study examined the day-to-day reciprocal associations of objectively measured PA, SB, and sleep parameters in young adolescents. **METHODS:** 263 adolescents (135 boys) in 6th-8th grades were asked to wear the ActiGraph GT9X accelerometer on their non-dominant wrist for 24-hour across three consecutive school days while completing sleep quality survey every morning. The parents recorded daily screen time of their child. Total sleep time (TST), sleep efficiency, and sleep fragment index (SFI) were estimated using the Sadeh algorithm. The % of moderate and vigorous PA (MVPA) and SB, relative to total wear time in a day, before and after school ends (BS and AS, respectively), were estimated using the Chandler's cut points for each measurement day. Multilevel models were constructed to examine the day-to-day reciprocal associations between study variables after adjusting for the repeated measures within participants as well as study covariates. **RESULTS:** MVPA and SB on one day were significantly associated with TST on that night. The reduced TST was associated with increased MVPA-AS ( $b = -2.72$ ;  $p = .045$ ) and SB-AS ( $b = -2.62$ ;  $p < .001$ ) while an inverse relationship was observed with SB-BS ( $b = 2.20$ ;  $p < .001$ ). The increased SB-AS was associated with improved sleep efficiency ( $b = 0.16$ ;  $p = .006$ ) and SFI ( $b = -0.24$ ;  $p = .002$ ), and screen time was associated with a decreased likelihood of having good sleep quality (OR = 0.89; 95% CI = 0.82, 0.97). Meanwhile, TST on previous night was associated with SB-BS ( $b = -0.02$ ;  $p < .001$ ) on next day, and lower sleep quality was associated with decreased MVPA-BS ( $b = -0.24$ ;  $p = .042$ ), increased SB-AS ( $b = 1.62$ ;  $p = .022$ ) and screen time ( $b = 14.54$ ;  $p = .049$ ) on next day, respectively. **CONCLUSIONS:** The current study suggests that, in general, a good perceived sleep quality on the previous night can potentially promote PA and reduce SB on next day. However, the temporal effects of PA and SB on sleep health are still inconclusive that warrants future study.

3398 Board #303 June 2 2:00 PM - 3:30 PM  
**Recess, Regular Physical Activity Outside Of School And Academic Achievement In U.S. Elementary School Students**

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 (No relationships reported)

Physical activity (PA) in general, but also time for recess, has declined in recent decades among children in the U.S. Carlson et al (2008) found small beneficial effects of time spent in physical education on math and reading scores but did not include recess or other PA measures. **PURPOSE:** To assess the association between recess, regular PA outside of school, and math scores in U.S. elementary school students. **METHODS:** We used the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K) for this analysis. Students in the ECLS-K cohort were followed from Kindergarten (KG) through 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 8<sup>th</sup> grade; but here only data from full-time KG, 3<sup>rd</sup> and 5<sup>th</sup> grade was used (N=1036). Mixed models with random effects were estimated to account for clustering by schools and repeated measures by students.

**RESULTS:** We confirmed the decline of recess over time; however, the majority students in KG, 3<sup>rd</sup> and 5<sup>th</sup> grade had daily recess. In the unadjusted models, we found significantly higher math scores in 5<sup>th</sup> grade among students with more than average ( $\beta=4.3$ ), average ( $\beta=4.1$ ) and below average ( $\beta=4.4$ ) time for recess compared to students with no recess (all  $p<0.001$ ). The effect of recess in 3<sup>rd</sup> grade was similar but less strong. Additionally, regular PA/exercise outside of school resulted in significantly higher math scores in 3<sup>rd</sup> grade students ( $\beta=4.9$ ) and 5<sup>th</sup> grade students ( $\beta=3.3$ ) compared to children without regular exercise (all  $p<0.001$ ). However, once we adjust for race, parental education and gender, the majority of effects of recess on math scores did not remain significant. Only students with a low amount of recess compared to no recess in 5<sup>th</sup> grade had significantly higher math scores ( $\beta=2.1$ ,  $p=0.03$ ). Also, regular exercise outside of school was positively associated with math scores in 3<sup>rd</sup> grade ( $\beta=2.5$ ,  $p=0.001$ ).

**CONCLUSIONS:** Academic achievement is related to future health since school outcomes are highly correlated with future socio-economic status which itself is correlated with health status in adults. We conclude that - compared to race and SES - recess and regular PA seem to be beneficial but of lower importance for academic achievement. Nonetheless, both PA measures are modifiable factors and thus can potentially play a vital role in both health promotion and improved school outcomes.

3399 Board #304 June 2 2:00 PM - 3:30 PM  
**Tracking Of Clustered Metabolic Syndrome Risk Factor In Japanese Children**

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(No relationships reported)

**PURPOSE:** Longitudinal studies about "tracking" of metabolic syndrome (MetS) risks are limited in Asian children. It is also unclear whether fitness and/or fatness level are contribute the tracking of MetS risk. The purpose of this study was to investigate tracking clustered metabolic syndrome (MetS) risk taking into account of fatness and aerobic fitness from childhood to adolescence in Japanese children.

**METHODS:** This cohort study included 113 participants (47 boys and 66 girls) who were measured for MetS risk factors at 9 years and 12 years of age. This study was performed in Ibara city of Okayama prefecture in Japan. All participating children and their parents provided written informed consent before participation. MetS risk scores were calculated from the total sex-specific values (z-scores) of the following five parameters: waist to height ratio, predicted  $\dot{V}O_{2peak}$ , triglycerides, high density lipoprotein cholesterol, and mean arterial pressure. All measurements were investigated at baseline (September, 2008) and follow-up (September, 2011). Partial correlation coefficients were calculated to determine the tracking of MetS risk variables and clustered MetS risk score from childhood to adolescents. A correlation ranging from 0.00 to 0.29 indicates low relationship, a correlation from 0.30 to 0.59 indicates a moderate relationship, and a correlation from 0.60 to 1.00 indicates a high relationship.

**RESULTS:** Sex-adjusted partial correlation coefficients were higher for HDL-c ( $r=0.804$ ,  $p<0.001$ ), W/H ( $r=0.753$ ,  $p<0.001$ ) and  $\dot{V}O_{2peak}$  ( $r=0.715$ ,  $p<0.001$ ). TG ( $r=0.436$ ,  $p<0.001$ ) and MAP ( $r=0.3970$ ,  $p<0.001$ ) indicated a moderate relationship. In addition, Met risk score ( $r=0.647$ ,  $p<0.001$ ) indicated a high relationship. Correlations coefficients of MetS risk score between 9 and 12 years in high W/H ( $r=0.713$ ,  $p<0.001$ ) was higher than that in low W/H ( $r=0.402$ ,  $p<0.01$ ). In addition, that in low  $\dot{V}O_{2peak}$  ( $r=0.630$ ,  $p<0.001$ ) was higher than that in high  $\dot{V}O_{2peak}$  ( $r=0.452$ ,  $p<0.01$ ).

**CONCLUSIONS:** We found that MetS risk was stable from childhood to adolescence in Asian children. Furthermore, our results show that both the fatness and fitness are crucial for tracking clustered MetS risk factors.

3400 Board #305 June 2 2:00 PM - 3:30 PM  
**The Association of FNPA Score and Nighttime Sleep with Preschooler Body Size and Adiposity**

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**Purpose:** The purpose of this study was to examine the cross-sectional associations between characteristics of preschoolers' home environment and sleep habits with body size and adiposity. **Methods:** Parents of 2-5 year-old children completed the Family Nutrition Physical Activity (FNPA) tool and Children's Sleep Habits Questionnaire (CHSQ). Child height and weight were determined according to standard procedures and BMI percentile was determined using the 2000 CDC growth charts. Adiposity was assessed using skinfold thicknesses (tricep, subscapular, suprailiac) and sum of skinfolds was calculated. **Results:** To date, 19 children (10 boys, 9 girls; mean age  $3.1 \pm 0.9$  y) have participated in the study. Boys and girls did not differ in terms of any anthropometric variables; therefore, analyses are not divided by sex. Twenty-one percent of the sample ( $n=4$ ) met criteria for overweight or obesity based on BMI percentile. Correlations between anthropometric variables and the FNPA total score did

not reach statistical significance. Nap duration tended to be inversely related to BMI percentile ( $r=-0.51$ ,  $p=0.06$ ) and z-score ( $r=-0.50$ ,  $p=0.07$ ). The FNPA total score was strongly correlated with total daily sleep ( $r=0.88$ ,  $p<0.0001$ ), indicating that children who live in generally healthy family environments are more likely to demonstrate healthy sleep habits. **Conclusion:** To our knowledge, this is the first study to use the FNPA as a measure of the family environment in a preschool-aged sample. Our results suggest that sleep characteristics may be associated with the family environment and adiposity in preschoolers; however, additional research with larger sample sizes is necessary to confirm these findings.

3401 Board #306 June 2 2:00 PM - 3:30 PM  
**Physical Activity Levels of 7th and 8th Graders During a Studio-Based Learning Experience**

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Schools are viewed as optimal settings for intervention efforts aimed at reducing childhood obesity. Identification of ways to increase physical activity throughout the school day is an important public health issue. Modest modifications to curriculum delivery or physical environment provide direct avenues to address this issue.

**PURPOSE:** The purpose of this study was to examine physical activity levels of middle school-aged students during a studio-based learning experience. The studio-based learning environment utilizes the "purpose, critique, iterate" cycle of repetitive thinking and learning that comes from the system of training used by designers across many professional fields. **METHODS:** Eleven 7th and 8th grade students who were identified as being "at-risk" for dropout were invited to participate in an educational service project aimed at developing areas of core curriculum by working on design problems in a studio-based learning environment. The studio-based learning experience was conducted between the hours of 8AM and noon (240 minutes) for two weeks in the summer. Participants were issued an Actigraph GT3x+ accelerometer upon arrival and monitors were collected at the end of each day. Physical activity was also measured the following fall semester in the same students. General anthropometric measurements were also assessed. **RESULTS:** Height approximated the 50th percentile for both boys and girls. Weight and BMI approximated the 90th percentile for boys and the 75th percentile for girls. Participants took part in an average of 25.0 and 7.2 minutes of moderate and vigorous physical activity, respectively, during the studio-based learning experience. During the regular school year, these students participated an average of 7.4 and 3.1 minutes of moderate and vigorous physical activity, respectively, during the hours of the school day corresponding with the summer experience. **CONCLUSIONS:** Studio-based learning may provide a viable option for increasing physical activity levels while addressing academic performance. This is particularly important for students classified as "at-risk" for dropout as they are often the same population affected by health disparities.

3402 Board #307 June 2 2:00 PM - 3:30 PM  
**Metabolic Syndrome And Activity Levels In College Students**

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**PURPOSE:** It is estimated that greater than 30% of young adults attending college are overweight or obese. Many of the known risk factors that are often associated with obesity also place an individual at risk for developing metabolic syndrome (MetS). In particular, physical activity has been shown to insulate against future risk of such metabolic disorders. The purpose of this study was to examine the relationship of the risk factors associated with MetS and activity levels in college students.

**METHODS:** Twenty-one college students (age:  $23.1 \pm 4.2$  years; BMI:  $28.1 \pm 6.2$  kg/m<sup>2</sup>) participated in the study. The following information was obtained from each participant; body anthropometrics, fasting glucose and lipoproteins, and accelerometry measured activity levels. Participants wore, at the waist, the wireless activity monitor (wGT3X-BT, ActiGraph, Pensacola, FL) for seven consecutive days. MetS was determined if the participants met three of the five criteria utilizing the NCEP guidelines.

**RESULTS:** Metabolic syndrome was prevalent in 9.5% of the population. The average daily step count for the participants were  $7982.6 \pm 2209.6$  steps/day. The observed categorical activity levels (not including while asleep) for the participants included  $84.3 \pm 0.05\%$  spent in a sedentary state and  $0.04 \pm 0.01\%$  engaged in moderate to vigorous physical activity.

**CONCLUSIONS:** Metabolic syndrome is becoming more prevalent in all populations including college students. Current levels of activity in college students do not meet the CDC's established guidelines for total steps/day, elevating their risk of acquiring

metabolic disorders. In order to reduce the increasing prevalence of MetS, increasing the total number of steps/day in conjunction with a focus on moderate-vigorous physical activity levels may reduce the risk factors associated with MetS later life. On-going participant collection will continue, looking to establish correlates between MetS criteria and physical activity.

3403 Board #308 June 2 2:00 PM - 3:30 PM  
**Discrepancies Among Children at the 99th Percentile**

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(No relationships reported)

**PURPOSE:** Use of the body mass index percentile curves (BMI%) allows for consideration of growth and maturation throughout childhood but creates a ceiling effect for children with severe obesity who are classified at the 99th percentile. This study aimed to evaluate variances by age and gender of alternative measures of weight status in children and adolescents.

**METHODS:** Age, height and weight from all children ages 3-18 were obtained from NHANES 2009-2010, 2011-2012, and 2013-2014 and BMI variables were calculated. These included raw BMI (kg/m<sup>2</sup>), BMI%, BMI z-score, and percent over the 50th and 95th percentile. Means and variances of these variables were calculated for all children with BMI% of 99% as well as 50% for comparison purposes. Analyses were conducted for 3-6, 7-11, and 12-18 year-old age groups.

**RESULTS:** Data was available for 9049 subjects. Raw BMI for all subjects with BMI% = 99 ranged from 19.06 - 57.1 kg/m<sup>2</sup> and mean BMI was 22.5, 29.6, and 39.6 kg/m<sup>2</sup> for 3-6 year olds, 7-11 year olds, and 12-18 year olds, respectively. The range was much narrower among children at the 50th percentile (15.2 - 22.0 kg/m<sup>2</sup>). Average BMI z-score for subjects at the 99th percentile ranged from a low of 2.5 in 7-11 year olds to a high of 2.9 in 3-6 year olds. Percent over the 50th percentile ranged from 22.3% - 155.8% in 3-6 year olds, 44.6%-189.6% in 7-11 year olds, and 60.0%-169.1% in 12-18 year olds. These ranges were narrower in children at the 50th percentile (-0.3% to 0.9%, -0.8% to -0.4%, and -0.9% to -0.2%, respectively). Among subjects at the 99th percentile, percent over the 95th percentile ranged from 6.5%-114.1% in 3-6 year olds, 17.8%-122.7% in 7-11 year olds, and 20.8%-99.6% in 12-18 year olds.

**CONCLUSIONS:** Alternative weight variables including percent over the 50th percentile and percent over the 95th percentile may allow for better distinction among children and adolescents presenting with severe obesity.

3404 Board #309 June 2 2:00 PM - 3:30 PM  
**Tracking BMI in Childhood Through Adulthood**

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(No relationships reported)

**Does a child's BMI percentile change from 1st to 10th grade?**

**Purpose:** Obesity, specifically in childhood, has become an important public health concern because of possible long-term correlations with heart disease and chronic illnesses in adulthood. However, there is limited evidence measuring the link between childhood to adolescent BMI by trained professionals. The purpose of this study is to track BMI measurements in 1st graders and later in 10th graders to analyze BMI trends from childhood to adolescence.

**Methods:** Child height and weight were measured in 1<sup>st</sup> grade (by school nurses) and 10<sup>th</sup> grade (by Physical Education teachers) and converted to Body Mass Index percentiles (BMI%) for sex and age using standard CDC SAS code. Subjects were grouped into BMI Categories (Cat) based on 1<sup>st</sup> grade BMI% with all children with BMI% less than 10% in Cat0, BMI% from 10-19% in Cat1 and so forth, up to Cat9 with 1<sup>st</sup> grade BMI% of 90% or higher. Average 10<sup>th</sup> grade BMI% and average change in BMI% from 1<sup>st</sup> to 10<sup>th</sup> grade were computed for each BMI Category.

**Results:** Complete data was available for 559 subjects. Average 10<sup>th</sup> grade BMI% ranged from 35.8% in Cat1 to 90.2% in Cat9. Average BMI% change was 2.86% from 1<sup>st</sup> to 10<sup>th</sup> grade. Average BMI% in Cat0 increased by 31.4% while Cat9 showed an average decrease of 6.9%. Cats 7, 8, and 9 all showed overall decreases in BMI% while Cats 0-6 showed increases

**Conclusion:** Categories 7, 8, and 9 show a decrease in BMI; however, that may be due to the maximum category limit. Childhood and adolescent obesity is an important public health concern as it shows an increased risk of becoming overweight and obese in adulthood, placing them at higher risk for chronic illness and heart disease. Obesity remains an issue and should continue to be monitored from childhood to adolescents. Singh, A. S., Mulder, C., Twisk, J. W. R., Van Mechelen, W. and Chinapaw, M. J. M. (2008). Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obesity Reviews*, 9: 474-488. doi:10.1111/j.1467-789X.2008.00475.x Cole Tim J, Bellizzi Mary C, Flegal Katherine M, Dietz William H. Establishing a standard definition for child overweight and obesity worldwide: international survey *BMJ* 2000; 320 :1240

3405 Board #310 June 2 2:00 PM - 3:30 PM

**Associations between Physical Activity, Sedentary Time and Percent Body Fat in Chilean Adolescents**

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(No relationships reported)

The prevalence of overweight and obesity among Chilean adolescents in 8<sup>th</sup> grade has increased from 41% in 2014 to 45% in 2016. However, physical activity (PA) and sedentary characteristics in this group of adolescents has not been evaluated. **PURPOSE:** To evaluate PA and sedentary time (ST) and their association with percent body fat among 8<sup>th</sup> grade adolescents in Chile. **METHODS:** A group of 156 adolescents (87 males, 69 females, mean age= 13.4±0.7 yrs) were recruited from 4 public schools in the metropolitan region in Chile. Measures of height, weight, and percent body fat using bioelectrical impedance were obtained. Physical activity and sedentary behavior were measured with ActiGraph GT3X+ accelerometers that adolescents wore in the right hip area attached to an elastic waist band for 8 consecutive days. T-tests were conducted to detect gender differences, and Pearson correlations and linear regressions were used to evaluate associations between PA, ST, and percent body fat. **RESULTS:** Males and females were not different in ST (9.0±2.6 vs. 8.9±2.8 hr/day, P=0.97), but females had higher percent body fat compared with males (27.8±5.9 vs. 17.2±7.1; P<0.001), lower moderate to vigorous PA (MVPA) (170.7±112.8 vs. 285.3±161.1 min/week; P<0.001), and lower steps/day (5951±2139 vs. 7181±2668; respectively, P=0.002). MVPA was inversely associated with percent body fat (r = -0.30, P=0.0004) but ST was not associated with percent body fat. However, a strong inverse association was observed between percent of the day in ST and MVPA (r = -0.62, P<0.001). **CONCLUSION:** This group of Chilean adolescents had high ST and no compliance with PA recommendations, particularly females; and those with less MVPA had higher percent body fat. To help control the obesity trend among adolescents in Chile, school programs that incorporate more PA and reduce ST is warranted.

3406 Board #311 June 2 2:00 PM - 3:30 PM

**Associations with Physical Activity and Sedentary Behavior with Physical Fitness in Chinese Children and Adolescents**

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(No relationships reported)

Associations with Physical Activity and Sedentary Behavior with Physical Fitness in Chinese Children and Adolescents

Zheng Zhu<sup>1,2</sup>, Peijie Chen<sup>1,2</sup>, Zhen-Bo Cao<sup>1,2</sup>, Yan Tang<sup>1,2</sup>, Jie Zhuang<sup>1,2</sup>, Yang Liu<sup>1,2</sup>  
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2. Shanghai Research Center for Physical Fitness and Health of Children and Adolescents

**PURPOSE:** The purpose of this study is to examine the associations of physical activity and sedentary behavior with physical fitness in Chinese children and adolescents. **METHODS:** A total of 33,414 participants (boys:48.9%, age:12.5±2.5 yr, weight:48.0±14.9 kg, height:154.6±13.9 cm, BMI:19.7±3.9 kg/m<sup>2</sup>) completed physical activity and sedentary behavior questionnaire and physical fitness test including Body Mass Index (BMI), lung capacity, sit and reach, jump rope/long jump, sit-ups/pull up and shuttle run /800meter/1000meter run. The participants were categorized into either "fit" or "unfit" by using National Students Physical Fitness Standard depending on whether they met the standard or not. Multiple logistic regressions were performed to examine the associations of physical activity and sedentary behavior with physical fitness after controlling for gender, age and BMI. **Results:** After adjusting gender, age and BMI, physical activity and sedentary behavior were significantly associated with physical fitness, independently. The children and adolescents who did not meet the recommendation of 60 min/day of moderate and vigorous physical activity (MVPA) had 1.97 times the odds of being unfit compared to those meeting guideline (95% confidence interval [CI] of Odds Ratio:1.69-2.30). The children and adolescents who did not meet the sedentary behavior guideline had 1.27 times the odds of being unfit (95% CI of Odds Ratio: 1.07-1.50). In joint association analysis, children who did not meet physical activity nor sedentary behavior guidelines had 2.26 times higher odds of being unfit than children who met both guidelines (95% CI of Odds Ratio: 1.61-3.17). **CONCLUSION:** The results demonstrated that being physically active and reducing the sedentary behavior are independently and positively associated with physical fitness in children and adolescents.

3407 Board #312 June 2 2:00 PM - 3:30 PM

### Anthropometric Measures are Associated with Canadian Agility and Movement Skill Assessment Scores

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(No relationships reported)

**PURPOSE:** Recent literature suggests that anthropometric measures are correlates of gross motor competence in children. The purpose of this study was to determine if body mass index (BMI) or waist circumference (WC) are associated with children's scores on the Canadian Agility and Movement Skill Assessment (CAMSA).

**METHODS:** Children aged 8-12 years ( $n = 7,773$ ), with parental consent, from 7 Canadian provinces had their physical literacy level measured using the Canadian Assessment of Physical Literacy (CAPL). CAPL testing was completed between 2012-2016 and administered by trained research staff. As part of the CAPL tests, movement competence was measured using the CAMSA which evaluates fundamental, combined, and complex movement and motor skills. Children were scored on time to complete the CAMSA (range 1-14 points) and ability to demonstrate the movement skill criteria (range 0-14 points) for a combined score out of 28, with the best of two trials used for analyses. BMI was calculated from measured height and weight and converted to BMI z-score using the World Health Organization's (WHO) BMI-for-age charts and formulae based on the LMS method. WC was measured in duplicate using an elastic tape measure at the level of the iliac crest and recorded in centimeters, with the average of the two measures used for analyses. Children were grouped for analysis based on those meeting ( $\geq -2.0$  to  $\leq 1.0$ ) and not meeting ( $< -2.0$  or  $> 1.0$ ) the WHO's recommended level of BMI z-score. Separate multiple linear regression models were used to predict CAMSA score for BMI z-score and WC, with both models adjusting for age and sex.

**RESULTS:** The difference in CAMSA scores between BMI z-score groups was significant ( $p < 0.001$ , Cohen's  $d = 0.3$ ). In the BMI z-score model, results of the regression ( $F [3,7455] = 353, p < 0.0001, R^2 = 0.12$ ) indicated that CAMSA scores were lower by 0.3 units for every 1 unit increase in BMI z-score. In the WC model, results of the regression ( $F [3,7455] = 402.2, p < 0.0001, R^2 = 0.14$ ) found lower CAMSA scores of 0.1 units for each 1 centimeter increase in WC. Age and sex were strongly associated with CAMSA score in both models, as expected.

**CONCLUSIONS:** These results align with previously reported findings suggesting that anthropometric measures have a moderate relationship with children's performance on movement competence assessments.

3408 Board #313 June 2 2:00 PM - 3:30 PM

### The Relationship Between Fundamental Motor Skills and Physical Activity in College Age Students in Puerto Rico

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Physical activity (PA) is associated with disease prevention and maintaining a healthy lifestyle. It is expected that individuals with higher levels of Fundamental Motors Skills (FMS) would be more physically active. The lack of PA is currently a global problem for it has caused 1.9 million deaths. Furthermore, only 33.8% of the population in Puerto Rico meets the current PA guidelines, thus placing in the top position with the lowest percentage among all the states and territories of the United States. **PURPOSE:** To investigate the relationship between PA and FMS in college-age students in Puerto Rico. **METHODOLOGY:** Participants were 91 college-age students that completed the International Physical Activity Questionnaire (IPAQ)

and used the Walk 4 Life Pedometer for 7 days. Also completed a series of motor skills tests: running 60 meters, overhand throw, and horizontal jump. A Spearman correlations analysis was used to identify relationships between variables.

**RESULTS:** The results showed that students did not fulfill the current PA recommendation assessed by pedometer (6,546.6 steps/day + 3234). Nevertheless, according to IPAQ, the population obtained a moderate/vigorous PA (5,499 METS + 6993), and engaged an average of 285 min/day of sedentary time in their most active day. Total FMS score averaged was  $19.4 \pm 4.38$ . PA (step/day) and METS were not correlated with FMS ( $r^2 = .034, p = .75$ ) and ( $r^2 = .124, p = .24$ ). PA (METS) was significantly correlated with overhand throw ( $r^2 = .255, P = .02$ ).

**CONCLUSION:** In conclusion, the participants did not comply with the total amount of daily steps recommended for PA and did not reach the expected level of FMS.

3409 Board #314 June 2 2:00 PM - 3:30 PM

### Physical Activity Levels in Preschool Children During Winter & Summer

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**Background:** The Norwegian Directorate of Health recommends that children between 3 to 5 years accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. However, knowledge about physical activity levels in preschoolers is limited.

**PURPOSE:** To compare physical activity levels in kindergarten preschool during summer and winter in children aged 3-5 years.

**METHODS:** From Monday to Wednesday, physical activity levels were monitored using the Actigraph GT3X between 07.30 am and 4.30 pm. ( $n = 81$ ; 4... yrs). Physical activity levels were measured twice, in February ( $n = 81$ ;  $4.45 \pm 0.86$  years), ( $n = 71$ ; 4... yrs) and in June. June ( $n = 71$ ;  $4.75 \pm 0.89$  years). The primary physical activity outcome was time spent at different activity intensities. We defined moderate-to-vigorous physical activity (MVPA) as all activity above 2000 counts/min. As used previously (Ekelund et al., 2004).

**RESULTS:** During the winter period, 64 % of the children reached MVPA the recommendations of 60 minutes physical activity daily, whereas 29% was in MVPA between physically active 30-59 minutes per day, and 6% were in MVPA active <29 minutes. During the summer period less children reached MVPA, physical activity were lower, as 50 % reaches MVPA were active > 60 minutes per day, while 39% were active reached MVPA between 30-59 minutes per day, and 11% was in MVPA less than were active <29 minutes. In total for bout periods the boys spent significantly more time in MVPA, ( $84.11$  minutes  $\pm 37.97$ ) compared to girls ( $63.46$  minutes  $\pm 31.39$ ) ( $p < 0.001$ ). In the winter, 65.8% of the boys met the recommendations, and the percentage was reduced to 58% in the summer. For girls, the respective numbers were 34 % and 41%. Boys were significantly ( ) more active than girls ( ) in both periods.

#### CONCLUSION:

More than 2/3 of preschoolers do not reach the recommendations of 60 minutes moderate-to-vigorous physical activity. More children in preschool reached the recommendations of MVPA above 60 minutes in the winter, compared with the summer period.

3410 Board #315 June 2 2:00 PM - 3:30 PM

### Changes in Sedentary Behaviour, Physical Activity and Body Mass Index in Schoolchildren: A 3-Year-Longitudinal Study

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There is growing interest in sedentary behaviour (SB) and its association with health outcomes. However, few studies have considered the changes in SB its association with change in MVPA and BMI in schoolchildren longitudinally and it is need better understanding. **PURPOSE:** To describe the 3-years changes in objectively measured SB, moderate-to-vigorous physical activity (MVPA) and body mass index (BMI), and to investigate changes in SB and its association with change in MVPA and BMI in a 3-year follow-up. **METHODS:** The sample consisted in 68 children ( $n = 39$ ; 57.4% female) aged 6 to 9 years-old, from schools in metropolitan area of Porto, Portugal. Height and weight of children were measured and BMI was calculated ( $\text{kg}/\text{m}^2$ ). SB and MVPA were measured by accelerometer. Changes between 2009/2012 and between 2010/2013 in SB, MVPA and BMI indicators were computed as the value recorded in the end of the follow up minus the value recorded in the baseline ( $\Delta$ ). Differences between baseline and follow-up SB, MVPA and BMI were examined by paired-sample

t-tests. ΔSB and its associations between ΔMVPA and ΔBMI were assessed using a multivariate linear regression model, adjusted for gender and baseline values of age, SB, MVPA and BMI. **RESULTS:** The SB and BMI baseline increased significantly compared with follow-up ( $562.51 \pm 46.81$  and  $577.29 \pm 49.81$  min/day;  $p = 0.033$ ;  $17.55 \pm 2.44$  kg/m<sup>2</sup>,  $19.61 \pm 3.21$  kg/m<sup>2</sup>;  $p = 0.0001$ , respectively) and MVPA was not significantly different ( $67.23 \pm 15.38$  and  $65.24 \pm 20.73$ ;  $p = 0.380$ ). Multiple linear regression analyses showed that ΔSB was negatively related to ΔMVPA ( $\beta$ : -0.609; 95%CI: 2.30, -1.39;  $p = 0.0001$ ), however it was not associated significantly with ΔBMI ( $\beta$ : -0.088; 95%CI: -6.79, 1.58;  $p = 0.218$ ). **CONCLUSIONS:** The increase of SB with age could displace the time spent in MVPA, although the influence of the BMI values remained unclear for the children sample presented here. This reinforces public health measures and suggests the need of interventions focusing in decline SB and increase MVPA during childhood. Supported by the CIAFEL under grant number UID/DTP/00617/2013; FCT under grant number SFRH/BD/86538/2012; CNPq under grant number 206862/2014-8 and CAPES under grant number 6099/13-0.

3411 Board #316 June 2 2:00 PM - 3:30 PM

**Effect of a Lifetime Health and Fitness Class on College Students**

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**PURPOSE:** A pre-post, quasi-experimental study was conducted to evaluate the association between a health and fitness class, physical education 215 (PHED 215) and chronic disease risk, cardiorespiratory fitness (CRF) level, body fat percentage, self-motivation, exercise self-efficacy, and transtheoretical model (TTM) physical activity stage of change progression among male and female college students ( $n = 64$ ).

**METHODS:** Secondary data were analyzed via descriptive statistics, paired *t* test (or Wilcoxon signed-rank test if data were not normal), and Bowker's test of symmetry.

**RESULTS:** Results showed a statistically significant association between PHED 215 and 2 dependent variables: cardiorespiratory fitness level ( $p = 0.0001$ ) and progressive movement through the TTM stages of change ( $p = 0.0061$ ). No statistically significant difference was found between PHED 215 and 4 dependent variables: disease risk, body composition, self motivation, and self-efficacy.

**CONCLUSIONS:** Because college age students are shaping their adult behaviors, positive health change adopted during this critical time could increase CRF, establish lifelong exercise habits, improve quality of life, and delay and decrease obesity risk and chronic disease and related costs. While further study in different settings is warranted, PHED 215 could be used as a blueprint for other interventions in the education, community, and healthcare settings.

Variable	Measurement Tool
Disease risk	ACSM Guidelines for Exercise Testing and Prescription (2010) Table utilizing combination of BMI and waist circumference to obtain disease risk
Cardiorespiratory fitness	Three Minute Step Test (Powers & Dodd, 2009)
Body fat percentage	Bioelectrical Impedance (Tanita 350 Body Composition Analyzer)
Self-motivation	Self-Motivation Inventory (Dishman & Ickes 1981; Merkle, 1997)
Exercise self-efficacy	Exercise Self-Efficacy Scale (Bandura, 1997)
Stage of change	Assessing Physical Activity Stages of Change (Marcus & Forsythe, 2003; ACSM Resource Manual, 2010)

Analysis Results									
Variables	Pretest Mean (SD)	Post-test Mean (SD)	Mean Difference (post-pre)	<i>t</i>	<i>P</i>	Skewness	Kurtosis	<i>SW</i>	<i>P</i> (Wilcoxon)
Body fat percentage (N=43)	23.42 (11.36)	23.53 (10.96)	0.11	0.26	0.7945	0.20	0.11	0.8317	0.9212
Cardiorespiratory fitness level (N=54)	160.74 (31.48)	152.70 (30.92)	-8.04	-3.04	0.0037*	1.48	5.17	0.0003	0.0001*
Self-motivation score (N=41)	129.51 (16.45)	131.71 (19.11)	2.20	1.41	0.1675	0.67	2.65	0.0042	0.1758
Self-efficacy score (N=41)	67.05 (14.22)	65.62 (16.73)	-1.42	-0.75	0.4560	0.51	1.77	0.1543	0.2510
PA stage (N=39)	2.56 (1.37)	3.15 (0.93)	0.59	2.85	0.0070*	-0.32	0.46	0.0059	0.0061*
N=sample size	SD=standard deviation			<i>t</i> =paired t-statistic	<i>P</i> =p-value for paired t-test; *indicated significance at the 0.05 level			<i>SW</i> =p-value of Shapiro-Wilk test	<i>P</i> (Wilcoxon) = p-value of Wilcoxon signed rank test; *indicated significance at the 0.05 level
Disease Risk Analysis Results									
Disease risk assessed via Bowker's test for table symmetry (p=0.9536)	55/56 subjects had same pretest and posttest disease risk								

3412 Board #317 June 2 2:00 PM - 3:30 PM

**Moderate to Vigorous Physical Activity during Recess and Physical Education by Gender and Body Fat**

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(No relationships reported)

**PURPOSE:** To compare the intensity of physical activity using accelerometers and heart rate monitor during physical education class and recess in students of third and fourth grade of primary education according to gender and body fat percentage.

**METHODS:** In order to determine the intensity of physical activity accelerometers ActiGraph GT9X Link and heart rate monitors Polar bluetooth smart were used, in 28 boys and 26 girls during 8 physical education classes and recess periods, to determine the percentage of body fat as normal or high bioelectrical impedance analysis was performed using the 720 Inbody equipment.

**RESULTS:** Student *t* test for independent samples resulting a P-value less than  $\alpha \leq 0.005$  with significant differences in physical education classes between the averages of moderate to vigorous physical activity (men:0,003 women:0,001) and heart rate beats/min (men:0,001 women:0,000) in participants with normal body fat percentage compared to high.

**CONCLUSIONS:** The intensity of physical activity during recess was higher in relation to physical education classes and with a moderate to vigorous physical activity less than 50% of the duration of the class, due, is important a feedback for the teachers in strategies for involving the students with increased risk of obesity in moderate to vigorous physical activity.

3413 Board #318 June 2 2:00 PM - 3:30 PM  
**Effects Of Moderate To Vigorous Program On Vo2max And Body Fat In Overweight Children**  
 PAULINA Y. OCHOA, JAVIER A. HALL. *Autonomous University of Baja California, Mexicali, Baja California, Mexico.*  
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 (No relationships reported)

**PURPOSE:** To evaluate the effect of a program of physical activity with moderate to vigorous under the model of CATCH on body fat percentage and aerobic capacity in overweight or obesity children.

**METHODS:** Twenty-six children (15 male and (11) female (age 9.4±0.3 years), diagnosed with overweight or obesity participated in a program of physical activity with moderate to vigorous under the model of CATCH, 2 times a week over a period of 10 months, consisting of exercise intensity of 56% evaluated by the system for observing fitness instruction time (SOFIT), before and after the program body fat percentage was evaluated determined by the equation Slaughter with the anthropometrics measurements of triceps and media calf skinfolds. Aerobic capacity ( $VO_{2max}$ ) was determined through the test course navette 20 meters. **RESULTS:** The results of student T test showed significant improvement ( $p<0.05$ ) comparing before and after the program in  $VO_{2max}$  ( $p=0.000$ ) and percentage change ( $\Delta\%$ ) of 11.3. **CONCLUSIONS:** Physical activity with moderate to vigorous under the model CATCH was able to enhance aerobic capacity in overweight or obesity children, however, will be appropriated in the future more studies to better clarify the possibilities of improvements improvement in the percentage of body fat.

3414 Board #319 June 2 2:00 PM - 3:30 PM  
**The Relationship between Sit & Play and Gross Motor Coordination in Preschoolers**  
 Sandra Silva-Santos<sup>1</sup>, Amanda Santos<sup>1</sup>, Michael Duncan<sup>2</sup>, Susana Vale<sup>3</sup>, Jorge Mota<sup>1</sup>. <sup>1</sup>University of Porto. Faculty of Sport., Porto, Portugal. <sup>2</sup>Coventry University, Coventry, United Kingdom. <sup>3</sup>High education school, Polytechnic institute of Porto, Porto, Portugal.  
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Gross motor coordination (GMC) is positively associated with physical activity (PA) and inversely associated with sedentary behaviour (SB) in childhood. Although children behave sedentarily while sitting and playing there is effectively movement in this behaviour. We considered the transition between SB ( $\geq 150$ c.p.m) and light physical activity (LPA) ( $\leq 800$ c.p.m) as sit & play (SP), that is when preschoolers are sitting but there is some movement playing. No studies to date have examined how GMC is related to SP. **PURPOSE:** To examine the association between SP and GMC during the early years regardless physical activity levels.

**METHODS:** The sample comprised 209 children aged 3-6 years, GMC was assessed according to the Movement Assessment Battery for Children (MABC-2). The battery comprised the aiming & catching and balance component. We summed the item standard scores for each component. The GMC was categorized in the red zone, as poor GMC, and the green zone, as high GMC. Body mass index (BMI) was assessed as mass (kg)/stature squared ( $m^2$ ), LPA, moderate vigorous physical activity (MVPA), SB and SP were assessed by accelerometer. SP was defined between  $\geq 150$  c.p.m until  $\leq 800$  c.p.m. For data analysis, the SP and SB were divided into two categories by median split.

**RESULTS:** The sample was 42.5% in the red zone for the aiming & catching component and 14.9% in the red zone for the balance component. Binary logistic regression analysis showed that preschoolers who had a low level of SP were 2.9 times more likely to be classified as having poor GMC level in aiming&catching than their counterparts with high SP level. (OR: 2.9; IC: 1.3-6.6) regardless gender, SB, BMI, LPA and MVPA. No statistical significant association was found for balance. Further binary logistic regression that examined the relationship between SB and GMC, did not show statistical significant association.

**CONCLUSIONS:** This study showed an association between low SP levels with poor GMC regardless of physical activity levels. Thus, children are sitting position, doing some movement playing looks good for GMC. No association has been found between SB and GMC. Further longitudinal studies are needed to confirm this data. *Supported by the CIAFEL under Grant UID/DTP/00617/2013; FCT under Grant SFRH/BD/86538/2012; and CAPES under Grant 6099/13-0.*

## F-64 Free Communication/Poster - Pregnancy

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
 Room: Hall F

3415 Board #320 June 2 2:00 PM - 3:30 PM  
**Postpartum Mothers' Physical Activity & Sleep: A Comparison of Overweight/Obese and Normal Weight Mothers**  
 Shane Warehime, Kailey Snyder, Jung-Min Lee, Danae Dinkel. *University of Nebraska at Omaha, Omaha, NE.* (Sponsor: Dustin Slivka, FACSM)  
 (No relationships reported)

Lack of physical activity (PA) and sleep are associated with several negative health outcomes. Two populations that are particularly vulnerable to these risk factors are postpartum mothers (<1 year of childbirth) and overweight/obese individuals. Thus, postpartum mothers who are also overweight/obese may be especially susceptible to issues related to lack of PA and sleep. However, research exploring this topic is lacking. **PURPOSE:** To compare PA and sleep of overweight/obese and normal weight mothers. **METHODS:** Physical activity and sleep levels were objectively measured using accelerometers worn on the non-dominant wrist. A total of 21 mothers (n = 13 overweight/obese, n = 8 normal weight) were recruited as part of a larger study. Mothers' PA and sleep levels (minutes) were assessed three times - when their infant was three months old, the onset of their child's sitting (~5 months of age), and one month post onset of sitting (~6 months of age) - for four days (two weekdays, two weekend days). Anthropometric measures (i.e., height weight) were collected at each visit to calculate BMI. Average BMI was used to classify mothers as normal weight or overweight/obese. A mixed-design ANOVA was used to examine differences between visits while comparing normal weight and overweight/obese mothers. **RESULTS:** Increases ( $p < 0.05$ ) in normal weight mothers' PA was observed between visits one ( $M = 78.98 \pm 20.83$  min/day) and three ( $M = 99.89 \pm 14.57$  min/day,  $p = 0.01$ ), and visits two ( $M = 84.49 \pm 17.33$  min/day) and three ( $p = 0.045$ ). Overweight/obese mothers displayed no significant change in PA over time. No significant change in sleep over time was observed in either group. No significant differences were observed between the PA and sleep levels of overweight/obese and normal weight mothers. **CONCLUSION:** Normal weight mothers tended to increase PA levels while overweight/obese mothers did not significantly change their PA levels over time. These findings can help guide future efforts aiming to increase the health of postpartum mothers, especially those that are also overweight/obese.

3416 Board #321 June 2 2:00 PM - 3:30 PM  
**Factors Associated With Household And Job Physical Activity In Low-income Pregnant Women: Ecological Perspective**  
 Alicia B. Stannard<sup>1</sup>, Lanay M. Mudd, FACSM<sup>2</sup>, James M. Pivarnik, FACSM<sup>3</sup>, Jean Kerver<sup>3</sup>, Lorraine Weatherspoon<sup>3</sup>. <sup>1</sup>Sacred Heart University, Fairfield, CT. <sup>2</sup>National Center for Complementary and Integrative Health, Bethesda, MD. <sup>3</sup>Michigan State University, East Lansing, MI.  
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Low-income pregnant women are less likely to meet physical activity (PA) recommendations compared to higher income counterparts. Some studies suggest that the difference in activity levels is diminished when household (HPA) and job physical activities (JPA) are considered but little is known about factors that may influence HPA and JPA levels. **PURPOSE:** To examine personal, social, and environmental factors impacting HPA and JPA during pregnancy in low-income women based on the Ecological Model. **METHODS:** Low-income pregnant and postpartum women were recruited nationwide using an online platform. Participants (n=109) recalled pregnancy HPA and JPA using the International Physical Activity Questionnaire (IPAQ) and answered a survey on personal (demographics, self-efficacy, lifestyle beliefs), social (social support, social perceptions, social roles strain) and environmental factors (safety, community involvement). Descriptive statistics were assessed for all variables. Median split was used to categorize HPA and JPA. Correlation matrices were created for personal, social, and environmental factors. Based on established criteria, significant variables were selected to be included in confirmatory factor analysis (CFA). A CFA model for each personal, social, and environmental latent factor and two structural equation models were created for predicting HPA and JPA. **RESULTS:** Participants' mean age was 29.5 years ( $\pm 5.6$ ) and 51.9% of women were on Medicaid. Median, range HPA was 28, 0-354 MET-hrs/wk and JPA was 0.2, 0-367 MET-hrs/wk. Latent personal, social, and environmental factors were not significantly related to HPA or JPA. However, significant interactions occurred between personal and environmental factors ( $-0.218$ ,  $p<0.05$ ) and social and environmental factors ( $-0.207$ ,  $p<0.05$ ) in the HPA model as well as personal and environmental factors

(-0.221,  $p < 0.05$ ) in the JPA model. **CONCLUSIONS:** Reported HPA and JPA levels were low, varied widely, and could indicate a lack of understanding of PA questions. Latent factors were not related to HPA or JPA, but the interactions among latent factors indicate that this analysis might not capture the complexity of PA behaviors. Other correlates not included in this study, such as job type, may have greater influence on HPA and JPA among low-income pregnant women.

3417 Board #322 June 2 2:00 PM - 3:30 PM  
**The Relationships Among Social Support and Self-Efficacy on Physical Activity during Pregnancy**  
 Ashley E. Boggs, Rebecca A. Schlaff, Meghan Baruth, Samantha Deere. *Saginaw Valley State University, University Center, MI.*  
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*(No relationships reported)*

There is some evidence to suggest that social support and self-efficacy aid in goal directed behaviors and may increase levels of physical activity (PA). **PURPOSE:** To examine the relationship between social support from family and friends, self-efficacy, and PA in a sample of pregnant women. **METHODS:** Participants ( $n=23$ )  $\geq 18$  years of age and 14-20 weeks gestation were enrolled in a nutrition and physical activity intervention. A survey assessing demographics (age, marital status, education, and race) was administered. Social support and self-efficacy for engaging in PA was also assessed. Height and weight were objectively measured to calculate body mass index (BMI). An accelerometer was worn to assess percent of day spent sedentary, in light PA, and in moderate to vigorous PA. Relationships were examined utilizing Pearson correlation coefficients. **RESULTS:** On average, participants were  $27.2 \pm 4.4$  years of age and had a mean BMI of  $26.7 \pm 5.7$  kg/m<sup>2</sup>. A majority of the sample was married (82.6%), had some college education (78.3%), and was white (81.8%). The sample spent 57.5% of the day sedentary, 41.0% in light PA, and 1.5% in moderate to vigorous PA. For social support from friends, Pearson correlations showed a significant negative relationship with light PA ( $r=-0.43$ ,  $p=0.04$ ), a significant positive relationship with moderate to vigorous PA ( $r=0.45$ ,  $p=0.03$ ) but no relationship with sedentary time ( $r=0.36$ ,  $p=0.09$ ). Pearson correlations also indicated significant positive relationships between self-efficacy and sedentary time ( $r=0.43$ ,  $p=0.03$ ) and light PA ( $r=0.45$ ,  $p=0.02$ ), but no relationship with moderate to vigorous PA ( $r=0.07$ ,  $p=0.71$ ). No significant relationships were found between social support from family and any intensity of PA. **CONCLUSIONS:** Findings indicate that social support from friends may be an important factor to consider when encouraging participation in moderate to vigorous PA during pregnancy. Future research is needed to fully understand the effects of social support and self-efficacy on PA during pregnancy. Prospective research with larger sample sizes should consider including more diverse samples of pregnant women. Furthermore, relationships between social support from family and friends, self-efficacy, and PA should be assessed across trimesters.

3418 Board #323 June 2 2:00 PM - 3:30 PM  
**Why are Pregnant Women Physically Active or not?**  
 Katrine M. Owe<sup>1</sup>, Hanne K. Hegaard<sup>2</sup>, Hanne T. Wolf<sup>3</sup>, Linn Marie Sørbye<sup>4</sup>. <sup>1</sup>*Oslo University Hospital, Oslo, Norway.* <sup>2</sup>*University of Copenhagen, Copenhagen, Denmark.* <sup>3</sup>*Copenhagen University Hospital, Copenhagen, Denmark.* <sup>4</sup>*University of Bergen, Bergen, Norway.*  
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Physical activity (PA) during pregnancy has an important impact on public health as it reduces the risk of common pregnancy complications and chronic diseases and provides numerous protective factors for pregnant women and their children. Although national and international guidelines have recommended regular PA for all pregnant women since the 1980s, only a small proportion of women achieve the recommended levels of PA during pregnancy, and longitudinal studies have shown a decline in PA levels as pregnancy progresses. PA levels are also lower in pregnant women compared to their non-pregnant counterparts. Understanding correlates of PA during pregnancy is crucial in order to target effective interventions to preclude inactivity among pregnant women. **PURPOSE:** To systematically review the literature regarding different correlates of PA during pregnancy including studies from all over the world. **METHODS:** A comprehensive and systematic search of the Medline, Embase, PsychInfo, Cochrane Library, SweMed+, Sociological Abstracts and Web of Science databases up until January 14 2016 was conducted by a professional librarian. Only studies in which PA was assessed prospectively during pregnancy were included. We conducted the present review as suggested by the PRISMA group and used a predefined PICO (Population, Intervention, Comparison, and Outcome) worksheet. **RESULTS:** Out of 342 records, we reviewed 16 original studies. Half of these used a cross-sectional design. We identified different types of correlates and categorized them into 1) demographic or biological variables; 2) psychological variables; 3) behavioral variables; and 4) social and cultural variables. Most studies reported demographic (e.g. maternal age, education and ethnicity) and biological correlates (e.g. pre-pregnancy

PA, smoking and diet) of PA during pregnancy but the results varied widely. Pre-pregnancy PA was the most robust correlate reported. None of the studies reported environmental correlates such as neighbourhood, transport, or weather conditions. **CONCLUSIONS:** PA before pregnancy was the most consistent correlate of pregnancy PA across studies. We need more knowledge on psychological, social and environmental correlates of pregnancy PA, particularly from low- and middle income countries.

3419 Board #324 June 2 2:00 PM - 3:30 PM  
**The Effects of Exercise Training on Cardiorespiratory Fitness in Obese Sedentary Pregnant Women**  
 Eva C. Diaz Fuentes, Aline Andres, Kartik Shankar, Elisabet Børsheim. *Arkansas Children's Nutrition Center, and University of Arkansas for Medical Sciences, Little Rock, AR.*  
*(No relationships reported)*

**Purpose:** Maternal obesity has profound detrimental effects on the offspring's risk of obesity and cardiometabolic health. Although pre-conception interventions are preferable, exercise during pregnancy can potentially mitigate the effects of maternal obesity on metabolic health in both the mothers and the offspring. The Expecting study is an ongoing RCT in obese sedentary women aiming to determine if combined resistance and aerobic exercise during pregnancy improves maternal health and decreases the risk of obesity in the offspring. The purpose of the current analysis was to assess the effects of 11 weeks of exercise training on markers of cardiorespiratory health in women participating in the study for whom data are available at gestation week (GW) 12 and 24. **Methods:** Women ( $n=40$ ) were recruited at GW 12. Body composition and submaximal aerobic capacity were assessed at GWs 12 and 24 using air displacement plethysmography and an incremental treadmill test, respectively. Twenty-one women were randomized to receive standard of care (SOC) and 19 received a combined exercise intervention (EX) 3 times/week. Oxygen consumption ( $VO_{2L}$ , ml·kg<sup>-1</sup>·fat-free-mass<sup>-1</sup>) and oxygen pulse [OP, ml/beat, ( $VO_{2L}$ /heart rate)] are reported for the work load corresponding to a rate of perceived exertion of 15 on Borg's scale (RPE-15). The intervention effect was assessed using analysis of covariance where baseline measurements and incline were used as covariates. Data are presented as mean  $\pm$  SE. **Results:** at GW 12, groups were comparable in terms of age (EX=30 $\pm$ 4 vs. SOC=29 $\pm$ 4 years, NS), BMI (37.4 $\pm$ 5.2 vs. 37.8 $\pm$ 6.6, NS), body fat mass (48.8 $\pm$ 5.4 vs. 47.8 $\pm$ 5.2%, NS), and body fat free mass (51.1 $\pm$ 5.9 vs. 51.4 $\pm$ 7.5 kg, NS). Mean attendance to EX sessions was 80 $\pm$ 9% (2.4 $\pm$ 0.3 visits/wk.) After 11 weeks of training, the EX group had higher  $VO_{2L}$  (34.0 $\pm$ 0.8 vs. 30.3 $\pm$ 0.7,  $p=0.002$ ) than the SOC group. Oxygen pulse was also higher in the EX group compared to the SOC group (11.6 $\pm$ 0.3 vs. 10.6 $\pm$ 0.3). **Conclusion:** A structured exercise intervention during pregnancy in obese sedentary women is not only well-received and easy to adhere to, but also results in improved aerobic fitness. Supported by USDA-ARS # 6026-51000-010-05S, ACRI, and Arkansas Biosciences Institute, the major research component of the Arkansas Tobacco Settlement Proceeds Act of 2000.

3420 Board #325 June 2 2:00 PM - 3:30 PM  
**Are There Benefits Of Physical Activities Centered On The Trunk For Pregnant Women?**  
 Eric Watelin<sup>1</sup>, Antonio Pinti<sup>2</sup>, Racha Doya<sup>3</sup>, Cyril Garnier<sup>3</sup>, Samuel Boudet<sup>4</sup>, Hechmi Toumi<sup>5</sup>. <sup>1</sup>*Université Lille Nord de France, Lille, France.* <sup>2</sup>*Orleans, France.* <sup>3</sup>*CNRS, UMR CNRS 8201, Valenciennes, France, Valenciennes, France.* <sup>4</sup>*Université Lille Nord de France, Lille, France.* <sup>5</sup>*Service de Rhumatologie, Centre hospitalier régional d'Orléans. Orleans University, Orleans, France.* (Sponsor: Thomas Best, FACSM)  
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**Abstract**  
**Purpose.** To examine the effect of trunk exercise program on pain, quality of life (QoL) and physical health (PH) in the late pregnancy and post-partum periods as well as baby weight and size and delivery.  
**Methods.** 90 nulliparous women allocated to a training group (TG) or to a control group (CG). TG carried out a structured program with exercises for flexibility, balance and strengthening for the majority of skeletal muscles specifically for the spinal ones, between the 24th and 36th week of pregnancy. Both TG and CG are evaluated for the pain at the beginning of the program (T1), at the end of the program (T2) and two months post-partum (T3). (QoL) at (T1; T2 and T3). (PH) at T1 and T3.  
**Results.** At T1, no significant difference was found between the two groups in: pain intensity (pain interference  $p=0.317$ ), QoL ( $p=0.18$ ) and PH (flexibility  $p=0.06$ ; walking  $p=0.85$ ). At T2, women of TG had a lower intensity of pain than CG (legs ( $p=0.029$ ), low back ( $p<0.0001$ ), upper back ( $p=0.022$ ), pelvis ( $p=0.017$ ), groins ( $p=0.043$ ), lower pelvis ( $p=0.009$ ) and interference of pain ( $p<0.0001$ )). At T3, TG had a lower intensity of pain than CG, in low back and upper back ( $p<0.0001$ ) and interference of pain ( $p<0.0001$ ). Best scores of QoL were observed in TG compared to

CG at T2 ( $p<0.0001$ ) and at T3 ( $p<0.0001$ ). PH was not different between the groups in T1 but the best one was in TG compared to CG in T3 (flexibility  $p=0.002$ , walking, balance, curling-ups and Ruffier  $p<0.0001$ ). TG is associated with more than four times less of caesarean and 4.5 hours less of labor time.  
Conclusion. Strengthening exercises centered on the trunk reduce pain, increase QoL and PH in late pregnancy and at two months in the post-partum period.

3421 Board #326 June 2 2:00 PM - 3:30 PM  
**Pregnancy Physical Activity Beliefs and Attitudes in a Non-pregnant Population**

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(No relationships reported)

**PURPOSE:** The purpose of this study was to examine the attitudes and beliefs about pregnancy physical activity (PA) in non-pregnant individuals.

**METHODS:** Participants were non-pregnant individuals between the ages of 20 and 60 years and were recruited by word-of-mouth and social media, or through one of five doctor's offices located in the southeastern United States. 738 participants completed at least some of the survey and 454 have complete data. The survey consisted of 27 items in five sections: basic demographic information, PA over prior six months, agree/disagree questions regarding safety and efficacy of PA during pregnancy, importance of exercise and lifestyle for pregnant women, and safety of moderate or vigorous intensity PA for mother and offspring. For analysis, participants were dichotomized by age (20 to 40 years; 41-60 years), sex (male; female), and education (Bachelor's degree; no Bachelor's degree).

**RESULTS:** For age, the older group (age 41 to 60) was more likely to view pregnancy PA favorably ( $p=0.001$  to  $0.010$ ). Females were more likely than males to view pregnancy PA positively ( $p=0.007$  to  $0.024$ ). Participants with a college degree were more likely to agree that pregnant women can begin an exercise program during pregnancy ( $p=0.047$ ) and benefit from moderate exercise ( $p=0.017$ ), but were less likely to believe PA is safe for mother and baby ( $p=0.000$  to  $0.001$ ).

**CONCLUSIONS:** Overall, participants who were older, female, and did not have college degrees viewed pregnancy PA more favorably.

**F-65 Free Communication/Poster - Ultrasound and Spectroscopy Applications**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

3422 Board #327 June 2 2:00 PM - 3:30 PM  
**Associations Of DXA-derived Appendicular Lean And Fat-Free Adipose Tissue Mass With A Single Forearm Ultrasound Image**

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(No relationships reported)

Dual-energy x-ray absorptiometry (DXA) is used to assess appendicular lean soft tissue mass (aLM), however, the aLM measured by DXA contains non-skeletal muscle tissue components (fat-free adipose tissue, FFAT). These components, if not accounted for, could falsely inflate the aLM in individuals with a relatively high amount of adipose tissue mass. Ultrasound is an imaging technique used to estimate body composition. Recently, we developed prediction equations for estimating aLM, (which includes FFAT) from ultrasound-derived muscle thickness and the forearm ulna (MT-ulna) was the single best predictor. For sarcopenia screening, a single ultrasound measurement may be advantageous for community-based physical examinations. However, it is unknown whether DXA-derived FFAT can be predicted from the forearm ultrasound image. **PURPOSE:** To investigate the relationships between DXA-derived appendicular fat mass and forearm adipose tissue thickness (AT-forearm) measured by ultrasound and DXA-derived and ultrasound-predicted aLM in older adults.

**METHODS:** Two hundred fifteen older adults (91 men and 124 women) aged 60-79 had appendicular fat mass and aLM measured by the DXA as well as AT-forearm and MT-ulna measured by ultrasound. Appendicular FFAT was calculated based on the results of a previous study (Appendicular FFAT = appendicular fat mass/0.85 x 0.15). AT-forearm and MT-ulna were measured as the distance between the appropriate tissue

interfaces. aLM was estimated from MT-ulna using a previously published equation ( $aLM = 4.89 \times MT\text{-ulna} \times \text{body height} - 9.15$ ). Pearson correlation coefficients were performed for all variables. Statistical significance was set at  $p<0.05$ . **RESULTS:** There was no significant difference between DXA-derived ( $17.1 [SD 4.0]$  kg) and ultrasound predicted ( $16.9 [SD 3.9]$  kg) aLM. The ultrasound predicted aLM was strongly correlated to DXA-derived aLM ( $r=0.910$ ,  $p<0.001$ ). In addition, DXA-derived appendicular FFAT was significantly correlated to AT-forearm ( $r=0.680$ ,  $p<0.001$ ).

**CONCLUSIONS:** Ultrasound forearm measurement correlates well with both aLM and FFAT. This one site measurement might be a quick and useful method for estimating muscle mass in older adults.

3423 Board #328 June 2 2:00 PM - 3:30 PM  
**Ultrasonic Imaging Before and After Bilateral Tenotomy in a Collegiate Basketball Player: A Case Study**

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(No relationships reported)

Patellar tendinopathy is a debilitating condition that often occurs in athletes who participate in jumping sports, such as volleyball or basketball. Ultrasound imaging has previously been used as a diagnostic tool in identifying tendon morphology. However, previous research has not tracked the time course of patellar tendon morphology changes following tenotomy. **PURPOSE:** The purpose of this study was to track and quantify changes in tendon morphology after bilateral patellar tenotomy in a female collegiate basketball player. **METHODS:** A Division I female basketball player (height=1.9 m, weight=85 kg) with chronic bilateral patellar tendon pain was recruited for participation in the study. Longitudinal B-mode images were taken of the patellar tendon with a research-grade ultrasound machine (Verasonics Inc, Kirkland, WA, USA) and high frequency (5-12-MHz) linear transducer at a center frequency of 10 MHz. The subject performed all rehabilitation exercises as prescribed by the athletic trainer and returned for weekly imaging sessions. As secondary measures of recovery, perceived pain and knee function were evaluated using the Victorian Institute of Sport Assessment (VISA) scale which was completed at each visit. Tendon micromorphology was evaluated using a custom MATLAB code (MathWorks, Natick, MA, USA). A region of interest was manually selected from the images and a two-dimensional fast Fourier transform was performed. The peak spatial frequency radius (PSFR) parameter was used to assess the micromorphology of the tendon, where higher PSF values were associated with increased collagen organization.

**RESULTS:** At the time of abstract submission, the subject had completed two post-surgical visits. The average PSKR increased for both knees (right: 1.00 vs. 1.28; left: 1.07 vs. 1.54). There was a small increase in the total VISA score between visits (5 vs. 8). **CONCLUSION:** Ultrasonic imaging was used to characterize initial micromorphology changes in the patellar tendon following bilateral tenotomy. Preliminary results showed increased collagen organization and improved VISA scores. Future findings may suggest a correlation between self-reported measures of knee pain and function and tendon morphology.

3424 Board #329 June 2 2:00 PM - 3:30 PM  
**Diagnostic Ultrasound Imaging In Assessing Medial Elbow Joint Space In College Baseball Pitchers**

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(No relationships reported)

Athletes participating in overhead throwing sports such as pitchers, volleyball players, and javelin are prone to ulnar collateral ligament (UCL) injuries of the elbow. UCL sprains typically occur when the elbow is subjected to repetitive or sudden valgus stress causing the UCL to exceed its tensile limits. Recently, the use of musculoskeletal ultrasound (MSK) during a valgus stress exam of the UCL has gained great interest. **PURPOSE:**

To examine medial elbow joint space (MJS) opening changes during a constant valgus load to the UCL through MSK in collegiate baseball pitchers during 6 weeks of a competitive season.

**METHODS:** Thirteen Division I college baseball pitchers with a mean age of  $20.4 \pm 1.45$  yrs and body mass index of  $24.56 \pm 1.78$  participated. Ultrasound images of the medial joint space on the participant's throwing arm were obtained using a GE LOGIQ E ultrasound unit. The participants were placed in a supine position with a wedge placed underneath their throwing hand to maintain their elbow angle at 30 deg. A hand held dynamometer was used to apply a 3 kg valgus force 20 cm distal to the medial epicondyle to maintain a constant 5 Nm valgus stress to each participant. The medial joint space of the elbow was imaged at the beginning of the spring baseball season

then 16 games or 6 weeks after baseline testing. Three images were taken during each session, where specific measurements from the apex of the trochlea to the apex of the ulna were taken.

**RESULTS:**

The MJS width increased approximately 15% from an initial baseline testing value of .49 cm±.06 to .56 cm±.02 after 16 games or 6 weeks [F(1,10)= 8.51, p=.015]. The covariates of total innings pitched [F(1,10) = 0.19 p = 0.68] and year of participation [F(1, 10) = 0.11 p = 0.75], were not significant factors in the change of MJS width over time.

**CONCLUSIONS:**

The results of this investigation demonstrate that MJS width and UCL integrity can be assessed accurately using diagnostic ultrasound during a valgus stress test. Moreover, these data indicate that total innings pitched during a season and year of participation did not have an influence on the MJS width. Further research is recommended to perform multiple imaging testing throughout the entire year (Fall and Spring seasons) to determine specific time points at which MJS width changes in collegiate baseball pitchers.

**3425 Board #330 June 2 2:00 PM - 3:30 PM  
Assessing UCL Width during Valgus Load for College Baseball Pitchers using Ultrasound Imaging**

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Injuries to the Ulnar Collateral Ligament (UCL) of the elbow are common in overhead throwing athletes. A repetitive valgus force during the throwing motion places significant stress on the UCL. More research needs to be conducted to investigate new methods to assess potential thickening of the anterior bundle of the UCL in order to understand ligament changes that may occur throughout the season. **PURPOSE:** To examine the reliability of ultrasound imaging measurements of UCL width at 2 different anatomical locations using 5Nm valgus stress; and to determine if a difference in ligament width exists between the two measurements 4 weeks apart within the season.

**METHODS:**

Thirteen Division I college men's baseball pitchers participated with a mean age of 20.4 ± 1.45 SD) and body mass index (BMI) 24.56 ± 1.78 SD). Ultrasound images were obtained of the anterior band of the UCL on the participant's throwing arm using a GE LOGIQ E ultrasound unit with a linear probe at 12Mhz. Participants were placed in a supine position with a wedge placed underneath their forearm to maintain their elbow position at a 30 deg. flexion angle. A 5 Nm valgus stress was applied 20 centimeters distal to the medial epicondyle. Measurements at the mid substance and the apex of the trochlea were taken at the beginning of the baseball season and then again 4 weeks later. Three images were measured during each session.

**RESULTS:**

Intra-rater reliability as expressed by ICC (3, 3) was .929 (SEM= 0.18mm) & .935 (SEM= 0.20mm) for the apex of trochlea measurement site and .861 (SEM= 0.22mm) & .920 (SEM=0.16mm) for the mid-substance measurement site, indicating excellent intra-rater reliability. There was no difference between the measurements obtained on the two testing dates (Apex of trochlea mean width 2.90mm & 2.92mm; t= -.155; p ≥ 0.05) and (Mid-substance mean width 4.49 mm & 4.44 mm; t= .571; p ≥ 0.05)

**CONCLUSIONS:** Excellent intra-rater reliability was found at all four measurement sites. There was no significant difference in UCL width from the beginning of the season and one-month into the season. Further research is recommended to perform multiple imaging sessions throughout the year to determine the long term physiological effects of overhead throwing on the anterior band of the UCL and to study the connection between UCL width changes, tissue quality, and injury risk.

**3426 Board #331 June 2 2:00 PM - 3:30 PM  
Epidemiological Study of Achilles Tendon Morphology Using Ultrasound Tissue Characterization Technology**

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(No relationships reported)

Ultrasound tissue characterization (UTC) imaging is a novel technology to objectively quantify tendon structural integrity. Previous UTC studies have primarily been performed in small, homogeneous samples, and varied in analysis parameters. No studies to date have examined a large, asymptomatic population.

**PURPOSE:** To characterize asymptomatic Achilles tendon (AT) structure in an adult population, identify factors that may be associated with tendon structure variation as measured by UTC, and provide a foundation for future research. **METHODS:** 575 asymptomatic subjects (male: 217, female: 291) were recruited. Each subject completed a medical history questionnaire and underwent UTC scanning of the right

AT. The motorized tracking device moved an ultrasound probe along the long axis of the AT capturing 598 transverse images at intervals of 0.2 mm over 12 cm. UTC algorithms quantified the stability of pixel brightness over every 17 contiguous images into four echotypes (ET): (I) aligned tendon bundles, (II) waving tendon bundles, (III) mainly fibrillar tissue, and (IV) mainly amorphous matrix. A region of interest (ROI) was selected from the calcaneus to the musculotendinous junction. Tendon borders were outlined manually in the transverse view at intervals no greater than every 25 frames (0.5 cm) across the ROI. Contours were interpolated to generate average percentages (%) of each ET for the total tendon volume. 67 subjects were excluded due to poor quality scans or not meeting inclusion criteria, resulting in 508 subjects in final analysis. **RESULTS:** Average ET % for the volume was: I-65.73% (SD±6.61, range 35.29-80.17), II-32.00% (SD±6.47, range 18.41-62.48), III-1.74% (SD±0.85, range 0.54-6.22), and IV-0.57% (SD±0.45, range 0.07-3.59). Differences between subgroups were compared and p-values <0.05 were considered significant. Higher % of ET I and lower % of ET II were associated with age 50-65 years old, male gender, African American race, and hypertension. Higher % of ET III was associated with age 50-65 years old, BMI>30, diabetes, and COPD. **CONCLUSION:** This work provides a baseline ET distribution that can be used in future AT research. We have shown numerous associations between tendon morphology and patient demographics/health that begin to help stratify differences in asymptomatic Achilles tendons.

**3427 Board #332 June 2 2:00 PM - 3:30 PM  
Micro-vascular Blood Flow During Post-Occlusive Reactive Hyperemia Assessed By Diffuse Correlation Spectroscopy**

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**PURPOSE:** The purpose of this investigation was to determine if Diffuse Correlation Spectroscopy (DCS) provides a reproducible measure of micro-vascular blood flow during post-occlusive reactive hyperemia (PORH). Previous techniques utilized to assess forearm muscle blood flow include brachial artery blood flow and Near Infrared Spectroscopy (NIRS). DCS provides a novel ability to examine red blood cell (RBC) flux within the muscle microvasculature. We hypothesized that DCS would provide a reproducible measure of muscle microvasculature RBC flux during PORH.

**METHODS:** 7 healthy male subjects (25.9 ± 4 yrs) performed 3 trials of brachial artery PORH tests. The DCS probe was placed on the *flexor digitorum superficialis* m. of the cuffed arm and provided Blood Flow Index (BFI). Brachial artery blood flow was assessed using Doppler Ultrasound to provide time-averaged maximum velocity (TAMAX). Following a 10 min supine rest period baseline measurements were performed for 1 min at which time a pneumatic cuff was inflated to at least 250 mmHg for 5 minutes. Measurements continued to be made for the 5 min of occlusion and 3 min post cuff release. The subjects were given 10 min rest between trials.

**RESULTS:** The peak TAMAX of the brachial artery for PORH1, PORH2, and PORH3 occurred at 7.3 ± 3.4, 6.0 ± 2.4, and 6.4 ± 2.7 sec respectively (p=0.397). The peak in BFI for PORH1, PORH2, and PORH3 occurred at 25.6 ± 4.5, 26.4 ± 8.3, and 22.3 ± 3.5 sec respectively (p=0.311). The time to peak for TAMAX was significantly different from the time to peak in BFI (p<0.001).

**CONCLUSIONS:** Similar time to peak for BFI across trials indicates that the DCS provides a reproducible signal of muscle microvasculature blood flow during PORH conditions. We speculate that the significant difference between time to peak for TAMAX and BFI may be due to compliance between the brachial artery and the microvasculature.

**F-66 Free Communication/Poster - Weight Control**

Friday, June 2, 2017, 1:00 PM - 6:00 PM  
Room: Hall F

**3428 Board #333 June 2 3:30 PM - 5:00 PM  
Sugar-Sweetened Beverages And Short-duration Exercise On Glycemic Response And Subjective Appetite In Young Boys**

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(No relationships reported)

**PURPOSE:** Sugar-sweetened beverage consumption is thought to be a contributor to weight gain through its effects on the control of food intake and glucose homeostasis. It has been suggested that energy from sugar-sweetened caloric beverages bypass

physiologic systems regulating food intake, leading to weight gain. Despite a lack of reported evaluation, short-duration exercise is promoted in schools as a means of achieving energy balance and glucose homeostasis. The purpose of the present study was to investigate the interaction between sugar-sweetened beverage consumption and short-duration exercise on glycemic response and subjective appetite in young boys. **METHODS:** Eight normal weight boys (age: 11.25 ± 0.7 years) consumed isovolumetric amounts (240mL) of either a commercial fruit drink or 1% chocolate milk, matched for available carbohydrates (25g) two hours after a standardized breakfast. The boys then exercised on a motorized treadmill at their ventilatory threshold or sat quietly for 15min, followed by 45min of quiet sitting. Subjective appetite and capillary blood glucose were assessed at baseline, and at 15 and 60min during the test condition. **RESULTS:** There was a beverage (fruit drink vs. chocolate milk) x test condition (exercise vs. rest) x time (0, 15, 60min) interaction for blood glucose response (p<0.01). There was a main effect of beverage on glucose response (p<0.01). Exercise increased subjective average appetite to 60min compared to quiet sitting (p<0.05). **CONCLUSIONS:** Fifteen minutes of moderate-intensity exercise attenuates the rise in blood glucose following sugar-sweetened beverage consumption. Chocolate milk has the lowest glycemic response, which may be due its milk protein and fat content and effect on gut hormone release. Further investigations are required to determine whether increased subjective appetite following short duration exercise would result in greater next-meal food intake.

a standard diet (35% fat-derived Kcal) or a high fat-diet (HFD), (70% fat-derived Kcal), as follows: SS, SVPA, SET, HS, HVPA and HET, during 17 wks. VPA groups had free access to running wheel throughout the entire protocol. After 9 weeks of HFD, SET and HET animals were submitted to 8-wks of ET on treadmill while maintained dietary treatments. Plasma non-esterified fatty acid (NEFA), glycerol and insulin levels were determined and epididymal white adipose tissue (eWAT) was used to determine gene and protein expression of AQP7 and fatty acid translocase (FAT/CD36). Diet and exercise effects were performed using 2-way ANOVA. **RESULTS:** The relative caloric intake was constant between groups. HFD increased visceral adiposity index (9.0±0.2 vs. 11.8±0.4; p<0.0001) and adipocyte area mean (3716.1±301.4 vs. 5348.6±471.5; p<0.001), ET reduced these obesity-related anatomical features (p<0.001). Both AQP7 and FAT/CD36 protein and gene expression remained unchanged after HFD regimen. VPA decreased plasma glycerol levels (12.6±0.8 vs. 12.5±0.6; p<0.001) and eWAT AQP7 gene expression (p<0.001) in S diet-fed animals and had no impact neither on plasma NEFA levels nor FAT/CD36 protein content. Eight-wks of ET decreased NEFA (SS vs. SET, 16.4±0.5 vs. 12.0±0.4; HS vs. HET, 14.7±0.7 vs. 10.8±0.7, p<0.001) and glycerol (SS vs. SET, 17.4±0.7 vs. 12.5±0.6; HS vs. HET, 15.6±0.5 vs. 10.3±0.9; p<0.001) plasma levels. ET decreased gene and protein expression of AQP7 (p<0.001) in eWAT in both diet types and increased FAT/CD36 gene (p<0.001) in SET group and its protein expression (p<0.001) in both diet types. **CONCLUSION:** Our data suggest that 8-wks of ET decreased AQP7 expression, which might play an important role preventing lipid overaccumulation in visceral adipose tissue of obese rats. Supported by: UID/DTP/00617/2013; POCI-01-0145-FEDER-016690

3429 Board #334 June 2 3:30 PM - 5:00 PM  
**Self-monitoring As A Predictor For Weight Loss In A Family-based Pediatric Obesity Treatment Program**  
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 (No relationships reported)

3431 Board #336 June 2 3:30 PM - 5:00 PM  
**Effects Of Intermittent Periods Of Severe Negative Energy Balance On Weight Maintenance During US Special Operations Forces Training**  
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 (No relationships reported)

Family-based pediatric obesity treatment programs for children in the 95<sup>th</sup>-99<sup>th</sup> BMI percentile are suggested to be comprehensive and multidisciplinary to change behaviors and decrease weight. Self-monitoring (SM) has shown to be an effective strategy in child weight loss. **PURPOSE:** To determine if child and parent SM of weekly nutrition (NUTR), physical activity (PA), and body mass (BM) predict weight loss during a 12-week pediatric obesity treatment program. **METHODS:** 51 children (age: 9.8 ± 2.3 years, BMI percentile: 98.0 ± 1.3), 45 mothers (age: 41.5 ± 6.2 years), and 37 fathers (age: 41.5 ± 6.2 years) participated in 12 weekly healthy living education sessions. SM scores were determined as the number of weeks participants logged energy intake (SM-NUTR), monitored steps per day (SM-PA), and weighed-in (SM-BM) over the 12 weeks. A sum score (SM-SUM) of the three SM components was created. Stepwise multiple regression models were used to predict parent and child weight loss from SM scores. **RESULTS:** In 12 weeks, children lost 5.1 ± 4.4% of BM, mothers lost 5.3 ± 8.0% of BM, and fathers lost 8.2 ± 4.7% of BM. SM-SUM was 79% for fathers, 81% for children, and 88% for mothers. Table 1 represents Pearson correlation coefficients between percent body mass loss and self-monitoring scores.

Physically active individuals often fail to meet energy requirements during sustained periods of increased physical activity, resulting in negative energy balance. Failure to increase energy intake during periods of high energy expenditure may compromise body mass and subsequent performance. Whether individuals adequately restore body mass between intermittent periods of severe negative energy balance during long-term training is not well characterized. **PURPOSE:** To examine energy balance and changes in body mass during US Special Operations Forces (SOF) training. **METHODS:** Energy expenditure (EE, doubly labeled water), energy intake (EI, 24 h recalls), energy balance (EB, intake - expenditure) and body mass were measured in 22 US Marines (mean ± SD, 25 ± 2 y, 86 ± 10 kg) during the 4 most physically demanding phases of a 261 d SOF training program [days 15-29 (I), 115-123 (II), 191-201 (III), and 243-261 (IV)]. **RESULTS:** EE was highest during phase II (6376 ± 712 kcal/d) compared to phase I (4011 ± 475 kcal/d), III (4189 ± 476 kcal/d), and IV (3735 ± 314 kcal/d) (P < 0.05). EI was lowest during phase I (300 ± 0 kcal/d) compared to phase II (2410 ± 338 kcal/d), III (2816 ± 488 kcal/d), and IV (2702 ± 738 kcal/d) (P < 0.05). EB was more negative during phase I (-3711 ± 475 kcal/d) and II (-3966 ± 776 kcal/d) compared to phase III and IV (P < 0.05). Body mass was lost during phases I, II, and IV, and the degree of body mass lost was equivalent between phase I (6.5 ± 1.5%; 5.6 ± 1.7 kg) and phase II (5.8 ± 2.0%; 4.9 ± 1.9 kg), and greater than phase IV. Initial body mass predicted the loss of body mass (r = -0.67, P < 0.05) during phase I. Body mass did not change during phase III. Body mass was restored before the start of each subsequent phase and was not different between the start (86.4 ± 9.8 kg) and end of the 261 d training (86.7 ± 9.0 kg). **CONCLUSION:** These data suggest that well-trained Marines adequately compensate EI to restore body mass between intermittent periods of severe negative EB. Supported by U.S. Army Medical Research and Materiel Command The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

Table 1. (*p<0.05)	Child % BM loss	Mother % BM Loss	Father % BM Loss
SM-NUTR	r = 0.33*	r = 0.41*	r = 0.49*
SM-PA	r = 0.20	r = 0.36*	r = 0.17
SM-BM	r = 0.13	r = 0.38*	r = 0.15
SM-SUM	r = 0.34*	r = 0.49 *	r = 0.36*

Stepwise multiple regression models suggested that Child's SM-SUM accounted for 19% of the variance in Child's % BM loss after 12 weeks (R<sup>2</sup>=0.19, p<0.05). Mother's SM-NUTR score (R<sup>2</sup>=0.47, p<0.05) and Child's SM-SUM score (R<sup>2</sup>=0.08, p<0.05) accounted for 55% of the variance in Mother's % BM loss (p<0.05). Father's SM-NUTR score accounted for 29% of the variance (R<sup>2</sup>=0.29, p<0.05) in Father's % BM loss. **CONCLUSION:** SM-NUTR, SM-PA, and SM-BM all appear to play a role with family weight loss, with SM-NUTR being most influential. Continuation of self-monitoring post-intervention and its influence on weight loss should be examined.

3432 Board #337 June 2 3:30 PM - 5:00 PM  
**Retrospective Analysis Of Weight Loss Relative To Protein Intake During Short-term Exercise Training In Women**  
 Conrad P. Earnest, FACSM<sup>1</sup>, Brittanie Lockard<sup>1</sup>, Claire Baetge<sup>2</sup>, Mike Greenwood<sup>1</sup>, Richard B. Kreider, FACSM<sup>1</sup>. <sup>1</sup>Texas A&M University, College Station, TX. <sup>2</sup>University of Texas at San Antonio, San Antonio, TX.  
**Reported Relationships:** C.P. Earnest: Salary; Nutrabolt. Contracted Research - Including Principle Investigator; Catapult Health and Naturally Slim.

3430 Board #335 June 2 3:30 PM - 5:00 PM  
**Effects Of Physical Exercise On The Modulation Of Aquaglyceroprotein 7 From Visceral Adipose Tissue**  
 Jorge Beleza, Sílvia Rocha-Rodrigues, Inês O. Gonçalves, António Ascensão, José Magalhães. *Faculty of Sports, University of Porto, Porto, Portugal.*  
 (No relationships reported)

A role for aquaglyceroprotein 7 (AQP7) in the control of lipid accumulation in white adipose tissue (WAT) has been hypothesized; however limited information is available regarding the impact of physical exercise. **PURPOSE:** We aimed to analyze the role of voluntary physical activity (VPA) and endurance training (ET) on WAT AQP7 expression of HFD-fed rats. **METHODS:** Male Sprague-Dawleys rats were assigned into sedentary (S), VPA and ET groups fed an isoenergetic Lieber-DeCarli-liquid diet:

**PURPOSE.** To retrospectively examine the effects of circuit weight training (10-wk) in 663 sedentary, overweight/obese women (age 46±y, BMI 34.85 ± 6.17 kg/m<sup>2</sup>) on weight loss, anthropometry and indices of cardiovascular health relative to PRO ingestion.

**METHODS.** Eight exercise-training studies performed from 2002–2014 were examined relative to tertiles of PRO ingestion (Low, <0.8 g/kg/d; Moderate; >0.8–1.2 g/kg/d; High >1.2 g/kg/d). The Primary outcome is clinically significant weight loss (CSWL, 5%). Secondary outcomes include anthropometry and measures of cardiovascular health. Data were analyzed using GLM adjusted for age, study and respective baseline values. Chi-square and adjusted residual analyses were used to determine categorical differences.

**RESULTS.** Protein ingestion was: Low (n=278; 0.65 g/kg/d ± 0.12; range 0.24–0.80), Moderate (n=225; 0.98 g/kg/d ± 0.12; range 0.891–1.19) and High (142 (n=142; 1.66 g/kg/d ± 0.42; range 1.20–3.28). Weight change was: Gained weight (12%; 1.01 kg, 95% CI, 0.24, 1.78), exhibited non-CSWL (50%; -1.81 kg, 95% CI, -2.04, -1.59) and achieved CSWL (39%; -7.17 kg (95% CI, -7.42, -6.92). Post-hoc assessment showed that High PRO consumers did not gain a significant amount of weight (0.70 kg, 95% CI, -0.42, 1.81), while Low (0.97 kg, 95% CI, 0.30, 1.64) and Moderate PRO consumers did (1.36 kg, 95% CI, 0.84, 1.89). No other significant differences were observed for weight loss or lean body mass relative to PRO tertiles. Interestingly, 57% of those consuming higher PRO (1.66 ± 0.42 g/kg/d) achieved CSWL vs. ~33% in low (0.65 g/kg/d) and moderate PRO (0.98 g/kg/d ± 0.12) consumers (*P-for-trend*, 0.001). Further comparison demonstrated that Low PRO consumers were significantly unlikely to achieve CSWL (*adjres* = -3.1), while those ingesting High PRO were significantly more likely to achieve CSWL (*adjres* = 4.9).

**CONCLUSION.** Despite the lack of difference for magnitude of weight loss between PRO groups, high PRO consumers were significantly more likely to achieve CSWL during a short exercise intervention consisting of resistance and aerobic training. Equally, higher PRO consumption may offset the magnitude of weight gain vs. lower PRO intakes if weight loss is not achieved.  
Sponsor: Curves International

3433 Board #338 June 2 3:30 PM - 5:00 PM  
**Effect Of Fat-sugar Snacking, With And Without Exercise Training, On Body Composition And Cardiometabolic Fitness**

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(No relationships reported)

**PURPOSE:** Diets high in fat and sugar have been implicated in the pathogenesis of obesity, diabetes and cardiovascular disease. Exercise aids in the prevention of weight/fat gain, and may prevent adverse cardiometabolic changes during periods of energy excess. We examined the interactions of fat-sugar snacking, with and without exercise training, on anthropometry, oral glucose tolerance and cardiorespiratory fitness in overweight and obese men. **METHODS:** Twenty-seven, healthy overweight/obese (BMI >25 kg/m<sup>2</sup>) men were fed a fat-sugar snack (2 donuts per day; ~600 kcal), 6 days/wk for 4 wks, while being asked to maintain their habitual diet. In addition, all participants were randomized to one of three groups: sedentary Control or isocaloric supervised exercise (250kcal/session, 4 days/wk for 4 wks): either moderate-intensity continuous training (MICT) (50% VO<sub>2</sub>peak), or high-intensity interval training (HIIT) (90–95% peak heart rate). A two-way repeated measures ANOVA was used to assess changes in body composition, oral glucose tolerance and cardiorespiratory fitness between and within groups. **RESULTS:** Body weight (Pre: 96.0±7.7kg, Post: 97.4±7.9kg, p=0.002) and lean mass (Pre: 64.2±4.9kg, Post: 65.1±4.7kg, p=0.02) increased significantly in HIIT and were unchanged in MICT. Trends for an increase in body weight (Pre: 93.1±11.8kg, Post: 94.0±12.8kg, p=0.07) and lean mass (Pre: 61.1±5.9kg, Post: 61.8±6.5kg, p=0.11) were observed in Control. Fat mass was unchanged in control and MICT, with a trend for increase in HIIT (Pre: 28.3±5.3kg, Post: 28.9±5.3kg, p=0.11). Glucose AUC (mg/dl 120 min) during the 2-h OGTT improved significantly in MICT (Pre: 3,801±2,453, Post: 2,518±2584, p=0.01) and Control (Pre: 5,666±2826, Post: 4,214±2,194, p=0.002) with no change in HIIT. VO<sub>2</sub>peak (L/min) increased significantly in both HIIT (Pre: 3.21±0.49, Post: 3.60±0.49) and MICT (Pre: 3.06±0.73, Post: 3.36±0.79) (p<0.001), with no change in Control. **CONCLUSIONS:** The addition of ~14,500 kcal of fat-sugar snacks in the form of donuts over a 4-week period was insufficient to induce deleterious changes in body composition in overweight/obese young men. Surprisingly, oral glucose tolerance was improved in Control. MICT may be preferable to HIIT during extended periods of snacking on foods comprised mainly of fat and sugar.

3434 Board #339 June 2 3:30 PM - 5:00 PM  
**Dose Response Effect of a Whey Protein on Appetite Profile, Energy Metabolism and Intake**

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(No relationships reported)

**PURPOSE:** To determine the effects of high (HWP) and low whey protein (LWP) at breakfast [TM1] on appetite profile, thirst, energy metabolism and subsequent energy intake. **METHODS:** Seventeen healthy participants (age 27 ± 7 y, BF 21.5 ± 6.9%, BMR 1741 ± 391 kcal/day) consumed one of three smoothies at breakfast on three separate days in randomized order. The energy intake from smoothies consisted of control (10% fat and 90% carbohydrate), LWP (20% whey protein, 10% fat and 70% carbohydrate) and HWP (40% whey protein, 10% fat and 50% carbohydrate), followed by an *ad libitum* lunch 3 hours later. Appetite profile was completed using a visual analog scale (VAS) before, at 0, 60, 120, and 180 minutes. Resting metabolic rate (RMR) 30 minutes before and thermic effect of a meal (TEM) at 45–60, 105–120, and 165–180 minutes were measured by indirect calorimetry to determine oxygen consumption (VO<sub>2</sub>) and respiratory quotient (RQ). The accepted level of significance was set at p < 0.05. **RESULTS:** Energy intake at lunch was higher (p = 0.02) following control (770 ± 289 kcal) compared to HWP (654 ± 252 kcal) and LWP (671 ± 217 kcal). Participants hunger, desire to eat, and perceived amount were significantly higher, whereas, satiety and fullness were lower after control compared to HWP and LWP. A significant difference over time was observed in thirst and cravings of sweet, salty savory and fatty, however there were no significant condition by time interactions. Additionally, a lower RQ (p < 0.001) and higher VO<sub>2</sub> (p < 0.001) was observed for HWP (4.3 ± 0.6, 4.2 ± 0.5, and 4.0 ± 0.5 ml · kg<sup>-1</sup> · min<sup>-1</sup>) compared to LWP (4.1 ± 0.6, 3.9 ± 0.5, and 3.5 ± 0.5 ml · kg<sup>-1</sup> · min<sup>-1</sup>) and control (4.0 ± 0.6, 3.7 ± 0.5, and 3.5 ± 0.4 ml · kg<sup>-1</sup> · min<sup>-1</sup>) at 45–60, 105–120, and 165–180 minutes, respectively. **CONCLUSION:** Breakfast with HWP and LWP were rated as more satiating coinciding with reduced subsequent energy intake at lunch. In addition, these results suggest a dose-response effect of whey protein on energy metabolism over 3 hours following breakfast.

3435 Board #340 June 2 3:30 PM - 5:00 PM  
**Sex Differences In Total Pyy And Glp-1 After Moderate-intensity Continuous And Sprint Interval Cycling Exercise.**

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(No relationships reported)

Exercise is often used as a weight-loss strategy, however, exercise interventions are sometimes less effective in females than males for improving body composition. One possible explanation is that exercise affects appetite regulating hormones differently in males and females such that females increase post-exercise energy intake. Recently, sprint interval training was shown to reduce body fat in females despite relatively low energy expenditure during exercise. **PURPOSE:** To examine sex differences in circulating anorexigenic hormones and perceived hunger following an acute session of sprint interval training (SIT) and moderate-intensity continuous training (MICT). **METHODS:** Twenty-one active participants (11 females in early follicular phase) participated in 3 sessions in a randomized crossover design: 1) MICT, 30 min cycling at 65% VO<sub>2</sub>max; 2) SIT, 6 x 30 sec "all-out" cycling sprints with 4 min recovery periods (27 min total); and 3) control (CTRL; no exercise). Participants arrived at the lab fasted and consumed a standardized breakfast 1 hour before exercise. Blood samples were collected pre-exercise, immediately and 90 min post-exercise for the measurement of total peptide tyrosine tyrosine (PYY) and glucagon-like peptide-1 (GLP-1). Subjective perceptions of hunger were assessed using a visual analogue scale before breakfast and before all blood draws. Hormone data were analysed as change in concentration from baseline. Changes in hormones and hunger were analysed using a 3 x 3 x 2 mixed factor (session x time x sex) repeated measures ANOVA. **RESULTS:** Increases in GLP-1 and PYY were greater during the MICT session (P<0.05) and SIT session (P<0.01) compared to CTRL. Total PYY increased more immediately post-exercise in males than females (P=0.030). GLP-1 increased only in females following MICT (P=0.034) and SIT (P=0.024) compared to CTRL. Perceived hunger was lower immediately post-MICT (P=0.016) and SIT (P=0.006) compared to CTRL, but there were no sex differences. **CONCLUSION:** Total PYY and GLP-1 appear to respond similarly to submaximal and supramaximal exercise, however, these results suggest they may respond differently to exercise in males and females over 90 min. The post-exercise hormonal response we observed in females would not be expected to create a compensatory increase in energy intake.

3436 Board #341 June 2 3:30 PM - 5:00 PM  
**12-Week Treadmill Program Elicits Low Energy Availability Without Changes in Serum Testosterone in Male Rats**

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 (No relationships reported)

Male endurance athletes have been reported to have lower testosterone concentrations than their sedentary counterparts, which may have detrimental health effects including increased risk of musculoskeletal injury and fertility complications secondary to decreased sex hormone production. Cholesterol supplementation has been reported to increase serum sex hormones. **PURPOSE:** The purpose of this study was to investigate whether a treadmill endurance exercise program would cause exercise-induced reproductive dysfunction in male rats and assess the impact of increased dietary cholesterol on sex hormone levels. **METHODS:** Male Sprague-Dawley Rats (n=20) were randomly assigned to a control group (C) or an exercise training group (EX) that performed treadmill running 40 min/day, 6 days/wk for a duration of 12 wks. At study midpoint (wk 6), rats were randomized to receive either a High-Cholesterol (HC) Diet (n=10) or remain on standard purified diet (n=10). Fasting blood samples were collected at baseline, wk 6, and wk 12. Serum testosterone (T) and leptin were measured via ELISA. Serum lipids (TC, HDL, LDL, TG) were measured via clinical chemistry analyzer. Body weight (BW) and voluntary food intake (EI) were measured weekly. **RESULTS:** At end of wk 6, EX had significantly lower BW (494.3±34.7g versus 565.3±47.9g, p=0.001), mean daily EI (77.5±3.5 kcal versus 91.6±5.2 kcal, p<0.001), and serum leptin (90.8±40.1 pg/mL versus 635.7±225.6 pg/mL, p=0.001) in comparison to C. No difference was observed between EX and C in serum T (12.7±6.0 ng/mL versus 12.9±5.8 ng/mL). At end of wk 12, exercise groups (EX and EX+HC) had significantly lower BW (539.4±40.6g versus 645.1±60.7g, p<0.001), mean daily EI (81.7±2.9 kcal versus 87.8±1.9 kcal, p<0.01), and serum leptin (132.8±110.1 pg/mL versus 519.2±300.8 pg/mL, p=0.001) in comparison to C and C+HC. HC diet did not have significant impact upon serum T in comparison to standard diet (3.8±3.4 ng/mL versus 4.9±2.4 ng/mL). **CONCLUSIONS:** Despite low energy availability, exercise-induced reproductive changes may not occur in training programs <12 weeks. Lower EI observed in exercise groups despite higher energy expenditure may indicate that low energy availability in endurance-trained individuals may be inadvertent. Supported by American Egg Board Graduate Fellowship Research Grant

3437 Board #342 June 2 3:30 PM - 5:00 PM  
**The Effect of Increased Water Intake on Food Consumption**

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 (No relationships reported)

Increased water consumption has potential to promote weight loss but previous interventions have been equivocal. **Purpose:** To examine the effects of hydration on energy intake at lunch and the remainder of the day. **Methods:** Ten males and 12 females attended 3 study sessions where they drank either 1, 3, or 4 bottles (500 ml) of water throughout the morning before lunch. Each participant was their own control (drinking one bottle), hydrated (three bottles), and overhydrated (four bottles). Food items were weighed and arranged on a tray in large portion sizes to allow for their desired amount of lunch intake. Participants rated hunger on a visual analog scale at three different time points before lunch and once after. When the participants selected to stop eating, food was reweighed to calculate caloric intake. Participants kept a food and beverage log for the remainder of the day. The detailed logs were then reviewed with the participant at the next visit and entered into the Nutritionist Pro software. Repeated-measures ANOVA determined if there was an effect between level of hydration and the amount of energy consumed at lunch and for the remainder of the visit day. **Results:** Hydration status, based on water consumed throughout the morning, significantly influenced energy intake for the remainder of the day. Hydrated males, males who drank three bottles of water throughout the morning, significantly increased energy consumed the rest of the day compared to when they were in the control group, 1686 ± 256 kcal vs. 990 ± 203 kcal (p=0.027). When energy intake at lunch was taken into account there was an effect of hydration status on daily energy intake. For women, energy consumed at lunch and the remainder of the day was not significant when compared with water intake (p=0.081 vs p=0.074, respectively). **Conclusion:** Drinking water throughout the morning had no effect on energy intake during lunch. Furthermore, energy intake was not suppressed even when 2L of water (4 bottles) was consumed over a 3.5-hour period. Males increased the amount of energy consumed for the remainder of the day when in the hydrated condition. Increased hydration may have adverse effects on energy intake due to the volume of water consumed prior to a meal.

3438 Board #343 June 2 3:30 PM - 5:00 PM  
**Effects of Moderate Consumption of Non-Nutritive Sweeteners on Glucose Tolerance and Body Composition in Rats**

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 (No relationships reported)

**Introduction:** To combat the effects of excess energy intake on obesity and glucose intolerance, non-nutritive sweeteners (NNS) have been used as a replacement for more energy dense traditional sweeteners. However, limited research has been completed regarding the metabolic effects of moderate consumption of non-nutritive sweeteners.

**Purpose:** The purpose of this study was to determine the effect of moderate consumption of NNS (aspartame and sucrose) on glucose tolerance and the insulin response to an oral glucose load, and on body composition in an animal model.

**Methods:** Male Sprague-Dawley rats (N=30) were given aspartame (ASP, n=10, 8.5 mg/kg/day) or sucralose (SUC, n=10, 2.6 mg/kg/day) in drinking water, or untreated water as a control (n=10) for 6 weeks. In the morning, after overnight fasting, rats underwent an oral glucose tolerance test (2g/kg 50% dextrose w/v by gavage). Blood was obtained by tail clip; glucose was measured by glucose meter and insulin was measured by radioimmunoassay. Following euthanasia, lean mass and fat mass were determined by dual energy x-ray absorptiometry; epididymal fat pads were removed and weighed.

**Results:** No significant differences were found between groups in area under the curve for glucose or insulin response to an oral glucose load. Significant differences in serum insulin were seen 15 minutes after the glucose load between both the ASP (0.72 ± 0.06 ng/mL vs 0.94 ± 0.08 ng/mL, p=0.035) and SUC group (0.72 ± 0.07 ng/mL vs 0.94 ± 0.08 ng/mL, p=0.048) compared with the control. While percent body fat was not different between groups, epididymal fat pad mass was significantly higher in the ASP group compared with the control group (5.50 ± 0.34 g vs 4.55 ± 0.19 g, p=0.042), while the ratio of trunk fat to total fat was significantly lower in the SUC group compared with controls (0.49 ± .02 vs 0.60 ± .14, p<0.01).

**Conclusion:** Moderate consumption of aspartame or sucralose had no effect on percent body fat. Fifteen minutes following a glucose load, serum insulin was significantly lower in both NNS groups compared with the control, suggesting a potential suppression in insulin response. Both aspartame and sucralose altered body fat distribution. These results may have implications for addressing abdominal obesity.

3439 Board #344 June 2 3:30 PM - 5:00 PM  
**Evaluation of Weight Loss Advice from Pharmacists and Supplement Retailers**

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 (No relationships reported)

Approximately half of adult Americans report the desire to lose weight and 17 million take dietary supplements for the purpose of weight loss. People may seek weight loss advice where dietary supplements are sold including pharmacies and retail shops.

**PURPOSE:** The purpose of the study was to evaluate the effectiveness and safety of weight loss advice provided by pharmacists and retailers. A secondary purpose was to evaluate whether either recognized symptoms associated with serious cardiovascular concerns and if appropriate follow-up advice was given. **METHODS:** Two college-aged women of normal BMI individually visited 51 pharmacies and 22 retailers with a standardized script that included a desire to lose weight and the presentation of multiple cardiovascular disease symptoms including heavy chest, light-headedness, breathlessness, and a tingling jaw. Immediately upon departure, all pertinent advice given was recorded. **RESULTS:** Descriptive analyses revealed that only 47% of pharmacists and 9% of retailers suggested reducing energy intake and/or increasing energy expenditure for weight loss. Cardiovascular symptoms were correctly identified and directly addressed by 4% of pharmacists and 0% of retailers. Other interpretations of symptoms included asthma (n=4), dehydration (n=1), electrolyte imbalance (n=1), allergies (n=1), or vitamin deficiencies (n=1), but 75% of the time, symptoms were ignored entirely. Forty-nine percent of pharmacists and 100% of retailers recommended a total of 55 different supplements including diuretics, fat binders, and vitamins. Twelve percent of pharmacists and 95% of retailers recommended stimulants, which could be particularly harmful for a person with cardiovascular disease. **CONCLUSIONS:** Although pharmacists gave better weight loss advice than retailers with regard to both effectiveness and safety, both gave enough ineffective and unsafe advice that consumers should use extreme caution when interpreting weight loss advice from pharmacists and retailers.

3440 Board #345 June 2 3:30 PM - 5:00 PM  
**Awareness Levels of the Misuse of the 3500 Calorie Rule Predicting Long Term Weight Loss**

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 (No relationships reported)

Recently, a new rule has been suggested to replace the 3500 calorie rule to predict long term weight loss (WL) but whether practitioners are aware of this is not known. **PURPOSE:** To assess the awareness of recent facts related to the misuse of the 3500 calorie rule for predicting WL and to determine whether awareness differs by certification status, a person's training level and their perceived WL knowledge. **METHODS:** Students (S), faculty (F), and professionals (P) [n = 352, 68% female, 31 ± 13.5 years] responded to an anonymous online survey sent via email lists and social media platforms. Each participant responded yes or no regarding their awareness of 8 statements focused on the misuse of the 3500 calorie rule, compensation that takes place with WL, the recommendation of a new rule, and the nonlinear nature of WL. Participants reported current exercise and nutrition certifications and were grouped as certified or not certified. They also reported their level of WL knowledge on a 5 point Likert scale and were divided into 2 groups for analysis: very good or excellent (EX) knowledge vs good, fair and poor (Poor) knowledge. Chi squared analyses were used to test for differences in the proportions of respondents who were aware of each statement between knowledge, certification, and training level groups. **RESULTS:** The % who were aware of WL statements was lower in S (p<0.05) and ranged from 26.1 - 61.8% for S, 19.4 - 93.5% for F and 19.7 - 84.5% for P. The lowest awareness for all groups was regarding the new rule to predict WL and did not differ between groups (26.1%, 19.4%, and 19.7% for S, F, and P, respectively; p=0.48). For 7 of 8 statements, more of those with EX self-reported knowledge had an awareness (30.4 - 83.0%) of WL statements than those with Poor knowledge (18.4 - 63.3%; p<0.05). For 4 of the 8 statements, more of those who were certified (71.7 - 82.8%) had an awareness of WL statements than those without a certification (54.4 - 65.0%; p<0.05). **CONCLUSIONS:** S were the least aware of the newest developments in the misuse of the 3500 calorie rule while F were the most aware, though awareness of some concepts were low for all. Awareness levels were highest in those who self-reported EX knowledge. Those with certifications had higher awareness levels of some WL concepts. More dissemination is needed to raise awareness of WL concepts.

3441 Board #346 June 2 3:30 PM - 5:00 PM  
**Assessment of the Relationship Between Macronutrient Intake and Browning of White Fat in Adult Males**

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Research conducted in rodents and humans present conflicting results on the relationship between caloric intake and the browning of subcutaneous white adipose tissue (scWAT). For example, exercise combined with caloric restriction did not change browning indices measured from human scWAT samples. In another study, caloric restriction in mice resulted in the browning of both scWAT and visceral white adipose tissue. Few investigators, however, have examined the relationship between differences in macronutrient intake and browning processes of human scWAT. **PURPOSE:** The purpose of this study was to investigate the relationship between macronutrient intake and browning indices assessed from scWAT of healthy adult males. **METHODS:** Forty-six healthy adult males [age (years): 35.2±6.9, body mass index (BMI): 27.3±4.2 (kg/m<sup>2</sup>)] completed a 3-day dietary recall within one week, and had a scWAT biopsy done to assess the mRNA of uncoupling protein one (UCP1) - a direct measure of browning processes. mRNAs of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1α), peroxisome proliferator-activated receptor alpha (PPARα) and peroxisome proliferator-activated receptor gamma (PPARγ) that indirectly indicate browning processes of scWAT were also assessed. Carbohydrate (CHO), protein (PRO), and fat (FAT) intake data as a percentage of total caloric intake were used for analysis. Waist-to-hip ratio, body composition, and resting energy expenditure were also measured. **RESULTS:** Spearman's correlation coefficient revealed a moderate positive association between CHO and PPARγ (rho = 0.375, p = 0.01). CHO was also negatively associated with fat mass (assessed as a percentage of total body mass) (rho = -0.297, p = 0.04). No other significant associations were detected (p > 0.05). **CONCLUSIONS:** Carbohydrate intake as a percentage of total kilocalories was positively associated with PPARγ in scWAT from healthy adult males. It is, however, difficult to determine if the association between carbohydrate intake and

PPARγ indicates browning processes in scWAT given that the mRNA of UCP1 was not related to macronutrient intake. More research is needed to expand on these findings with the use of longitudinal intervention based studies.

3442 Board #347 June 2 3:30 PM - 5:00 PM  
**Liposomal Encapsulated Alpha-Lipoic Acid, Benfotiamine and Curcumin Prevent Overfeeding Mediated Increases in Waist Circumference**

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 (No relationships reported)

**PURPOSE:** To determine if liposomal (L) encapsulated alpha-lipoic acid (0.5g), benfotiamine (0.5g) and curcumin (2.0g) (ABC) would prevent the unfavorable metabolic consequences of sedentary high-fat overfeeding in healthy young adults. **METHODS:** 29 young (18-30 years), healthy, physically active men and women were randomly assigned to ingest placebo (n=9), ABC (n=10), or L-ABC (n=10) twice daily for 28 days. Between days 22 and 28 all participants abstained from their normal regular exercise and consumed a high calorie, high fat diet. **RESULTS:** On Day 29, circulating alpha lipoic acid was greater (p<0.01) in L-ABC (412±73 ng/mL) compared with ABC (154±33 ng/mL). During the sedentary high fat overfeeding, dietary intake was not different (p>0.6) between groups (~3,400 kcal/day; ~50% from fat). Sedentary high fat overfeeding increased (P<0.05) waist circumference in the placebo (+2.7±2.7 cm) and ABC (+3.3±2.0) groups but not the L-ABC group (+0.7±2.7). The magnitudes of increase (p<0.05) in body mass (1.7±0.3 kg), fat mass (0.7±0.2 kg), and blood pressure (3±1 mmHg) and decrease (p<0.05) in insulin sensitivity (Matsuda Index: -2.9±0.9) after overfeeding were not different between groups (all p>0.5). **CONCLUSIONS:** Liposomal encapsulated alpha-lipoic acid, benfotiamine and curcumin: 1) promoted alpha-lipoic acid bioavailability; and, 2) prevented sedentary high-fat overfeeding mediated increases in waist circumference in usually active healthy young adults. These data may have important public health implications for periods of inactive overconsumption such as during seasonal celebrations.

3443 Board #348 June 2 3:30 PM - 5:00 PM  
**The Effect Of High-intensity Interval Exercise In Hypoxia On Appetite Regulations In Female Athletes**

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 (No relationships reported)

**PURPOSE:** Effect of high-intensity interval exercise (HIIT) in hypoxia has been investigated recently. However, the effect of HIIT in hypoxia on appetite regulation among female athletes remains unclear. The present study aimed to determine the time-courses changes in appetite-regulating hormones, subjective feeling of appetite, and energy intake after HIIT in hypoxia in trained female athletes. **METHODS:** 15 female team sport athletes (age: 20.7 ± 0.2 years, height: 159.6 ± 1.7 cm, weight: 55.3 ± 1.4 kg, BMI: 21.7 ± 0.4) participated three trials on different days: either HIIT in hypoxia (HYP), HIIT in normoxia (NOR) or rest in normoxia (CON). We have collected data from 15 subjects, but three of 15 athletes were excluded for analyses (n = 12, age: 20.8 ± 0.2 years, height: 158.7 ± 1.9 cm, weight: 54.8 ± 1.3 kg, BMI: 21.8 ± 0.4) because the menstrual phase did not match among trials. Exercise trials (HYP, NOR) consisted of two successive sets of 8 repeated bouts of 6-s maximal sprint separated with 30-s rest. A 10-min rest was provided between sets. Blood sample were obtained to measure plasma acylated ghrelin, GLP-1 and other hormonal and metabolite concentrations before, immediately and 30 min after exercise. Time-course of changes of subjective feeling of appetite and fatigue were also measured following exercise. Energy and macronutrient intake during ad-libitum buffet test meal were evaluated 30 min after exercise or rest. **RESULTS:** Plasma acylated ghrelin concentrations were significantly decreased after exercise (P < 0.001), whereas a significant difference was not observed between HYP and NOR. Plasma GLP-1 concentrations were not altered significantly after exercise (P = 0.507), with no significant difference between HYP and NOR at any point (P = 0.242). Although absolute energy intakes in both HYP (634 ± 67 kcal) and NOR (597 ± 63 kcal) were significantly lower than CON (756 ± 63 kcal, P = 0.006), no significant difference was not observed between HYP and NOR. **CONCLUSIONS:** These results show that HIIT under hypoxic and normoxic conditions lowered plasma acylated ghrelin concentrations and energy intake, whereas these responses were not augmented by exposure to hypoxia during exercise.

3444 Board #349 June 2 3:30 PM - 5:00 PM

**Unexpected Weight Gain Following Long Term Increased Mvpa Is Linked To Elevated Respiratory Quotient**

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**Purpose:** Randomized controlled trials demonstrate that exercise alone, if completed in adequate amounts, will result in weight loss for most individuals but with large variation in amount. The purpose of the current study is to evaluate the role of respiratory quotient (RQ), which represents contributions in substrate oxidation of stored carbohydrates and fats, on weight change among young adults who increased their moderate-to-vigorous physical activity (MVPA).

**Methods:** Participants included 417 young adults; during the 12-month observation period, 114 participants increased their MVPA and were included in the subsequent analyses. Body composition was assessed via dual-energy X-ray absorptiometry, MVPA via arm-based activity monitor, self-reported energy intake (EI) via 24-hour dietary recalls, and RQ via indirect calorimetry; all were assessed every 3 months, except for RQ which was assessed every 6 months.

**Results:** Participants were classified according to 12-month weight change; weight loss (n=38; group mean±SD, -4.0±3.7 kg), weight maintenance (n=38; 0.3±0.8 kg), and weight gain (n=38; 2.9±1.4 kg). The weight maintenance and loss groups were subsequently combined. Between group analysis at baseline indicated no difference in body weight (P=0.13), fat mass (P=0.51), fat-free mass (P=0.29), MVPA (P=0.07), EI (P=0.8), or percent of carbohydrates in the diet (P=0.83). RQ was lower in the maintenance/loss group compared to the gain group (0.782 vs. 0.801, P=0.02). At 12-month follow-up, there was no between-group difference in MVPA (P=0.14), self-reported EI (P=0.83) or percent of carbohydrates (P=0.18). Total MVPA was significantly higher in the maintenance/loss group (103.7 vs. 78.1 min/day, P=0.05).

Linear modeling of fat mass change indicated a positive association with RQ at baseline (P=0.06) after adjustment for baseline values and changes in MVPA and EI. **Conclusion:** These results suggest that resting substrate oxidation may explain the unexpected body weight responses following increases in physical activity. These findings support previous research, which suggests that lower levels of fat oxidation, independent of changes in energy intake and physical activity, contribute to changes in fat mass.

3445 Board #350 June 2 3:30 PM - 5:00 PM

**Hypoxia-inducible Factor 2 Alpha Mediates Exercise-Induced Hypothalamic Glucose Sensing**

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(No relationships reported)

**PURPOSE:** The hypothalamus controls the energy homeostasis integrating of hormonal and nutritional signals. In this context, glucose plays a critical role in the control of energy balance acting in specific hypothalamic neurons. It has been demonstrated that the lost selective of glucose sensibility in the hypothalamic neurons are related to the hyperphagia and obesity. Recently, the hypoxia-inducible factor 2 alpha (HIF2α) have emerged as regulated important in maintenance of glucose sensibility in hypothalamic neurons. In this context, the maintenance of neuronal HIF2α function can be considered a determinate strategy for maintenance of lean phenotype. At the same time, the physical exercise is considered a main contributor to the control of body weight and energy expenditure. Thus, sought evaluate the effects of physical exercise on HIF2α protein levels and on glucose sensibility in the hypothalamus of rodents.

**METHODS:** Physical exercise, Western blot and stereotaxic surgery were combined to explore HIF2α protein levels and hypothalamic glucose sensibility. The intracerebroventricular (ICV) injection of glucose was performed to measure the food intake and the quantification of HIF2α pathway in hypothalamus of both lean and obese (diet-induced obesity) male *Wistar* rats. For statistical analysis were used the ANOVA one-way.

**RESULTS:** We observed the reduction of hypothalamic glucose sensitivity in obese mice, which was accompanied by a lower protein expression of HIF-2α, as well as reduction of prolyl hydroxylases (PHDs) and ubiquitin E3 ligase PVH, product Hoppel-Lindau (VHL) gene, when compared to the control group. Interestingly, we found that the exercise restored hypothalamic of HIF-2α expression and glucose sensitivity in obese rats.

**CONCLUSIONS:** Our preliminary results demonstrate that high-fat diet disrupts hypothalamic HIF-2α protein and affects the glucose sensitivity in neurons, contributing with hyperphagia. On the other hand, exercise increased HIF-2α protein levels in the hypothalamus and potentiated glucose sensitivity in obese rats, reducing the food intake.

3446 Board #351 June 2 3:30 PM - 5:00 PM

**The Effects of a Clinical Outpatient Behavioral and Nutritional Intervention Program on Body Mass**

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(No relationships reported)

The prevalence of obesity has increased drastically over the past few decades in the United States. While a balanced nutrition and exercise program are suggested, more clinical-based treatments may be implemented (i.e., bariatric surgery and behavioral/nutritional interventions). Behavioral/nutritional intervention programs have been shown to be successful at decreasing body mass in overweight and obese individuals. However, further research needs to be conducted to determine the most successful behavioral and/or nutritional intervention for overweight and obese individuals.

**PURPOSE:** The purpose of this study was to assess the effects of a clinical outpatient behavioral/nutritional intervention on body mass in overweight and obese individuals. **METHODS:** Forty-eight overweight (n=2) and obese (n=46) males (n=17) and females (n=29) [56 (13) yrs., height 1.70 (0.10) m., body mass 120.55 (33.83) kg, and BMI 41.45 (8.55) kg/m<sup>2</sup>] participated in this 15 week study. Participants self-selected one of two meal plans, offered through Healthy Management Resources, Decision Free or Healthy Solutions. The Decision Free meal plan required the consumption of 500-800 kilocalories per day through a minimum of five shakes or three shakes and two entrees. The Healthy Solutions meal plan required the consumption of 1,200 to 1,400 kilocalories per day through a minimum of three shakes, two entrees and five servings of fruits and vegetables. Both meal plans required regular physical activity of at least 2,000 kilocalories per week. Body mass was measured weekly. **RESULTS:** An independent samples t-test found no significant changes in body mass between the two meal plans. A paired samples t-test showed a significant decrease in the Decision Free meal plan pre- [125.71 (32.50) kg] vs. post-body mass [105.49 (27.01) kg] (t=11.688, p<.001) and the Healthy Solutions diet pre [115.40 (35.06) kg] vs. post-body mass [98.55 (29.88) kg] (t=12.452, p<.001). **CONCLUSIONS:** The results of this study support past research and suggests that behavioral and nutritional interventions are effective strategies for reducing body mass.

3447 Board #352 June 2 3:30 PM - 5:00 PM

**Do Weight Concerns Put Female Prisoners at Risk for Re-Offending?**

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Incarceration and substance abuse are two of the largest public health issues in America. Substance abuse is prevalent (80%) among imprisoned women; particularly stimulant use (e.g., methamphetamine) due to its appealing side effects including weight loss and increased energy. Ironically, newly abstinent from stimulant-type drugs during incarceration, metabolic activity and appetite suppression are removed and women experience significant amounts of unwanted weight. **PURPOSE:** Examine female prisoner's body weight, perceived weight concerns, and weight loss behaviors as risk factors for re-offending. **METHODS:** Prior to participation in a health and body image program, 364 female inmates completed questionnaires to assess drug history and weight concerns/behaviors. Height, weight and body fat (4-site skinfolds) were assessed and body mass index (BMI) calculated. **RESULTS:** Prisoners were adult (age=37.8±10.2y) and 83% were overweight or obese (BMI=30±5.8 kg/m<sup>2</sup>; body fat = 30.9±5.2%). Physical activity (PA) was low, with 29% self-reporting being sedentary and 19% reporting that most days they did no PA. Use of unhealthy weight loss methods were high, with participants reporting 'sometimes', 'often' or 'very-often' to the following behaviors: tobacco smoking (43%), methamphetamine (40%), energy drinks (36%), energy supplements (36%), diet pills (32%), starvation (19%), laxative use (12%), diuretics (10%), vomiting (9%) and enemas (4%). Overall, 60% of participants were concerned about weight gain in recovery, 45% were concerned that gaining weight could trigger a relapse, and 36% were concerned about using drugs

to lose weight after leaving treatment. **CONCLUSIONS:** Female prisoners were typically overweight or obese and used risky behaviors to manage weight, which may increase their risk of re-offending. Poor weight management behaviors, combined with a lack of PA, in this vulnerable and underserved population leads to “self-medication” to lose weight, which may lead to life-threatening eating disorders and other compensatory behaviors. Health, PA, nutrition and healthy body image programs are warranted in this population.

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3448 Board #353 June 2 3:30 PM - 5:00 PM

**Association Between Health-related Quality Of Life And Weight Loss, Fitness, And Physical Activity**

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Weight loss is associated with improved health-related quality of life (HRQOL); however, it is important to know whether change in physical activity or fitness that also occurs during the weight loss process influences this relationship.

**Purpose:** This study examined the associations between change in HRQOL and weight loss, fitness, and physical activity in response to a 12 month behavioral weight loss intervention.

**Methods:** Participants (N=280; Age=45.1±7.9 years, BMI=32.3±3.9 kg/m<sup>2</sup>) engaged in a 12-month behavioral weight loss intervention program. Participants were randomized to a reduced calorie diet (DIET), diet plus a moderate dose of physical activity (MOD-EX), or diet plus a high dose of physical activity (HIGH-EX). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. MOD-EX was prescribed physical activity that progressed to 150 min/wk with HIGH-EX progressed to 250 min/wk. Weight, fitness, physical activity, and HRQOL were assessed at 0 and 12 months.

**Results:** There was significant ( $p<0.05$ ) weight loss at 12 months ( $-10.2\pm 7.9$  kg;  $-11.1\pm 7.8\%$ ), with no significant difference between intervention conditions. HRQOL, measured by the SF-36, also significantly improved across 12 months ( $p<0.05$ ), with no significant difference between intervention conditions. Change in HRQOL was associated with change in weight ( $r=-0.35$ ,  $p<0.001$ ), percent weight change ( $r=-0.39$ ,  $p<0.001$ ), change in fitness ( $r=0.29$ ,  $p<0.001$ ), and change in physical activity ( $r=0.21$ ,  $p<0.001$ ). While somewhat diminished after controlling for change in fitness, the correlation between change in weight ( $r=-0.25$ ,  $p<0.001$ ) and percent change in weight ( $r=-0.29$ ,  $p<0.001$ ) remained significant. A similar pattern was shown when controlling for change in physical activity ( $r=0.34$ ,  $p<0.001$ ;  $r=0.38$ ,  $p<0.001$ ).

**Conclusions:** Weight loss across a period of 12 months is significantly associated with improved HRQOL in adults who are overweight or obese. It appears that change in fitness and physical activity partially mediate these associations. Thus, it appears that weight loss interventions should target improved fitness and physical activity to maximize improvements in HRQOL.

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