Cerebral blood flow is commonly assessed in the middle cerebral artery (MCA) as blood velocity, using non-imaging transcranial Doppler ultrasound (TCD). However, to accurately determine blood flow, both blood velocity and vessel diameter are critical components, and there is mounting evidence that the MCA is vasoactive.

**PURPOSE:** Therefore, the purpose of this study was to employ imaging TCD (ITCD), utilizing color flow and pulse wave velocity, as a novel approach to measure both MCA blood velocity and diameter to quantify cerebral blood flow. **METHODS:** ITCD was performed in rest in 9 healthy participants (7M/2F; 29.1±8 years) with sublingual nitroglycerin (NTG, 0.8mg) and without (CON). Measurements were taken for 2 minutes prior, and for 5 minutes following NTG or sham delivery (CON).

**RESULTS:** There was a 6-fold fall in MCA velocity in response to NTG (Δ -4.8±4.2 cm/s) compared to negligible fluctuations in CON (Δ -0.81±2.5 cm/s).

**CONCLUSIONS:** This juxtaposed data highlight the importance of measuring both MCA blood velocity and diameter when assessing cerebral blood flow and document ITCD as a novel approach to achieve this goal. Supported by the Veterans Administration Rehabilitation Research and Development Service (E6910-R, E1433-P, E9275-L and E1572-P).

**Thematic Poster - Blood Flow**

**Board #1**

**May 29 1:00 PM - 3:00 PM**

**Imaging Transcranial Doppler: A Novel Approach to Assess Cerebral Blood Flow**

Catherine L. Jarrett1, Katherine L. Shields2, Ryan M. Bruchman1, Sonal R. Panikar1, Jayson R. Gifford1, Russell S. Richardson1

1University of Utah, Salt Lake City, UT; 2Brigham Young University, Provo, UT.

Email: catherine.jarrett@utah.edu

(No relevant relationships reported)

Understanding the middle cerebral artery dynamic response during different exercise intensities is vital for understanding brain health and designing and evaluating exercise strategies for maximizing therapeutic potential. However, whether there is an interaction between exercise intensity and cerebrovascular kinetics is unknown.

**PURPOSE:** To characterize mean middle cerebral artery blood flow velocity (MCAv) kinetics associated with two exercise work rates: low and moderate. We tested the hypotheses that increasing work rate would increase the MCAv amplitude and that age and estimated maximal oxygen uptake (V̇O₂max) would be related to the MCAv amplitude. **METHODS:** Baseline values were collected for 90-seconds followed by a 6-minute exercise bout on a recumbent stepper. Heart rate, end tidal CO₂ (PETCO₂), beat-to-beat blood pressure, and MCAv were recorded at rest and during exercise. The MCAv kinetics response for participants from baseline (BL) was described by the response amplitude (Amp), time delay (TD), and time constant (τ).

**RESULTS:** Sixty-four adults completed the low and moderate intensity exercise transition. MCAv Amp increased from rest as a function of work rate, low and moderate intensity, respectively (11.8±14.7 cm/s; p<0.001) while no difference between work rates were observed in either TD (35.2 ± 31.4 s; p=0.47). Age showed a moderate, negative association with MCAv Amp (r=-0.40 and r=-0.42; p<0.01). Higher estimated V̇O₂max demonstrated a moderate, positive correlation with MCAv Amp (r=0.41 and r=0.30; p<0.01). **CONCLUSION:** Moderate intensity exercise induced a greater MCAv response amplitude compared to low intensity exercise. The amplitude of the initial MCAv response for both exercise intensities increased systematically with work rate whereas the TD and τ kinetics parameters were invariant. Therefore, the possibility exists that the cerebrovascular system may have protective mechanisms in place to avoid the more rapid responses as seen in skeletal muscle, however more work is needed to address this hypothesis. Finally, although the MCAv Amp declines with age, maintaining higher cardiopulmonary fitness may benefit the cerebrovascular response to exercise.
Prolonged periods of uninterrupted sitting (1-6 hours) have been shown to reduce lower limb blood flow, impair vascular endothelial function of leg arteries, and increase central arterial stiffness. It is unclear whether sitting can have a similar negative impact on cerebrovascular hemodynamics. PURPOSE: To determine the impact of a brief period (1 hour) of uninterrupted sitting on total brain blood flow (BBF).

METHODS: Eleven participants (25±1 years, BMI=26.1 kg/m², Female=5) completed a 1-hour bout of sitting. Assessments of central (heart rate and mean arterial pressure) and cerebrovascular hemodynamics (carotid artery blood flow, assessed via Doppler-ultrasound) were performed pre-post 1-hour of sitting (supine), as well as during the sitting intervention (10- and 60-minutes). In a subset (N=7), flow through the internal carotid (ICA) and vertebral arteries (VA) was examined to estimate total BFF (ICA+VA)*2.

RESULTS: When measured supine, HR and MAP were similar pre-post sitting. However, there was a significant increase in HR when measured while seated (e.g., 10-min=671±6 vs. 60-min=704±8 bpm; p=0.02). CCA blood flow was comparable pre-post sitting (p=0.25), but decreased 10-60 minutes while seated (10-mins=1049±64 vs. 60-mins=921±63 mL/min; p=0.006). Conversely, estimated total BBF significantly decreased pre-post sitting (pre=1039±135 vs. post=843±82 mL/min; p=0.01), but was comparable between the 10- and 60-minute time points (10-mins=799±148 vs. 60-mins=802±135 mL/min; p=0.95).

CONCLUSIONS: These preliminary findings suggest that cerebrovascular hemodynamics are significantly affected by a 1-hour bout of uninterrupted sitting, largely due to a reduction in estimated total BBF.

Board #5  May 29 1:00 PM - 3:00 PM
The Effects of Prolonged Sitting on Cerebral Perfusion and Executive Function

Jade Blackwell, Quentin Willey, Bill Evans2, Katie Burnett, Erik Hanson1, Daniel Credeur1, Lee Stoner, FACSM1. University of North Carolina, Chapel Hill, Chapel Hill, NC. (Sponsor: Lee Stoner, FACSM) (No relevant relationships reported)

Purpose: Little is known about the effects of prolonged sitting on cerebrovascular function. We hypothesized intermittent calf raises (every 10min) would: (i) prevent venous pooling in the lower extremities; (ii) maintain cerebral perfusion; (iii) maintain executive function.

Methods: 20 healthy, yet sedentary subjects (19-35 years old) were recruited to participate in two 3hr sitting conditions: control (CON) and experimental heel raise (HEEL) study. Cerebral perfusion (total haemoglobin, tHb) and tissue oxygenation (tissue saturation index, TSI) were measured using near-infrared spectroscopy (NIRS) and the Stroop-color test evaluated executive function. Measurements were made at 10, 90 and 170min.

Results: CON and INT CBF (mean CON: 9.9±8.1% vs. INT: 19.5±8.3%; P=0.05), however total RET SR did not differ between conditions. When measured supine, HR and MAP were similar pre-post sitting. HR increased from seated (91.5±9.5 vs. 66.3±4.9; P=0.05) and ANT SR reached a plateau over the 30min period (1 hour) of uninterrupted sitting. No time was spent in pure oscillatory shear (>0.5 AU). At present, existing studies that demonstrate individual responses to IPC are limited due to a reduction in estimated total BBF.

Board #6  May 29 1:00 PM - 3:00 PM
Using Continuous And Interval Exercise To Manipulate Shear Rate Patterns In The Common Femoral Artery

Abigail L. Cook, Gemma K. Lyall, Karen M. Birch, FACSM. University of Leeds, Leeds, United Kingdom. (Sponsor: Karen M. Birch, FACSM) Email: bsaco@leeds.ac.uk (No relevant relationships reported)

Vascular shear rate (SR) assessed via ultrasound represents frictional force of blood flowing over the endothelium. Low and oscillatory shear confers a pro-inflammatory phenotype, whereas greater shear has an anti-inflammatory phenotype decreasing CVD risk. Exercise increases SR, however the impact of continuous (CON) and interval (INT) exercise upon the balance of antegrade (ANT) and retrograde (RET) SR and thus the oscillatory shear index (OSI) is unknown. PURPOSE: To examine the impact of acute CON and INT (no active recovery) exercise on SR patterns and OSI in the common femoral artery (CFA) during exercise. METHODS: 10 healthy individuals (25±3 years, n=5 male) undertook two-work matched exercise sessions (CON and INT) on a supine cycle ergometer at 125% lactate threshold. In each protocol repetitive ultrasound scans were taken of the CFA during a brief cessation to characterize the expected individual variability in performance with and without IPC treatment. For each IPC trial, IPC was completed 15 minutes prior to exercise and consisted of 3x5-min cycles of bilateral occlusion and reperfusion to the upper thighs. RESULTS: Comparing baseline control to IPC, mean time to completion did not reach significance (51.8s ± 1.01.8%; P=0.08), despite a 1% change commonly being recognized as the benchmark for a meaningful alteration in performance. Examination of individual participant data revealed 8 of 12 (67%) participants improved mean 5km TT performance following IPC (2.1±1.3%). If the individual’s mean IPC response is considered only as an improvement that exceeded one’s own percent coefficient of variation from the repeated controls (0.4±0.8%) then 7 (58%) and 5 (42%) would be classed as legitimate responders and non-responders. When the individual response or non-response to IPC was examined over the three repeated IPC trials, 81% and 87% of trials confirmed the effect, respectively. CONCLUSIONS: We present evidence that individual performance is affected at a magnitude that exceeds normal variability. This suggests the existence of participants who consistently respond to IPC exposure at a magnitude that exceeds chance.

Board #7  May 29 1:00 PM - 3:00 PM
Impact of a Brief Period of Uninterrupted Sitting on Cerebrovascular Hemodynamics

Raymond Jones1, Dominique McArthur1, Stephanie M. McCoy1, Lee Stoner, FACSM2, Daniel P. Credeur1. University of Southern Mississippi, Hattiesburg, MS. (No relevant relationships reported)

Board #8  May 29 1:00 PM - 3:00 PM
An Examination of Group and Individual Response Rates to Ischemic Preconditioning for Sport Performance

Joshua Slysz, Heather Petrick, Jamie Burr, FACSM. University of Guelph, Guelph, ON, Canada. (Sponsor: Jamie Burr, FACSM) Email: jslysz@uoguelph.ca (No relevant relationships reported)
Elevated renal vascular resistance (RVR) during heat stress may provoke localized ischemia, especially when exposed to multiple sympathetic stressors. Whole-body cooling reduces risks associated with heat stress. However, this cooling raises RVR and could therefore exacerbate increases in RVR caused by prior heat stress, particularly during sympathetic activation. PURPOSE: To test hypotheses that increases in both extra- and intra- RVR to the cold pressor test (a sympathoexcitatory stimulus, CPT) are exacerbated by whole-body cooling following heat stress.

METHODS: Nineteen healthy adults (22 ± 2 y) underwent passive heat stress sufficient to raise core temperature 1.2°C above normothermic baseline (NT), after which they underwent passive cooling recovery (CR) to within 0.2°C of NT. Participants completed a 2 min CPT at NT and at the end of CR. Changes in body weight provided an indication of dehydration. Heart rate (HR), mean arterial pressure (MAP), and renal blood velocity (RBV) were measured pre-CPT (Pre) and at the end of the CPT (End). RBV was measured using the coronal approach with Doppler ultrasound at the distal segment of the right renal artery (Extra-, r = 11) or the same segmental artery within participants in the right kidney (Intra-, r = 8). RVR was calculated as MAP/RBV. Data are presented as mean ± SD.

RESULTS: The change in body weight was -1.2 ± 0.5%. In Extra- at Pre, MAP was elevated in CR compared to NT (95 ± 9 vs. 85 ± 7 mmHg, P<0.01) with no differences in HR (58 ± 7 vs 56 ± 9 bpm, P=0.24). MAP and HR in Intra- at Pre did not differ from Extra- (P=0.72). In Extra- at Pre, RBV (33 ± 4 vs 36 ± 3 cm/s, P=0.01) and RVR (0.35 ± 0.06 vs 0.43 ± 0.08 mmHg/cm/s, P<0.01) were lower in CR compared to NT. RBV was lower and RVR was higher in Intra- compared to Extra- (P=0.02) at Pre. At End, increases in HR (12 ± 7 vs 14 ± 7 bpm, P=0.50) and MAP (24 ± 16 vs 24 ± 16 mmHg, P=0.99) were not different between CR and NT in Extra- or Intra-

CONCLUSIONS: Whole-body cooling following passive heat stress does not affect the extra- or intra- renal vascular responses to sympathetic activation.

B-08 Thematic Poster - Cooling Interventions, Physiological Responses, and Performance in the Heat

Wednesday, May 29, 2019, 1:00 PM - 3:00 PM
Room: CC-101B

Chair: Scott Montain, USARIEM, Natick, MA.

(No relevant relationships reported)

Bing Zhang1, Xiuzhen Liu2, Yuanlong Liu2, Liye Zou1. Tsinghua University, Beijing, China. 1Western Michigan University, Michigan, MI. 2The Chinese University of Hong Kong, Hong Kong, China.

Email: bzhang@tsinghua.edu.cn

(No relevant relationships reported)

529 Board #3 May 29 1:00 PM - 3:00 PM The Central Mechanism Underlying Arginine Vasopressin Changes During Cooling Therapy For Exertional Heat Stroke Rats

Bing Zhang1, Xiuzhen Liu2, Yuanlong Liu2, Liye Zou1. 1Tsinghua University, Beijing, China. 2Western Michigan University, Michigan, MI. 3The Chinese University of Hong Kong, Hong Kong, China. (Sponsor: Yuanlong Liu, FACSM)

Abstract: Cooling therapy is very effective for improving the survival of patients with Exertional Heat Stroke(EHS); however, the central activation mechanism of Arginine Vasopressin in cooling therapy for EHS is not very clear. The central mechanism of cooling therapy induces changes of AVP to adjust water metabolism, which involves that the synthesis and release of AVP in hypothalamus. PURPOSE: To determine the central activation of AVP mRNA expression and AVP protein expression in hypothermia in improving water metabolism when EHS rats were treated with cooling. METHODS: Male Sprague Dawley rats were randomly divided into normal control group(NC, n=8) and EHS group. EHS group was further divided into the onset group(EHSO, n=9), the rest group(EHSR, n=9) and the cooling group(EHSC, n=8). The rat model of EHS was induced by exercising to exhaustion and raising rectal temperature to about 42°C in the environment of 36°C temperature and 75% humidity. Cold water immersion for 5 min at 19°C was used as cooling treatment. Blood and hypothalamus were taken for testing. AVP in serum was measured by ELISA method. AVP mRNA expression and AVP protein expression were detected by PCR and WB respectively. We analyzed data with Mann-Whitney U test.

RESULTS: Onset of EHS, to regulate water metabolism, AVP mRNA expression and AVP protein expression were up-regulated significantly (EHSO vs. NC were 2.76 ± 1.01 vs. 0.00 ± 0.00, H<0.01). After cold water immersion, No significant change of Hct was found, AVP mRNA expression and AVP protein expression were significantly down-regulated(EHSC vs. EHSO were 1.66 ± 0.33 vs. 3.45 ± 0.95, P<0.01; Protein: 1.52 ± 0.85 vs. 2.76 ± 1.01, H<0.05).

CONCLUSIONS: Hct, AVP mRNA expression and AVP protein expression are pathophysiological biomarkers of EHS. Cooling treatment restrain water reabsorption by down-regulating the expression of AVP mRNA and AVP protein in kidney.

530 Board #4 May 29 1:00 PM - 3:00 PM Continuous Forearm Cooling Attenuates Increase in Core Body Temperature of Elite Cyclists under Heat Stress

Eric T. Hedge1, Kathryn A. Zuj1, Alexander G. Stothart1, Erica H. Gavel1, Len S. Goodman2, Sean D. Peterson2. 1University of Waterloo, Waterloo, ON, Canada. 2University of Toronto, Toronto, ON, Canada. (Sponsor: Toronto Research Centre, Toronto, ON, Canada)

Email: ethedge@uwaterloo.ca

(No relevant relationships reported)

Physical activity results in the generation of heat which is dissipated though thermoregulatory processes, such as the production of sweat. Environmental conditions were 4 groups of male SD rats, including normal control group(NC, n=8), EHS onset group(EHSO, n=9), EHS rest group(EHSR, n=9) and EHS cooling group(EHSC, n=8). We established the rat model of EHS by exercising to exhaustion in the environment of 36°C temperature and 75% humidity until rectal temperature reaching about 42°C. The cooling treatment for EHS was to immerse in cold water for 5 minutes at 19°C. Blood and kidney were taken. Hct in serum was measured by automatic blood cell analyzer. PCR and WB were used to detect AQP2 mRNA expression and AQP2 protein expression respectively. Data were analyzed with Mann-Whitney U in nonparametric test.

RESULTS: When EHS occurs, Hct increased significantly(EHSO: 0.43 ± 0.29 vs. 0.40 ± 0.04; L<0.05). To fit for water metabolism, AQP2 mRNA expression and AQP2 protein expression were up-regulated significantly (EHSO vs. NC were mRNA: 3.45 ± 0.95 vs. 1.19 ± 0.37, P<0.01; Protein: 2.76 ± 1.01 vs. 1.00 ± 0.00, L<0.01). After cold water immersion, No significant change of Hct was found, AVP mRNA expression and AVP2 protein expression were significantly down-regulated(EHSC vs. EHSO were mRNA: 1.66 ± 0.33 vs. 3.45 ± 0.95, P<0.01; Protein: 1.52 ± 0.85 vs. 2.76 ± 1.01, H<0.05).

CONCLUSIONS: Hct, AVP mRNA expression and AVP protein expression are pathophysiological biomarkers of EHS. Cooling treatment restrain water reabsorption by down-regulating the expression of AVP2 mRNA and AVP2 protein in kidney.
can inhibit thermoregulation resulting in heat accumulation with eventual impairment in performance. **PURPOSE:** To determine if continuous inner forearm cooling helps to maintain body core temperature and athletic performance during cycling in a hot and humid environment. **METHODS:** Preliminary results report on data collected from three competitive triathletes [two male, one female; age: 31 ± 2 years; mean ± standard deviation]. Each performed two cycling sessions at 70 ± 4% of their functional threshold power for up to 45 minutes in an environmentally controlled chamber (temperature: 30°C, humidity: 70%). One trial included continuous inner forearm cooling (FC), while the other was a control trial (NFC). Heat rate (HR) was monitored throughout the test and body core temperature (Trec) was measured using an ingestible radio capsule. Ratings of perceived exertion and thermal comfort were assessed every 10 minutes throughout exercise. **RESULTS:** Preliminary data suggest that forearm cooling attenuated the increase in Trec during exercise (FC: 2.32 ± 0.36°C/hr vs. NFC: 2.85 ± 0.33°C/hr), as HR was 6.11.7°F and HR was removed from the body during the cooling trials. Furthermore, two of the three participants were unable to complete the non-cooling trial due to reaching the temperature threshold for test termination (39.7°C). Similarly, HR appeared to be lower in the FC condition compared to the NFC condition. Participants’ ratings of perceived exertion were similar between conditions; however, participants’ thermal comfort was improved with inner forearm cooling. **CONCLUSION:** Preliminary data analysis suggests that during cycling in the heat, continuous cooling of the forearm may improve athlete comfort by attenuating the exercise induced increase in core body temperature.

The skin of the human face and head is uniquely sensitive to cold stimuli, influencing whole body thermal perception more than most other skin surfaces. This sensitivity might be particularly relevant for American football, where padding and equipment cover much of the body but athletes regularly experience large thermal stress. **PURPOSE:** To assess how face and head cooling impact thermoregulation and perception during simulated American football. **METHODS:** Ten male American football or rugby athletes (age = 27 ± 5 y, height = 184.1 ± 5.9 cm, mass = 96.7 ± 10.2 kg; mean ± SD) completed two 65 min football exercises protocols. Each protocol was divided into four quarters (Q1 - Q4) and consisted of maximal sprints and symmetrical push-ups separated by breaks regularly occurring during an American football game (e.g. breaks between quarters, time outs, and offense-defense transitions). Sessions occurred in 36°C and 50% RH and participants wore full American football uniforms throughout. During one session (COOL), each participant removed his helmet and donned a cooling hood during breaks longer than two minutes; the cooling hood covered the cheeks, forehead, head, and neck and was activated by soaking in an ice slurry mixture. During the other session (CON), each participant only removed his helmet during breaks longer than two minutes. Thermoregulatory and perceptual variables were measured throughout. **RESULTS:** No significant differences existed between COOL and CON for gastrointestinal temperature (COOL = 38.0 ± 0.5 °C, CON = 38.1 ± 0.5 °C), mean weighted skin temperature (COOL = 35.5 ± 0.7 °C, CON = 35.6 ± 0.7 °C), or heart rate (COOL = 124 ± 26 bpm, CON = 125 ± 26 bpm). COOL significantly improved whole body thermal sensation compared to CON (COOL: Q1 = -4 [-5, -3], Q2 = -5 [-5, -4], Q3 = -4 [-5, -3], Q4 = -4 [-5, -3]; CON: Q1 = 6 [-7, -6], Q2 = 6 [-5, -6], Q3 = 6 [-5, -6], Q4 = -7 [-6, -7]; median [interquartile range]). COOL similarly benefited thermal comfort. **CONCLUSIONS:** These data confirm the sensitivity of the face and head to cooling stimuli and reinforce their influence over whole body thermal sensation and comfort during exercise in the heat. Moreover, these data indicate a cooling hood covering the cheeks, forehead, head, and neck can significantly improve thermal perception during exercise in the heat without influencing classic thermoregulatory measures.

Participants practiced each skill until proficient and then completed two testing days outdoors (wet bulb globe temperature: 19.3 ± 1.1°C). On testing days, participants were pre-cooled for 15 minutes using CWI (10.1 ± 0.3°C) or not. They donned an American football uniform and completed multiple bouts of 40-yard dash, vertical jump, broad jump, agility test, dynamic (i.e., catching while running) and stationary catching, throwing distance, and throwing accuracy. Rectal temperature (Trec) was measured before, during, and after precooling and every 5 minutes during skill testing. MANOVA and dependent t-tests identified differences between conditions for football skill data. Repeated measures ANOVA and Tukey-Kramer post-hoc tests identified differences in Trec between conditions over time. **RESULTS:** Data are means and standard deviations. Cohen’s effect sizes (ES) were calculated when significant differences occurred. PC did not affect vertical jump, broad jump, agility, dynamic or stationary catching, or throwing distance (P > 0.13). PC impaired 40-yard dash time (PC: 5.72 ± 0.53 s, Control: 5.31 ± 0.34 s; P = 0.03, ES = 1.2) and throwing accuracy (PC: 9.0 ± 0.2 points, Control: 3.1 ± 0.3 points; P = 0.001, ES = 1.4). On average, Trec was 0.58 ± 0.35°C lower during skills testing following PC and statistically differed from control from minute 10 to the end of testing (~35 minutes; P < 0.05, ES = 1.2). **CONCLUSION:** PC may be a useful strategy to prevent EHS in American football players since it lowered Trec without affecting most American football skills. By lowering Trec, PC would prolong the time it would take for an athlete’s body core temperature to become dangerous (i.e., >40.5°C). IFPC is implemented, coaches should alter practice so throwing accuracy and speed drills occur after an athlete’s body core temperature returns to normal.

**Purpose:** Determine how a cooling vest worn during a warm-up could influence selected performance (counter movement jump (CMJ)), physical (GPS) metrics and psycho-physiological (body temperature and perceptual) variables. **METHODs:** In a randomized crossover design, twelve elite male World Rugby Sevens Series athletes completed an outdoor (WBGT: 23.7°C) match-specific externally-valid 30 min warm-up wearing a phase change cooling vest (VEST; also worn for 70 min prior-to warm-up) and without (CONTROL), on separate occasions 7 days apart. CMJ was assessed before and after the warm-up, with GPS indices and heart rate monitored during the warm-ups, whilst core temperature (Tc; ingestible telemetric pill; n = 6) was recorded throughout the experimental period. Measures of thermal sensation (TS) and comfort (TC) were obtained pre- and post-warm-ups, with rating of perceived exertion (RPE) taken post-warm-ups. Results: Athletes in VEST had a lower ΔTc from pre-warm-up to post-warm-up [effect size (ES) = 90% confidence limit; -1.54; ±0.62] and Tc peak (±0.7°C lower on average) at the end of the warm-up (t = 1.59; ±0.64) compared to CONTROL. Athletes demonstrated a decrease in ΔTS (t = 1.59; ±0.72) and ΔTC (t = 1.63; ±0.73) in VEST compared to CONTROL, pre- to post-warm-up. Furthermore, athletes in VEST had a lower post-warm-up RPE compared to CONTROL (t = 1.01; ±0.46). Changes in CMJ and GPS indices were trivial between conditions (ES < 0.2). **Conclusions:** Wearing the vest prior-to and during a warm-up can elicit favorable alterations in physiological (Tc) and perceptual (TS, TC and RPE) warm-up responses, without compromising the utilized warm-up characteristics or physical performance measures. Supported by Aspire Zone Foundation (AZF; Doha, Qatar) funding.
Board #1 May 29 1:00 PM - 3:00 PM
β-Alanine Supplementation Reduces Anxiety and Increases Neurotrophin Expression in Both Young and Older Rats
Jay R. Hoffman, FACSIM1, Ylach Gepner2, Hagit Cohen3.
1University of Central Florida, Orlando, FL. 2Tel Aviv University, Tel Aviv, Israel. 3Ben Gurion University, Beer Sheva, Israel.
Email: jay.hoffman@ucf.edu
(No relevant relationships reported)

PURPOSE: The effect of 30 days of β-alanine (BA) supplementation (100 mg kg−1) on hippocampal expression of brain-derived neurotrophic factor (BDNF), neuropeptide Y (NPY) and markers of inflammation was examined in both young (4 months) and older (14 months) rats.

METHODS: Animals were assigned to either a control group in which young (YC) or older (OC) rats were fed regular food and water or a β-alanine group, in which rats were fed regular food and provided β-alanine in their water (YBA or OBA, respectively). Behavior measures were conducted following the 30-day supplementation period, which included spatial learning, memory and an anxiety index. Hippocampal expressions of BDNF, NPY, glial fibrillary acidic protein, NF-κB p50 and p65 subunits, TNFα and cyclooxygenase-2 were also analyzed.

RESULTS: Learning ability was reduced (p<0.001) and anxiety index higher (p<0.001) in older compared to young rats. Similarly, BDNF and NPY expressions were reduced, and all inflammatory markers were elevated (p's<0.05) in the older animals. β-alanine increased BDNF expressions in the CA1 (p<0.003) and CA3 (p<0.001) subregions of the hippocampus. BDNF expression for YBA was also significantly greater than YC in CA3. Learning for young animals fed β-alanine was significantly better than all other groups. Significant reductions in anxiety were noted in both older and younger rats fed β-alanine compared to age-matched controls.

CONCLUSIONS: Results indicated that β-alanine ingestion in both young and older rats was effective in attenuating anxiety and augmenting BDNF expression in the hippocampus.

Board #2 May 29 1:00 PM - 3:00 PM
The Effects of Two Multi-Ingredient Pre-Workout Supplements on Endurance Capacity and Anaerobic Cycling Performance
Meaghan E. Beckner1, Brian J. Martin1, Alexis A. Pihoker1, Matthew E. Darnell1, Alicia L. Kjellsen2, Bradley C. Nindl, FACSM3, 4.
1University of Central Florida, Orlando, FL. 2Tel Aviv University, Tel Aviv, Israel. 3University of Central Florida, Orlando, FL. 4University of Pittsburgh, Pittsburgh, PA.
Email: meb115@pitt.edu
Reported Relationships: M.E. Beckner: Industry contracted research; Isagenix International LLC.

Multi-ingredient pre-workout supplements (MIPS) have become an increasingly popular ergogenic aid among fitness enthusiasts. Previous research has primarily focused on the effectiveness of individual ingredients, rather than the combination. PURPOSE: To examine the effectiveness of two MIPS, one with beta-alanine and caffeine (BAC) and one without (NBAC), vs. placebo (PLA) on anaerobic performance and endurance capacity. METHODS: Twenty-eight exercise-trained individuals (15 men, 13 women, 24.3 ± 4.9 years, 73.6 ± 9.2 cm, 74.7 ± 15.5 kg) participated in a randomized, counterbalanced, double-blind, placebo controlled cross-over study to assess anaerobic power and capacity via Wingate (WAnT), and aerobic endurance via cycle VO2max. On three separate occasions (7 days between trials) subjects completed vertical jump (VJ), 30-second Wingate test and VO2max test 30 minutes after ingestion of BAC, NBAC, or PLA. WAnT and VO2max were calculated as the peak and average power relative to body mass, respectively. Following a 10 minute walking recovery, subjects completed the cycle VO2max test. Blood lactate was collected within 5 minutes post WAnT (BLAmax), and VO2max. Following tests for normality, outcome variables were compared between supplements using one-way repeated measures ANOVA or Friedman test (alpha=0.05) and Bonferroni adjusted pairwise comparisons as appropriate. RESULTS: There was a significant effect of treatment on WAnTτ (p<0.016). WAnTτ was higher in BAC (10.9 ± 1.4 W/kg) and NBAC (10.8 ± 1.2 W/kg) compared to PLA (10.5 ± 1.2 W/kg) (p<0.018 and p<0.004, respectively). WAnTτ was significantly different across supplements (p<0.043), but post hoc pairwise comparisons were not significant. BLAmax was higher with BAC (17.7 ± 3.5 mmol) and NBAC (17.4 ± 3.2 mmol) compared to PLA (15.3 ± 3.3 mmol) (p<0.028 and p<0.033, respectively). BLAmax was higher with BAC (12.7 ± 5.9 mmol) compared to NBAC (9.9 ± 2.4 mmol, p<0.001) and PLA (9.7 ± 2.8 mmol, p<0.001). No significant differences were observed in VO2max or RPE.

CONCLUSION: MIPS demonstrate the potential to augment production of anaerobic power during a Wingate cycle test, accompanied by higher blood lactate accumulation. Improvements may be less apparent in vertical jump type movements or prolonged endurance exercise.

Board #3 May 29 1:00 PM - 3:00 PM
Acute Capsaicin Supplementation Improves 400 and 3000 Meters Running Time-trial Performance in a Distance-dependent Way
Valéria L G Panissá1, Lázaro F A Da Costa2, Alcione De Sá2, Marcelo C, De D2, Fabio E. R.2.1University of São Paulo, São Paulo, Brazil. 2Federal University of Piauí, Teresina, Brazil. 3University of Western São Paulo, Presidente Prudente, Brazil.
Email: valeriapannissa@gmail.com
(No relevant relationships reported)

Ergogenic effect of capsaicin has been shown in mid-distance time trial (1500 meters) but not in repeated maximal sprints indicating the need of explore exercises with different metabolic demands. PURPOSE: The purpose of this study was to investigate the acute effect of capsaicin supplementation on short (400 m) and middle distance (3000 m) running time-trial performance, maximum heart rate and rate of perceived exertion in physically active adults. METHODS: Twelve physically active men (age = 28.6±5.4 y) completed four randomized, double-blind trials: Capsaicin condition (12 mg) or a placebo condition. Forty-five minutes after supplement consumption, the participants performed a randomized 400- or 3000-meters running time trial. Time (in seconds) was recorded. Heart rate was analyzed at rest and immediately post-exercise, and the rate of perceived exertion (RPE) was collected immediately after exercise. The effect of capsaicin on time-trial performance, maximum heart rate and rate of perceived exertion during short (400 m) and middle distance (3000 m) running were analyzed via a Paired t test. In addition, the effect size (ES, 90% confidence interval [CI]) and magnitude-based inference statistics in the selected variables were calculated. RESULTS: For 400 m time-trial (Capsaicin= 66.4 ± 4.2 sec vs Placebo= 67.1 ± 4.8 sec, p= 2.250, p= 0.046) and 3000 m time-trial (Capsaicin= 876.2 ± 76.1 sec vs Placebo= 905.1 ± 73.3 sec, t= 2.848, p= 0.016) the time in seconds was significantly lesser in the capsaicin compared to placebo. Capsaicin showed a likely small improvement of performance in the 3000 m (d= 0.40, IC 90%: 0.00 to -0.60 to -1.14) and likely trivial in the 400 m (d= 0.13, IC 90%: -0.24 to -0.03). There was no statistically significant difference for the maximum heart rate (400m: p=0.114, 3000m: p= 0.319 and RPE (400m: p=0.615; 3000m: p= 0.438).

CONCLUSION: In summary, acute capsaicin supplementation improved 400 m and 3000 m running time-trial performance in a distance-dependent way without modifying RPE and maximum heart rate in physically active adults. Furthermore, the present study showed a meaningful improvement in the performance during 3000 m running time-trial.

Board #4 May 29 1:00 PM - 3:00 PM
Acute Supplementation with Caffeine Improves Strength and Increases Metabolic Stress After a Maximal Strength Test
Luis H. Boiko Ferreira1, Andre C. Smolarek2, Steven R. McNulty3, Brad J. Schoenfeld1, Alan A. Aragon4, Alan C. Utter, FACSIM, Ricardo J. Souza-Junior1, Tatiana P. Souza-Junior1.
1University of Connecticut, Storrs, CT. 2Tel Aviv University, Tel Aviv, Israel. 3University of Pau, Pau, France. 4California State University, Northridge, CA.
(Sponsor: Alan C. Utter, FACSIM)
Email: lhboikoferreira@gmail.com
(No relevant relationships reported)

BACKGROUND: Caffeine has dose-dependent benefits on endurance, but the effect of different doses of caffeine on strength is inconclusive. PURPOSE: We aimed to analyze the acute effect of different doses of caffeine on strength and metabolic stress in recreationally trained men. METHODS: The effect of different doses of caffeine on strength, creatine phosphokinase (CPK), lactate dehydrogenase (LDH), and uric acid (UA) were assessed in 17 recreationally active young adults (19.2 ± 2.5 yrs of age), who performed three tests, separated by 14 days between trials. Day one involved collection of baseline data and brief explanation of the strength test protocol.
The protocol used to analyze the effect of different doses of caffeine on strength was examined by three different exercises (bench press [BP]; deadlift [DL]; and squats [SQ]) following a 10 PM test protocol. Blood samples were collected immediately upon arrival to the laboratory, followed by consumption of a standardized isocaloric shake along with capsules containing different doses of caffeine: 6mg • kg^{-1} (CF1), 8mg • kg^{-1} (CF2), or placebo (CG). Another blood sample was collected 45 minutes after caffeine/placebo consumption and immediately after the execution of each exercise. The supplementation, blood lactate levels and post and pre, during, and post-exercising heart rates were measured. RESULTS: No significant difference (p>0.05) between the control (15.0±3.21 mm) and supplement (15.88±3.43 mm) performance on time to completion. Post-exercise blood lactate (11.14±2.84 mm/dL) was not significantly different (p>0.05) than the control (12.00±2.53 mm/dL). Additionally, mean RPE for BR supplement (14.78±2.50) was not significantly different (p>0.05) than the control (16.22±1.2). CONCLUSIONS: The exercise conditions were performed following nitrate supplementation. These findings may have been caused by the duration and intensity of the benchmark workout which included both anaerobic and aerobic components, unlike previous research that found relationships between beetroot nitrate and performance of aerobic and anaerobic exercises alone.

Individuals who are unaccustomed to resistance exercise experience greater levels of exercise-induced muscle soreness, this can deter individuals from completing an exercise programme and improving strength and power. To alleviate the symptoms, they may consume Non-steroidal anti-inflammatory drugs (NSAIDS). Evidence suggests NSAIDS blunt muscle protein synthesis (Trappe et al., 2002) and attenuate strength and muscle hypertrophic adaptations from resistance training (Lilja et al., 2018), negating the effects of the exercise. Omega-3 supplementation has been suggested as an alternative to NSAIDS but the impact of Omega-3 on resistance training is inconclusive. PURPOSE: To determine the effects of omega-3 supplementation on eccentric training-induced increases in torque and power. METHODS: Nine physically active but non-resistant trained males (29.9 ± 3.9 years) were pair matched for isometric and eccentric quadriceps strength and randomly assigned, in a double-blind manner, to either omega-3 (5.5 g/d) or olive oil (6.09g/d) supplementation for 3 weeks prior to and for 8 weeks during eccentric training. Performance measures of peak torque (isometric, concentric, eccentric) and jump height were conducted before and after 8 weeks of training. Supervised training consisted of maximal eccentric quadriceps contractions on an isokinetic dynamometer at 60°/s through 80° range of motion. Two training sessions were conducted per week, with a minimum of 48 hours recovery between sessions. Number of repetitions and sets were increased for both training groups. RESULTS: Following 8 weeks of eccentric training, peak eccentric torque significantly increased by 40 ± 56 Nm in omega-3 group and 51 ± 52 Nm in olive oil group, with no differences between groups (p > 0.05). Both groups also significantly increased their maximal isometric torque (p < 0.02); omega-3 group increased by 21 ± 10 Nm and olive oil group increased by 23 ± 30 Nm, with no differences between groups (p > 0.05). There was no main effect of training on peak concentric torque (p > 0.05). Jump height increased by 1.0 ± 1.9 cm in the omega-3 group and decreased by 0.03 ± 1.33 cm in the olive oil group, with no differences between groups (p > 0.05). CONCLUSIONS: Omega-3 supplementation did not impair or augment eccentric training-induced increases in torque or power in young males.

Nitrates supplementation has been shown to improve athletic performance for short-duration, vigorous activity, as well as long-duration, aerobic activity. As an antioxidant, nitrates have the ability to reduce oxidative stress on exercising muscles, which is thought to help maintain energy metabolism, therefore, decreasing fatigue. PURPOSE: The purpose of this research was to explore the effects of beetroot nitrate supplementation on performance during a baseline CrossFit® workout. METHODS: Twenty current CrossFit® participants (25±6.5 years, 175.17±8.1 cm, 84.94±12.09kg), who attended CrossFit® classes at least 3 days per week for the past 3 months, performed a benchmark performance test, “Nancy” (5 rounds of 15 overhead squats with a 95lb (for males)/65lb (for females) barbell followed by a 400m run). In a randomized order, 72 hrs apart, participants were tested under a control session and once after consuming 2.4oz beetroot nitrate supplement, Beet It®, 2 hours prior to beginning the assigned workout. For both workouts, time to completion, pre- and post-exercise blood lactate levels and RPE, and pre, during, and post-exercising heart rates were measured. RESULTS: No significant difference (p>0.05) between the control (15.0±3.21 mm) and supplement (15.88±3.43 mm) performance on time to completion. Post-exercise blood lactate (11.14±2.84 mm/dL) was not significantly different (p>0.05) than the control (12.00±2.53 mm/dL). Additionally, mean RPE for BR supplement (14.78±2.50) was not significantly different (p>0.05) than the control (16.22±1.2). CONCLUSIONS: The exercise conditions were performed following nitrate supplementation. These findings may have been caused by the duration and intensity of the benchmark workout which included both anaerobic and aerobic components, unlike previous research that found relationships between beetroot nitrate and performance of aerobic and anaerobic exercises alone.

Carbohydrate (CHO) ingestion is an established strategy to improve endurance performance. Race fuels should not only sustain performance, but also be readily digestible and absorbed and replenish electrolytes. Potatoes are a cost-effective option that fulfills these criteria; however, their impact on endurance performance remains unexamined. PURPOSE: Compare the effects of potato purée (POT) ingestion during endurance cycling on subsequent performance versus commercial CHO gel (GEL) or a control (water, CTL). METHODS: Ten trained cyclists (28±5.56y; 70.1±7.4kg; 1.71±0.0mm; 62.7±9.3mg/kg/min) consumed a standardized breakfast then drank either a commercial gel (GEL, 14.92±2.12% energy) or a control (water, CTL). During a 2h cycling challenge (60-85%VO_{2max}) following a 1h pre-caffeine challenge, cyclists consumed a standardized breakfast then drank either a commercial gel (GEL, 14.92±2.12%) or a control (water, CTL). Consumption was either a 30 min ingestion pre-flask (PRE) or 10 min ingestion post-flask (POST) with a 95lb (for males)/65lb (for females) barbell followed by a 400m run). In a randomized order, 72 hrs apart, participants were tested under a control session and once after consuming 2.4oz beetroot nitrate supplement, Beet It®, 2 hours prior to beginning the assigned workout. For both workouts, time to completion, pre- and post-exercise blood lactate levels and RPE, and pre, during, and post-exercising heart rates were measured. RESULTS: No significant difference (p>0.05) between the control (15.0±3.21 mm) and supplement (15.88±3.43 mm) performance on time to completion. Post-exercise blood lactate (11.14±2.84 mm/dL) was not significantly different (p>0.05) than the control (12.00±2.53 mm/dL). Additionally, mean RPE for BR supplement (14.78±2.50) was not significantly different (p>0.05) than the control (16.22±1.2). CONCLUSIONS: The exercise conditions were performed following nitrate supplementation. These findings may have been caused by the duration and intensity of the benchmark workout which included both anaerobic and aerobic components, unlike previous research that found relationships between beetroot nitrate and performance of aerobic and anaerobic exercises alone.

Post-exercise And Pre-sleep Protein-polyphenol Supplementation Improves Recovery Following Muscle-damaging Eccentric Exercise: Preliminary Findings.

Purpose: Eccentric contraction (EC) induced muscle damage is characterised by weakened force production, increased soreness and elevated plasma creatine kinase (CK). Recovery rate is likely to be dependent on muscle remodelling, which may be influenced by dietary protein and polyphenol availability. We investigated if consuming protein-polyphenol drinks post-exercise and before bed improved recovery of knee extensor function and reduced soreness following a bout of EC.

| Board #5 | May 29 1:00 PM - 3:00 PM | Potato Ingestion as an Effective Race Fuel to Improve Cycling Performance in Trained Cyclists |
| Board #6 | May 29 1:00 PM - 3:00 PM | The Effect of Beetroot Supplementation on High Intensity Functional Training Performance |

Abstracts were prepared by the authors and printed as submitted.
Methods In a randomised, parallel groups, placebo controlled double blind design, 18 healthy males and females (22 ± 1 y; BMI: 24.0 ± 0.9 kg·m⁻² (± SEM)) consumed a controlled isocaloric (120 g protein) protein for 7 days before and after a single bout of 300 maximal unilateral quadriceps EC, in combination with either post-exercise (20 g whey, casein and pea protein blend and 650 mg pomegranate extract) and pre-bed (20 g casein protein and 480 mg tart cherry extract) drinks (Beachbody LLC) (PRO; n = 9; 4 females), or isocaloric maltodextrin placebo (PLA; n = 9; 3 females). Total isokinetic work over 30 maximal knee extensions (TW), peak isometric torque (PT) and muscle soreness (visual analogue scale (VAS) and pressure pain threshold (PPT)) were measured relative to the contralateral control limb (%con) before and every 24 h for 7 days following EC, as was CK. Data were analysed using two-way ANOVAs.

Results EC caused a maximum decline in TW in PLA after 48 h to 68 ± 6 %con (p < 0.001) which remained below baseline until 120 h (p < 0.05). Conversely, TW in PRO was reduced at 24 h only (to 89 ± 5 %con; p < 0.05) and was restored thereafter. PT decreased following EC (p < 0.001) and was significantly lower in PLA compared with PRO at 48 h (69 ± 5 vs 107 ± 13 %con, respectively) and 96 h (76 ± 7 vs 110 ± 14 %con, respectively). Muscle soreness in both groups peaked within 72 h of EC (p < 0.05), but vastus medialis PPT was attenuated at 72 h in PRO compared to PLA (102 ± 3 vs 88 ± 3 %con, respectively; P < 0.05). Plasma CK rose >30-fold from 96 to 120 h (p < 0.01), and was similar between groups (p < 0.05).

Conclusion Consumption of commercially available post-exercise and before bed protein-polyphenol beverages accelerated recovery of skeletal muscle function following EC-induced muscle damage, potentially due to improved protein turnover and remodelling.

Supported by a Beachbody LLC (USA) grant.

B-10 Thematic Poster - Hormones and Obesity

Wednesday, May 29, 2019, 1:00 PM - 3:00 PM
Room: CC-102B

543 Board #1 May 29 1:00 PM - 3:00 PM Post Meal Hypoglycemia With and Without Exercise in Non-Obese and Obese Individuals.
Jay W. Porter1, Ryan Pettit-Mec1, Sean Ready1, Nancy C. Winn PhD1, Anand Chackolangam MD1, Guido Lastra Gonzalez MD1, Jill A. Kanaley PhD, FACSM1. 1University of Missouri, Columbia, MO. 2University of Missouri School of Medicine, Columbia, MO. (No relevant relationships reported)

Purposes: Hypoglycemia (<70 mg/dL) during exercise has been observed in some individuals when exercise is preceded by carbohydrate ingestion. Counterregulatory responses normally maintain plasma glucose concentrations to prevent hypoglycemic events in healthy adults. The degree to which hypoglycemia is observed across health statuses in response to an evening meal plus moderate intensity exercise is unknown. The purpose of this study was to examine glucose variability when a dinner meal containing 10 kcal/kg (40% CHO, 35% FAT, 25% PRO) was followed by moderate exercise in lean and obese individuals, and to establish if these associations are similar in Hutterites (H) (self-sufficient, farming, Anabaptist group) and non-Hutterites (NH), as well as in males and females.

Methods: 307 adults (118 H and 54 NH females, 75 H and 60 NH males) aged 20-66 years had body composition measured using DXA, serum (fasted) IGF1 concentrations and protein intake (by FFQ). Correlations were used for bivariate analyses and multivariate modeling was used to determine whether relationships between LM and IGF1 and LM protein intake were similar in both sexes and populations (sex-by-IGF1, sex-by-protein, population-by-IGF1, population-by-protein interactions) controlling for age, height, and fat mass.

Results: IGF1 correlated with protein intake in NH (r=-0.27, p=0.004), but not in H (r=-0.01, p=0.9); there was no correlation between circulating IGF1 and protein consumption in females (r=0.12, p=0.1) or males (r=0.01, p=0.1). LM was not correlated with IGF1 in H (r=-0.09, p=0.3) or NH (r=0.11, p=0.1); LM was correlated with IGF1 in males (r=0.21, p=0.01) but not females (r=0.02, p=0.21). LM was positively correlated with protein intake in NH (r=0.44, p=0.01) and H (r=0.44, p=0.01), and in males (r=0.33, p=0.01) but not females (r=0.02, p=0.8). Greater LM was not associated with age (β=-0.04, p=0.09), but was associated with greater fat mass (β=-0.51, p=0.001), being taller (β=0.49, p=0.001), being male (β=15.4, p<0.001), and consuming more protein (β=0.02, p=0.02). None of the interactions were significant indicating that the relationships between LM and IGF1 and protein intake are similar for both populations and sexes.

Conclusions: Results from this study indicate that protein intake is an important factor in maintaining LM and is independent of IGF1 concentrations. These data support previous studies indicating that manipulating IGF1 concentrations to improve LM may be ineffective and that individuals attempting to gain LM should focus on ensuring that adequate protein is being consumed.

B-10 Thematic Poster - Hormones and Obesity

Wednesday, May 29, 2019, 1:00 PM - 3:00 PM Post Meal Hypoglycemia With and Without Exercise in Non-Obese and Obese Individuals.
Jay W. Porter1, Ryan Pettit-Mec1, Sean Ready1, Nancy C. Winn PhD1, Anand Chackolangam MD1, Guido Lastra Gonzalez MD1, Jill A. Kanaley PhD, FACSM1. 1University of Missouri, Columbia, MO. 2University of Missouri School of Medicine, Columbia, MO. (No relevant relationships reported)

Purposes: Hypoglycemia (<70 mg/dL) during exercise has been observed in some individuals when exercise is preceded by carbohydrate ingestion. Counterregulatory responses normally maintain plasma glucose concentrations to prevent hypoglycemic events in healthy adults. The degree to which hypoglycemia is observed across health statuses in response to an evening meal plus moderate intensity exercise is unknown. The purpose of this study was to examine glucose variability when a dinner meal containing 10 kcal/kg (40% CHO, 35% FAT, 25% PRO) was followed by moderate exercise in lean and obese individuals, and to establish if these associations are similar in Hutterites (H) (self-sufficient, farming, Anabaptist group) and non-Hutterites (NH), as well as in males and females.

Methods: 307 adults (118 H and 54 NH females, 75 H and 60 NH males) aged 20-66 years had body composition measured using DXA, serum (fasted) IGF1 concentrations and protein intake (by FFQ). Correlations were used for bivariate analyses and multivariate modeling was used to determine whether relationships between LM and IGF1 and LM protein intake were similar in both sexes and populations (sex-by-IGF1, sex-by-protein, population-by-IGF1, population-by-protein interactions) controlling for age, height, and fat mass.

Results: IGF1 correlated with protein intake in NH (r=-0.27, p=0.004), but not in H (r=-0.01, p=0.9); there was no correlation between circulating IGF1 and protein consumption in females (r=0.12, p=0.1) or males (r=0.01, p=0.1). LM was not correlated with IGF1 in H (r=-0.09, p=0.3) or NH (r=0.11, p=0.1); LM was correlated with IGF1 in males (r=0.21, p=0.01) but not females (r=0.02, p=0.21). LM was positively correlated with protein intake in NH (r=0.44, p=0.01) and H (r=0.44, p=0.01), and in males (r=0.33, p=0.01) but not females (r=0.02, p=0.8). Greater LM was not associated with age (β=-0.04, p=0.09), but was associated with greater fat mass (β=-0.51, p=0.001), being taller (β=0.49, p=0.001), being male (β=15.4, p<0.001), and consuming more protein (β=0.02, p=0.02). None of the interactions were significant indicating that the relationships between LM and IGF1 and protein intake are similar for both populations and sexes.

Conclusions: Results from this study indicate that protein intake is an important factor in maintaining LM and is independent of IGF1 concentrations. These data support previous studies indicating that manipulating IGF1 concentrations to improve LM may be ineffective and that individuals attempting to gain LM should focus on ensuring that adequate protein is being consumed.
Hypogonadism (serum testosterone concentration < 300 ng·dL−1) has been associated with poor health in men. The current treatment for hypogonadism—testosterone replacement therapy—is expensive, may produce adverse effects and its long-term safety is unknown.

**Purpose:** To identify nutritional and physical activity predictors of low serum testosterone status in men using the National Health and Nutrition Examination Survey (NHANES), a nationally representative sample of the United States.

**Methods:** A secondary analysis of cross-sectional data from 2011-2012 NHANES was carried out to examine the associations between weight status, dietary intakes, physical activity and serum testosterone concentrations. 1,933 adult men were included in the study after exclusion for missing and unreliable data. Nutrient intakes from foods and supplements were assessed using 24-hour recall via the 5-step Automated Multiple Pass Method. Participants self-reported typical weekly physical activity and daily sitting time. Body mass index (BMI), age, race, relationship status, education, and smoking behavior and serum testosterone concentration were assessed during mobile exam center visits. Logistic regression was used to identify predictors of low testosterone status (lowest quartile; 204 ± 4 ng·dL−1). Sampling weights were utilized in the analyses to account for the complex sampling design.

**Results:** Overweight and obese men had greater odds (2.10, 95% CI 1.17-3.78; 5.23, 95% CI 3.12-8.76) of low testosterone. Men reporting any vigorous physical activity, either recreational or work-related, had lower odds (0.42, 95% CI 0.28-0.64; 0.56, 95% CI 0.33-0.98) of low testosterone, whereas sitting time was associated with increased odds (1.05, 95% CI 1.02-1.08). None of the dietary variables were statistically significant predictors of low testosterone status in the logistic regression model (all p > 0.153).

**Conclusion:** BMI, vigorous physical activity and sitting time were independently associated with low testosterone status and appear to be candidates for lifestyle interventions. Future research should examine the effectiveness of weight loss interventions employing dietary, sedentary behavior, and physical activity modification to increase testosterone in overweight/obese men with low testosterone status.
RESULTS: 1) MVC force of the chronic resistance trained group was 33 % higher (p ≤ 0.001) than the untrained group. 2) The chronic resistance trained group had lower AMTs at all contraction intensities (p ≤ 0.03, p ≤ 0.01, p ≤ 0.08 for the 15 %, 25 % and 40 % of MVC, respectively) compared to the untrained group. 3) MEP amplitude (normalized to Mmax) did not differ between the two groups. 4) During 25 % of MVC, the untrained group exhibited decreased SICI in comparison to the chronic resistance trained group (SICI: 78 ± 13% vs. 97 ± 9% of test pulse; p ≤ 0.01, respectively). During 40 % of MVC, the untrained group also exhibited decreased SICI in comparison to the chronic resistance trained group (SICI: 86 ± 14% vs. 102 ± 11% of the test pulse; p ≤ 0.03, respectively). SICI did not differ between groups at 15 % MVC (p ≤ 0.30).

CONCLUSION: Based on the results, chronic resistance training significantly reduces SICI at stronger contraction intensities compared to no training. The significant reductions in inhibitory outputs suggest the presence of an adaptive process of facilitatory network activation, which can cancel out the SICI, to increase corticomotor drive to the exercised muscle following a long period of resistance training.
May 29 2:00 PM - 2:15 PM

Painful Control During A Knee Lift Test Is Associated With Increased Risk Of Knee Injuries

Mari Leppänen1, Marko Rossi2, Jari Parkkari1, Ari Heinonen3, Sami Ayrämö1, Tommi Vasankari2, Kritta Pasanen1. 1Tampere Research Center of Sports Medicine, Tampere, Finland. 2University of Jyväskylä, Jyväskylä, Finland. 3UK Institute, Tampere, Finland. *University of Calgary, Calgary, AB, Canada.
Email: mari.leppanen@uta.fi

PURPOSE: To investigate whether deficits in stance leg, hip and pelvic stability during a standing knee lift test are associated with increased risk of non-contact knee and ankle injuries in youth team sports.

METHODS: At baseline, 263 basketball and floorball players (age range 12–21 y.) participated in a standing knee lift test using 3-dimensional motion analysis. The test was a modified version of the Trendelenburg test to assess stance leg and hip stability. Two trials per leg were recorded from each participant and mean value was used in the analysis. The biomechanical variables calculated were peak anterior pelvic tilt angle (APT) and peak lateral pelvic drop angle (LPD). The APT and LPD were categorized into two groups using the median of the cohort: low group (values less than median value) and high group (values larger than median). All new non-contact knee and ankle injuries, as well as match and training exposure, were then recorded for 12 months. A Cox regression models were used to calculate hazard ratios (HRs) and 95% CIs.

RESULTS: A total of 16 new non-contact knee injuries (of which eight were ACL injuries) and 8 new non-contact ankle injuries were registered during the study period. Athletes displaying high lateral pelvic drop angles (LPD) were at increased risk of knee injuries (adjusted HR for high versus low group 4.22; 95% CI 1.34–13.3). A significant association was found between high lateral pelvic drop angles and ACL injury risk in female athletes (adjusted HR for high versus low group 8.14; 95% CI 0.97–68.6). No potential ankle injury risk factors were found. A receiver operating characteristic curve analysis for the LPD and APT showed an area under the curve of 0.60, which indicates poor combined sensitivity and specificity of the test.

CONCLUSIONS: Poor pelvic control, with increased lateral pelvic drop, is associated with increased risk of non-contact knee injuries among young team sport players. However, the knee lift test cannot predict non-contact knee injuries in youth team sports.

Supported by the Finnish Ministry of Education and Culture, and the Competitive State Research Financing of the Expert Responsibility area of Tampere University Hospital (Grant 98047).

May 29 2:15 PM - 2:30 PM

Effects of Foot Instability Variations on Muscle Activation during Front Plank Exercise

Saori Hanaki, Kimberly J. Evans, Tim Ruden. Weber State University, Ogden, UT.
Email: saorihanaki@weber.edu

PURPOSE: To identify how different foot stability variations of front plank influence activation of 5 different muscles.

METHODS: 19 physically active, healthy individuals (8 males, 11 females; age 39±16.0 years; height 1.68±0.1 m; mass 75±17.5 kg) performed each of 4 plank variations in a randomized order. The foot stability was modified by placing the feet: 1) on a level, stable floor (FLOOR); 2) on an elevated stable step (STEP); 3) in elevated suspension straps (SUSPEND); 4) on a rubber dome (DOME). STEP, SUSPEND and DOME were matched for foot placement. Electromyography of 5 muscles, rectus abdominis (RA), external oblique abdominis (EOE), rectus femoris (RF), sartorius anterior (SA) and erector spinae (ES) during front plank with 4 different foot stability conditions was examined and normalized at 5% maximal voluntary isometric contraction (%MVIC). Foot stability variation effect on normalized average muscle contraction of 5-second static plank trials was assessed using one-way repeated measure ANOVA and Friedman test for normally and non-normally distributed data respectively.

RESULTS: SUSPEND was associated with greater muscle activation than DOME in RF (43.2±25.8 vs. 32.9±25.9 %MVIC, p<0.05) and in RA (39.5±18.2 vs. 30.3±18.5 %MVIC, p=0.05). Compared to FLOOR, SUSPEND was associated with higher activation of SA (57.2±27.5 vs. 48.2±23.1 %MVIC, p<0.05) and ES (8.9±4.3 vs. 7.5±3.4 %MVIC, p<0.05).

CONCLUSIONS: Plank with suspended feet increased average activation of muscles used in the front plank. The use of RF and RA increased primarily due to foot instability induced by suspension, and the activation of SA and ES increased with combination of instability and increased weight distribution to the upper body.
RESULTS: The peak RMS of Gmax, BFL and STN sEMG while performing mSLB were 82.1±21.4, 141.5±36.4, and 155.0±2.5, respectively. The peak magnitude of the hamstring muscle activations were greater, although peak Gmax activity was lower (p=0.05), while performing mSLB than that of ST and BFL. Gmax muscle activation burst duration of mSLB was 1.6±0.7s longer while performing mSLB than that of ST and BFL (p=0.05). Muscle activation burst durations of STN (3.82±0.58s) and Gmax (3.53±1.72s) were (0.42±0.50s) and Gmax (0.47±0.44s) shorter than that of mSLB (p=0.05).

CONCLUSIONS: Comparing to SLB, mSLB increased bi-articular hip extensor (BFL and ST) muscle activation level while reduced mono-hip extensor (Gmax) activation level accompanied by prolonged BFL activities and shortened Gmax/St activation durations.

559 Chair: Graham R. McGinnis. University of Las Vegas Nevada, NV. (No relevant relationships reported)

May 29 1:00 PM - 1:15 PM
Sites of Disruption in Dystrophic Muscle Following Eccentric Contractions
Cory W. Baumann1, Gordon L. Warren, FACSM2, Dawn A. Lowe, FACSM2. 1University of Minnesota, Minneapolis, MN. 2Georgia State University, Atlanta, GA.
Email: cbbaumann@umn.edu (No relevant relationships reported)

PURPOSE: Dystrophin is responsible for maintaining plasmalemmal integrity and cellular homeostasis. A key feature of skeletal muscle that lacks dystrophin, as in the mdx mouse model for Duchenne muscular dystrophy (DMD), is a heightened sensitivity to eccentric (ECC) contraction-induced strength loss. However, the mechanisms responsible for the exaggerated loss of strength in dystrophic muscle have yet to be fully established. The purpose of this study was to determine possible sites within mdx muscle that are disrupted following ECC contractions.

METHODS: Male wildtype and mdx mice (n = 8 per group) were chronically implanted with stimulating electrodes on the left common peroneal nerve and EMG electrodes on the left tibialis anterior (TA) muscle. The left anterior crural muscles (TA and extensor digitorum longus; EDL) of anesthetized mice performed 50 maximal ECC contractions. In vivo peak dorsiflexion torque and M-wave root mean square (RMS) were measured prior to and immediately after the ECC contractions. Following the in vivo assessment, the EDL was removed and ex vivo peak isometric force and caffeine-induced force were analyzed. RESULTS: Peak torque and force in wildtype mice were reduced 36 ± 4 and 28 ± 4% (p = 0.001) following the ECC contractions, while no changes were observed in M-wave RMS (10 ± 2%, p = 0.49) or caffeine-induced force (10 ± 4%; p = 0.20). To the contrary, both M-wave RMS and caffeine-induced force were reduced in mdx muscle (60 ± 4 and 58 ± 5; p ≤ 0.001), and corresponded to reductions of 60 ± 2 and 67 ± 8% (p ≤ 0.001) in peak torque and force. CONCLUSIONS: On the basis of the disproportional reductions in strength measured in vivo and ex vivo (36 and 28%, respectively) compared with that of in vivo M-wave RMS (10%) and ex vivo caffeine-induced force (10%), we confirm that ECC contractions uncouple the plasmalemma from the ryodamine receptors (RyRs) in wildtype muscle. However, in mdx muscle, in vivo peak torque and M-wave RMS in addition to ex vivo force and caffeine-induced force were all reduced to a similar degree (58-67%), indicating that various sites were disrupted immediately following the injury. These data indicate strength loss in wildtype and mdx mice differ, in that plasmalemmal function and sites or at distal to the RyRs may all be impaired in dystrophic muscle following ECC contractions.

EXOSOMES are extracellular vesicles that carry ‘cargo’, such as microRNA, which may interact with different tissues and regulate cellular signaling pathways. PURPOSE: To determine the effects of exogenous bovine exosomes on the liver and skeletal muscle in young, growing rats. METHODS: Twenty-eight-day Fisher 344 rats were provided a milk-based diet that either contained exosomes (EXO+, n=12) or was exosome depleted via sonication (EXO-, n=12) for four weeks. Following the intervention, the liver and gastrocnemius were removed and measurements of respiratory control ratio (RCR), reactive oxygen species emission (ROS), antioxidant levels, cross sectional area (CSA), total RNA, and transcriptomics were performed. Except for transcriptomic data, independent samples t-tests were performed between diet groups and statistical significance was set at p<0.05. For transcriptomic data, all annotated transcripts with FPKM scores >1.0 were analyzed between groups and any score exceeding a fold-change cut-off >1.5 fold (p<0.01) were considered meaningful. RESULTS: There was no significant change in mitochondrial volume in either the liver (p=0.707) or gastrocnemius (p=0.724), however the liver had increased state 3 and state 4 in the EXO- treated group (p=0.040 and p=0.009) with complex I substrates. No significant differences were detected in liver antioxidant protein levels or oxidative damage markers (p=0.050). There was an increase in GPX protein levels in gastrocnemius (p=0.016). There was an increase in GPX protein levels in gastrocnemius (p=0.016). There was an increase in GPX protein levels in gastrocnemius (p=0.016). There was an increase in GPX protein levels in gastrocnemius (p=0.016). There was an increase in GPX protein levels in gastrocnemius (p=0.016). There was an increase in GPX protein levels in gastrocnemius (p=0.016). 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é¢面部。CONCLUSION: An exosome depleted diet affects liver and skeletal muscle parameters and resulted in increased muscle hypertrophy. These changes may be due to the enhanced mRNA nature of the EXO- diet. Supported by AU IGP Grant; NIFA 2015-67017-23181 and 2016-67001-25301; NIH R25GM104320; Gates Foundation, Gerber Foundation; PureTech Health, Inc. JZ serves as a consultant for PureTech Health, Inc.

563 May 29 1:45 PM - 2:00 PM
Resolvins E1 Attenuates Inflammatory Induced Muscle Atrophy In Human Derived Muscle Cells
1Loughborough, Loughborough, United Kingdom. 2University of Leicester, Leicester, United Kingdom.
Email: m.r.lindley@iboro.ac.uk

(no relevant relationships reported)

Purpose Loss in skeletal muscle size and function is a common debilitating co-morbidity in an array of chronic disease states as well as during the aging process. This can lead to a loss of physical activity and ability to perform everyday tasks, leading those affected into a downward spiral of muscle loss and inactivity which has been strongly linked to increased rates of morbidity and mortality. Many factors have been linked to induce such processes, one of which is inflammation, with therapeutic research looking for ways to resolve chronic inflammation to subsequently alleviate related muscle atrophy. Resolvins E1 (RvE1) is a specialised pro-resolving lipid mediator, derived from the metabolism of the omega-3 fatty acid EPA, which has shown to have beneficial pro-resolving properties in an array of cell types, including our previous work in immortalised skeletal muscle cell lines. Method This set of experiments cultured human derived skeletal muscle cells from healthy control participants (n=6). Once differentiated, myotubes were exposed to Lipopolysaccharide (LPS) in the presence or absence of RvE1 (100ng/ml) and compared with a control condition. Post exposure, myotubes were harvested for gene expression and intracellular protein analysis. From the same experiment, wells were also fixed and stained for immunocytochemistry analysis of myotube size and number. Results Our work indicates beneficial pro-resolving properties of RvE1 in human skeletal muscle cells. Specifically, the presence of a RvE1 concentration of 100ng/ml resulted in a significant increase in gene expression and intracellular protein expression of markers involved in the regulation of muscle hypertrophy and ribosome biogenesis. Our novel findings provide initial rational for further investigation of RvE1 as a potential therapy for the treatment of muscle wasting in health and disease. Conclusion Preliminary evidence suggests that RvE1 may induce its effects through the inhibition of classical canonical inflammatory signalling. Our novel findings provide initial rational for further investigation of RvE1 as a naturally occurring nutritional therapeutic in chronic conditions characterised with a degree of inflammatory induced skeletal muscle atrophy.

564 May 29 2:00 PM - 2:15 PM
Concurrent Exercise of the Arm Extensors Modulates Anabolic Signaling and Gene Expression for Ribosome Biogenesis
Tommy R. Lundberg1, Björn Hansson2, Luke A. Olsen1, Ferdinand von Walden1, Rodrigo Fernandez-Gonzalo1, Martin R. Lindley1, Per A. Tesch3, Tommy L. Pedersen4, 5.
1Karolinska Institutet, Stockholm, Sweden. 2University of Kansas, Lawrence, KS. 3University of Leicester, Leicester, United Kingdom. 4Karolinska Institutet, Stockholm, Sweden. 5University of Kansas Medical Center, Kansas City, KS.

Email: tommy.lundberg@ki.se

(no relevant relationships reported)

PURPOSE: As most concurrent exercise studies to date have focused on lower-limb muscles, this study explored the acute molecular response to concurrent exercise of the arm extensors. Specifically, the effects of a heavy load exercise bout (4 sets of 8 reps with flywheel technology) on subsequent anabolic signaling and ribosome biogenesis response to resistance exercise (RE) were explored. METHODS: Eleven moderately trained men (28 ± 5 years, 181 cm ± 6 cm, 81 ± 8 kg) performed a unilateral bout of arm extensor aerobic exercise (~45 min) in a seated isokinetic dynamometer. Subsequently, unilaterally resistance exercise (4 sets of 7 reps) was performed for both arms using flywheel technology. Thus, one arm was subjected to RE alone, while the other arm performed consecutive bouts of AE and RE interspersed by 15 min recovery. Peak power (merged across arm x time interactions, P < 0.05). Phosphorylation of AMPK increased in 2F, and 4E-BP1 decreased (0.5-fold), after the AE bout (arm x time interactions, P < 0.05). Phosphorylation of 70S6K remained unaltered.

Gene expression of c-Myc and 45S pre-rRNA (ITS) increased with exercise and was greater in AE+RE compared with AE alone (main effect of time and arm P < 0.05). Polr1b expression increased in both AE+RE and RE (main effect of time P < 0.05).

CONCLUSION: The results suggest that post-exercise translational signaling could be compromised by prior aerobic exercise. In contrast, concurrent exercise of the arm extensors accentuates the expression of key regulators of ribosome biogenesis and promotes rRNA transcription.

565 May 29 2:15 PM - 2:30 PM
The Skeletal Muscle Transcriptome Signature of 84-day Bed Rest and its Reversal by Resistance Exercise
Rodrigo Fernandez-Gonzalo, Per A. Tesch, Tommy R. Lundberg, Eric Rullman, Thomas Gustafsson.
Karolinska Institutet, Stockholm, Sweden.
Email: rodrigo.gonzalo@ki.se

(no relevant relationships reported)

PURPOSE: Given the poor understanding of the molecular mechanisms regulating skeletal muscle alterations to long-term unloading/microgravity, this study assessed the transcriptomic changes to 84 days of bed rest, and the potential of high-intensity, low-volume resistance exercise (RE) to counteract the bed rest signature. METHODS: Healthy men (age range 26-41 yr) were randomized to perform 84-d bed rest with (BRE; n=9) or without (BR; n=12) concurrent RE targeting the knee extensors (i.e. supine squat; 4 sets of 7 maximal concentric-eccentric repetitions every third day) employing Yo-Yo iso-inertial flywheel technology offering eccentric overload. Biopsies from m. vastus lateralis were obtained from all subjects before and after bed rest. The muscle specimens were used to conduct a DNA microarray analysis. RESULTS: Three hundred thirty-five probesets were down- and 315 were upregulated after bed rest at a false discovery rate of 0.01. Amongst the downregulated genes, ontologies related to muscle structural and contractile components, and acetylcholine receptors, were highly enriched. Yet, the ontology most substantially affected by bed rest, with 109 genes downregulated, was the mitochondrion. Although RE normalized a large portion of the transcripts affected by bed rest, genes that were upregulated after bed rest were less likely to become normalized by BRE. The greatest counteracting effect of RE was noted in genes belonging to the mitochondrion. This ontology was even slightly elevated by exercise compared with the baseline signature in BRE (Pre-Post: BRE; P<0.05, interaction BR-BRE; P=0.78). A group of upregulated transcripts were not affected by RE. These genes are involved in transcriptional regulation, and DNA and chromatin stability. CONCLUSIONS: Long-term bed rest has a profound effect on muscle mass and function. Our data indicate that such changes are driven by alterations in molecular pathways regulating muscle structure, contractile properties, neuromuscular junction, and importantly, the mitochondrion. This particular RE regimen appears to counteract, and even reverse, selected transcriptomic modifications induced by long-term bed rest. Yet, some genes modulated by bed rest were resistant to RE and thus represent the residual signature of bed rest induced muscle atrophy.

566 May 29 2:30 PM - 2:45 PM
Lifelong Deficiency in Ulk1-Mediated Autophagy Precipitates Skeletal Muscle Aging
Anna S. Nichenko1, William Michael Southern2, Grant Mercer1, Sarah M. Greising3, Jarrod A. Call1. 1University of Georgia, Athens, GA. 2University of Minnesota, Minneapolis, MN.

(email: no relevant relationships reported)

Autophagy is a cellular recycling mechanism critical for maintaining cellular homeostasis because it degrades dysfunctional organelles and proteins. Insufficient autophagy is implicated in the pathophysiology of a plethora of diseases (i.e. Type 2 diabetes, obesity, and sarcopenia) and in the process of aging across many cell types. Ulk1 is an autophagy-related protein kinase that initiates autophagy and may be particularly critical for maintaining skeletal muscle cellular homeostasis throughout lifelong. METHODS: To investigate muscle health and function in an aging mouse model with a lifelong deficiency of Ulk-1-mediated autophagy. RESULTS: Autophagosomes significantly increased in vivo ankle dorsiflexion torque from age 12 months to age 22 months in Ulk1 KO mice and their littersmates controls (LM) were performed beginning at 12 months of age. At age 22 months, mice were administered a glucose tolerance test (GTT), followed by in vitro force testing of the extensor digitorum longus (EDL) and soleus (SOL) muscles. Mice were then sacrificed and mitochondrial function was measured via oxygen consumption rates of permeabilized muscle fibers from the gastrocnemius muscle. RESULTS: Body mass did not change throughout the longitudinal force measurements (p=0.58). Ulk1 KO mice experienced a greater reduction in in vivo ankle dorsiflexion torque from age 12 months to age 22 months compared to LM mice (−50% vs. −36%, p=0.026). In vitro peak-isometric force of isolated EDL muscles was lower in Ulk1 KO mice (p=0.016) but there was no difference in isolated SOL muscle force between genotypes suggesting an accelerated aging phenotype in predominately fast-twitch muscle fibers. There was no difference in the GTT between genotypes (p=0.1). Interestingly, mitochondrial respiration was greater in the Ulk1 KO mice when normalized to muscle fiber mass

Abstracts were prepared by the authors and printed as submitted.
Exercise is one of the few behavior modifications that enable long-term weight loss through unknown mechanisms. High-intensity exercise (HIE) induces norepinephrine and calcium signaling, which together, stimulate the Crtc2 coactivator to activate the Crtc2-mediated transcriptional program in skeletal muscle. We previously demonstrated that Crtc2 activation drives an adaptive anabolic transcriptional response that includes hypertrophy and enhanced exercise performance (Bruno et al. EMBO J. 2014). PURPOSE: Here, we examined the role of skeletal muscle-selective Crtc2/Creb1 signaling in the metabolic response to weight loss. METHODS: Crtc2 was selectively overexpressed in skeletal muscle using a doxycycline-inducible transgene. Compared to control Tg mice, which lost lean body mass (p < 0.02), Crtc2 Tg mice lost more weight over time (Crtc2, p = 0.013; Crtc2 x Time, p = 0.00015) through a selective loss of fat body mass (p = 0.004). This effect was due to higher energy expenditure during fasting (1 kCal/hr, < 10-15), and was associated (ADF).

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May 29 1:45 PM - 2:00 PM
The Exercise Response In Blood Flow Restriction Training Varies As A Function Of Cuff Type
Johanna Vogel, Jan Wilke, Lutz Vogt, Winfried Banzer, FACSFM, Graduate School of Sport Sciences, Frankfurt, Germany. (Sponsor: Winfried Banzer, FACSFM)
Email: johvogel@em.uni-frankfurt.de

Purpose: Blood flow restriction (BFR) training is a popular method to induce muscle hypertrophy. Both conventional blood pressure cuffs and devices specifically developed for BFR are used to achieve vascular occlusion/BFR. However, it is unknown if the training response differs depending on the cuff type. This study elucidated the acute effects and the safety of exercising with a medical blood pressure cuff (MC) and a BFR cuff (BFR-C).

Methods: Ten healthy individuals (30 ± 8 years, 57% male) completed three sessions of unilateral low-intensity resistance exercise (30% 1RM) of the knee extensors. In the first session, wearing a BFR-C, the participants performed three sets until maximal exhaustion. In the two other conditions (order selected randomly), the same workload (sets & repetitions) was used for a training session with a MC and without any BFR. Pre and post-intervention, blood lactate, thigh circumference, pressure pain threshold, tissue stiffness and elasticity were measured. During exercise, heart rate, subjective discomfort and fatigue were documented. Twenty-four, 48 and 72 hours after training, muscle soreness was assessed. To judge safety, the pressure [mmHg] needed to provoke full occlusion at rest was determined with Doppler sonography. Differences between conditions were detected by means of Friedman tests including adjusted post hoc Conover comparisons.

Results: Both, BFR-C (+ 49%, p < 0.05) and MC (+ 29%, p = 0.03) induced greater lactate concentrations than the no-BFR control. Compared to the other conditions, BFR-C resulted in higher values for exercise heart rate (+ 3% vs. MC, p = 0.015, + 3% vs. no-BFR, p = 0.015) as well as muscle soreness after 24 hours (+ 81% vs. MC, p = 0.012, + 150% vs. no-BFR, p = 0.004). 72 hours post training, soreness was still increased in BFR-C (+ 3.5 pts on NRS vs. no-BFR, p = 0.045). Similarly, BFR-C elicited stronger (p < 0.05), + 150% vs. no-BFR) ultrasound examinations revealed that MC could generate a full occlusion while BFR-C did not entirely obstruct blood flow as long as the normal scale was not exceeded. Conclusions: Although BFR-C seems to provide a stronger exercise stimulus than MC, it may be a better choice regarding exercise safety. This finding may particularly be of value if applying the method in elderly/untrained persons or individuals with chronic disorders.

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May 29 2:00 PM - 2:15 PM
Influence of Testing Sequence on an Adult’s Ability to Achieve Maximal Aerobic and Anaerobic Power

Purpose: To examine how testing sequence affects an adult’s ability to achieve maximal aerobic and anaerobic power during a single assessment visit.

Methods: Fifty-three adults (31 women, 22 men; 21.9 ± 1.6 years) participated in this investigation. All subjects were tested on three separate occasions. Participants completed two baseline visits (Visits 1 and 2) consisting of either a VO2max or WAnT in a randomized counterbalanced order. Participants then completed an experimental visit (Visit 3) which consisted of both a VO2max and WAnT in a randomized order (Group A: WAnT/VO2max; Group B: VO2max/WAnT) with 20 minutes of rest between tests. Mixed model ANOVAs with Bonferroni post hoc analyses compared baseline (Visits 1 or 2) and experimental (Visit 3) exercise test performance between and within groups for both relative VO2max and absolute peak power.

Results: No significant main or interaction effects were observed for relative VO2max at baseline and experimental visits when comparing Group A (42.9 ± 7.2 mL/kg/min and 42.0 ± 8.0 mL/kg/min, respectively) and Group B (47.7 ± 22.9 W and 742.7 ± 221.3 W, respectively) (p = 0.088, 0.05; 0.001). There were no changes in ECR, or OCR, and RER. Comparing Group A (747.7 ± 229.4 W and 742.7 ± 221.3 W, respectively) and Group B (747.7 ± 229.4 W and 742.7 ± 221.3 W, respectively) (p = 0.004, 0.05; 0.001). There were no changes in ECR, but may mask changes in sub-maximal running variables such as ECR, OCR, and RER.

CONCLUSIONS: Marathon training decreases RER during moderate exercise at the same absolute but not relative velocity. Changing the speed of the exercise testing protocol to reflect current running ability helps detect changes in aerobic capacity (VO2max), but may mask changes in sub-maximal running variables such as ECR, OCR, and RER.

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May 29 2:15 PM - 2:30 PM
Effects Of Honest And Dishonest Pre-exercise Placebo Ingestion On V02Peak And Isometric Handgrip Performance
Jessica Moon1, Christian Espitia2, Landon Hieber1, Christopher A. Fabs1, Lindy M. Rossow2, St.Charles, MO. 1Lindenwood University Belleville, Belleville, IL. (No relevant relationships reported)

Purpose: The purpose of this study was to examine the effects of honest (subjects were told they were consuming placebo) or dishonest (subjects were told they were consuming a pre-workout supplement) placebo ingestion on VO2peak values determined during a maximal treadmill graded exercise test. A secondary purpose of this study was to examine the effects of placebo consumption on isometric handgrip performance. We hypothesized that pre-exercise ingestion of both placebo conditions would result in increased VO2peak and handgrip performance compared to control. Methods: 28 males (178.4 ± 6.94 cm, 83.3 ± 14.8 kg, 22.6 ± 2.3 years) and 13 females (166.4 ± 8.49 cm, 73.6 ± 20 kg, 26.4 ± 11 years) participated in this study. In a randomized, cross-over design, subjects performed treadmill VO2peak and isometric handgrip testing after consumption of honest placebo (HP) or dishonest placebo (DP). In addition, a third baseline trial (CON) was performed to establish performance values that were unaffected by a perceived placebo effect due to supplementation. All outcomes were assessed for normality using the Shapiro-Wilk test. When assumptions of normality were violated, log transformations were computed. However, transformations did not improve model assumptions. Therefore, non-transformed data is reported. One-way ANOVAs were used to analyze VO2peak and handgrip strength data across conditions. Alpha was set at 0.05 prior to all analyses. Results: Significant between-groups differences (p<0.05) were not detected for relative VO2peak (CON = 46.2 ± 9.3 mL/kg/min; HP = 46.7 ± 10 mL/kg/min; DP = 46.6 ± 9.6 mL/kg/min) or for maximal handgrip strength (CON = 43 ± 9.6 kg; HP = 44 ± 12.4 kg; DP = 43 ± 12.1 kg). Conclusion: Administration of honest or dishonest placebo immediately prior to VO2peak and handgrip testing had no effect on performance compared to control. The VO2peak and isometric handgrip tests were found to be robust exercise tests not significantly influenced by perceived pre-workout supplement consumption.

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May 29 2:30 PM - 2:45 PM
Using a Stretch Sensor to Evaluate Muscle Contraction Timing During a Neuromuscular Control Screening Activity
Shannon E. Linderman1, Donna Mosley Scarborough1, William Day2, Daniel Wrafter3, Eric M. Berkon1. 1Massachusetts General Hospital, Boston, MA. 2figur8, Inc, Boston, MA. 3Massachusetts Institute of Technology, Cambridge, MA. Email: slinderman@mgh.harvard.edu

Reported Relationships: S.E. Linderman: Salary; figur8,Inc.

Purpose: Stretch sensors are wearable devices that when applied over a muscle group, can measure the physical output of muscle deformation resulting from a muscle contraction. Electromyography (EMG) is the clinical standard for assessing the electrical signal identifying muscle activation. The well-established challenges in EMG data collection and analysis methods limit utility for wearable wide-spread neuromuscular control screening. The purpose of this study was to investigate the ability of stretch sensors to detect timing patterns of muscle contraction and compare time events to those collected through traditional clinical EMG. Methods: 4 healthy subjects (mean age: 23.29 ± 3.43 y) completed 5 repetitions of a unilateral partial squat with a stretch sensor and an EMG unit simultaneously applied to the dominant leg quadriiceps muscle. Paired T-test and linear regression analyses assessed differences in key muscle contraction time events (Figure 1) for the stretch sensor (SS) and EMG.

Results: Relative times of peak contraction (t=0.99, mean relative error (RE) = 0.04), activation (t=0.98, RE=0.14), and deactivation (t=0.92, RE=0.35) displayed excellent correlation between the EMG and SS. Duration of ascent (p=0.103, EMG: 1.14 ±0.86 s, SS: 1.36 ±0.27 s) and descent (p=0.079, EMG: 1.38 ±0.49 s, SS: 1.14 ±0.37 s) squat phases and total contraction time (p=0.95, EMG: 2.55 ±0.83 s, SS: 2.85 ±0.95 s).
4.9±0.30 s) did not differ significantly between EMG and SS. Average within-subject variation was not significantly different for EMG timing of ascent (p=0.56) and descent (p=0.15) phases, and total contraction (p=0.08).

CONCLUSIONS: Our findings reveal similarities in time signatures between SS and EMG for assessing quadriceps activation during a standard neuromuscular screening activity. This suggests the potential for utility of SS evaluation of muscle activation timing. This study was supported in part by figure8 Inc.

Although the direct measurement of VO_{2max} during an exercise test provides the most accurate assessment of cardiorespiratory fitness, estimates of VO_{2max} are often more practical. Prior research suggests that VO_{2max} obtained during a treadmill maximal graded exercise test can be accurately estimated in men using the Heart Rate Ratio Method. This method estimates VO_{2max} using the following equation: VO_{2max} (mL/kg/min) = (HR_{max}/HR_{rest}) x 15. The validity of this equation to estimate VO_{2max} has not been established in women or in other modes of exercise, such as cycling.

METHODS: This study compared VO_{2max} values measured during running and cycling to estimates of VO_{2max} using the Heart Rate Ratio Method in 42 men and women. METHODS: Resting metabolic rate (RMR) and VO_{2max} on the treadmill and cycle ergometer were measured on 21 men and 21 women between 19-39 years of age. Each subject’s running and cycling VO_{2max} was estimated using the Heart Rate Ratio Method and their resting HR measured during the RMR test and their actual maximal HR achieved during the maximal exercise test. RESULTS: The average running and cycling VO_{2max} values for males (54.2 ± 7.1; 50.0 ± 8.9 mL/kg/min) were higher (p<0.001) than in females (43.4 ± 5.8; 39.8 ± 7.4 mL/kg/min), respectively. Resting HR values for males (55 ± 7 bpm) and females (57 ± 6 bpm) were similar as were the maximal HR values during running (186 ± 12; 190 ± 12 bpm) and cycling (181 ± 11; 184 ± 13 bpm), respectively. The estimates of running and cycling VO_{2max} under-predicted actual values in males (-2.9 ± 8.0; -0.26 ± 7.8 mL/kg/min) and overestimated actual values in females (7.3 ± 7.9; 9.3 ± 8.2 mL/kg/min), respectively. There was a significant gender effect in the prediction of VO_{2max}.

CONCLUSION: The high SEE and LOA precludes this method for predicting running and cycling VO_{2max}. Gender differences in maximal HR and VO_{2max} are not accounted for in predictions of VO_{2max} using the Heart Rate Ratio Method.
HISTORY: A 42-year-old male was diagnosed with stage IV colorectal, metastatic cancer. In 2017 (2 years post-diagnosis) he came to our laboratory seeking exercise advice. He had received 56 rounds of chemotherapy without signs of remission. He also exercised on the bike 4-5 days/week with a duration of 1-3 hours. PHYSICAL EXAMINATION: He performed an incremental cardiopulmonary cycling exercise test. 02 consumption, blood lactate (BLA) as well as fat and carbohydrate oxidation rates (FATox/CHOox) were measured to assess cardiopulmonary and mitochondrial function. Both his FATox and lactate clearance capacity were poor, suggesting poor mitochondrial function despite exercising 4-5 days/week. He was given an individualized exercise prescription program for 3 months with the same amount of days and hours/week but with specific exercise intensities based on his individual metabolic parameters with the aim to improve oxidative metabolism to try to target the glycolytic phenotype of cancer (Warburg Effect). During the course of this exercise program he continued with chemotherapy. TESTS AND RESULTS: 3 months after the individualized exercise program he returned to the lab for re-evaluation. Significant increases in oxidative metabolic capacity at different exercise intensities were observed: [At 115, 150, 190 Watts his BLA significantly increased (0.11 g/min vs 0.29 g/min); 0.06 g/min vs 0.25 g/min and 0.0 g/min vs 0.25 g/min respectively].

- Significant differences in oxygen uptake capacities at different exercise intensities were observed: [At 115, 150, 190 and 235 Watts (20 ml O2/L vs 1.0 ml O2/L; 2.6 ml O2/L vs 1.4 ml O2/L; 4.4 ml O2/L vs 2.2 ml O2/L and 9.7 ml O2/L vs 4.6 ml O2/L respectively)].

FINAL/WORKING DIAGNOSIS: The patient's cardiovascular and oxidative capacity significantly improved after 3 months of individualized exercise program. TREATMENT AND OUTCOMES: One month later, he performed a new PET scan showing remission and no evidence of cancer. CONCLUSIONS: This case shows a novel approach to individualize exercise prescription in cancer patients to try to elicit improvements in oxidative metabolism to counteract the glycolytic phenotype of many cancers. The mechanisms for this meta-bolism reprogramming could be a possible crosstalk between skeletal muscle and cancer cells via exosomes could be a possible explanation.

Patient was doing well as of this writing, with no pain or range of motion restriction after surgery. Given reports of recurrence of giant cell tumors, follow-up was recommended in the event that the mass recurred or was noted in other locations.
and recommended participation in study TREATMENT AND OUTCOMES: 1. Procarbazine, Lomustine, and Vincristine Sulfate (PCV) chemotherapeutic (6x) with ionized radiation (46Gy followed by 14Gy boost to resection site and G2/FLAIR regions) - temozolomide added as adjuvant to radiation 2. Patient completed 36 sessions of aerobic and flexibility training 3. Improvements observed in physiological, psychosocial, and cognitive variables 4. Patient then made a positive transfer into a standard exercise-based cancer rehabilitation program

**585** May 29 2:40 PM - 3:00 PM

**Stomach Cancer - Physical and Functional Tests**

Roberto Carlos Vieira Junior, RCVJ1, Geovane J. Tolazzi, GJT2, Haracelli Christina Barbosa Alves Leite da Costa, HCBALC2, Ailton Silva Machado, ASM2, Felipe dos Santos Buia Sorte, FSBS2, Andrea Claudia Alves, ACV2, James Wilfred Navalta, JWN, FACSMM2, Fabricio A. Voltarelli, FAV2. 1Federal University of Mato Grosso, Cuiabá, Brazil. 2Federal University of Mato Grosso, Cuiabá-MT, Brazil. 3Mato Grosso Cancer Hospital, Cuiabá-MT, Brazil. 4University of Nevada, Las Vegas, Las Vegas, NV. Email: rcviejrajr@gmail.com

(No relevant relationships reported)

**HISTORY:** A 53-year-old female patient (Body mass ~ 71.30 kg; Height; 1.58 m; BMI ~ 28.74 kg / m²) from the Mato Grosso Cancer Hospital in Cuiabá, Brazil, with stomach cancer, reported stomach pain for at least 12 months, with no improvement in the use of proton pump inhibitors (omeprazole) and/or antacids (sodium bicarbonate). She reported vomiting and increasing pain after consuming beer and using tobacco. The patient denied having decreased body weight over the last six months. Abdominal distension was reported.

**PHYSICAL EXAMINATION:** Clear awareness, without edema, afibrile, normal blood pressure SARC-F questionnaire: score = 4 (tendency for sarcopenia).

**DIFFERENTIAL DIAGNOSIS:**
1. Reported muscle strength loss
2. Needed help to walk and lift chair
3. Could not climb stairs

**TEST AND RESULTS:**
- Tomography of the whole abdomen:
  - wall thickening of the gastric antrum
- Functional evaluation:
  - Handgrip test: mean of 30 kg.f in both hands (good);
  - 30-second elbow flexion test: 13 repetitions (good);
  - 30-second chair stand test: 11 repetitions (adequate);
  - Timed Up and Go test: 9 seconds (low risk of falls);
  - Walking speed test: 1m / sec (adequate);
  - 2-minute walk test: 109 knee elevations (good functional capacity)

**FINAL WORKING DIAGNOSIS:** Locomotor difficulties were diagnosed through the physical/clinical examination and there was a tendency for sarcopenia; on the other hand, the physical tests did not corroborate this information and did not independently confirm physical incapacity prior to the total gastrectomy.

**TREATMENT AND OUTCOMES:**
1. Total gastrectomy
2. Need to develop physical/functional tests to be applied, specifically, in cancer patients, regardless of tumor type.
3. Currently available physical tests were developed for an elderly population, which may compromise the interpretation of the results obtained (low specificity and sensitivity).
4. Prescription of physical exercises (as a non-pharmacological treatment) for patients with stomach cancer should begin before surgery, because the current patient presented, in advance, with locomotor difficulties.
5. The SARC-F questionnaire seems to be a good tool to detect sarcopenia in a patient with stomach cancer, although it also requires future adaptations for this purpose.

**B-15 Clinical Case Slide - Shoulder**

**Wednesday, May 29, 2019, 1:00 PM - 1:20 PM**

**Chair:** Cheri Blauwet. Harvard Medical School, Boston, MA.

(No relevant relationships reported)

**586** May 29 1:00 PM - 1:20 PM

**Severe Shoulder Pain in a Healthy Adolescent Child**

Ashkan Alkhamisi, M.D., J. Parker Chapman, M.D., Laurel Blakemore, M.D., Jason Zarembski, M.D., FACSM. University of Florida, Gainesville, FL. Email: ashkan.alkhamisi@ufl.edu

(No relevant relationships reported)

**HISTORY:** A 12-year-old child presented to sports medicine clinic with his grandfather for evaluation of 4 days of diffuse left shoulder and upper arm pain. Pain developed hours after holding onto a rope while tubing in a lake. He denies being thrown off the tube or shoulder pain while riding. Pain was 4/10 pain at rest and 9/10 pain with movement. Pain gradually worsened over previous past 4 days. He denied any previous injury to the left arm or shoulder. He denied any numbness, or tingling of the left arm. He denied any changes in vision, headaches, chest pain, shortness of breath, or rashes. Of note, he went to the ED two days prior due to subjective fevers and diagnosed with a viral upper respiratory infection.

**Physical Exam:** Vital signs were normal. He was distressed and tearful. He had no tenderness and full range of motion (ROM) of his cervical spine. There was diffuse left sided tenderness over the sternum, ribs, mid-humerus, biceps, upper trapezius, and rhomboids. Pain with active and passive ROM of the elbow and shoulder. Shoulder strength was limited due to pain. Sensation was intact throughout the left upper extremity. No skin discoloration, breaks, or increased warmth of the left arm or shoulder.

**Differential Diagnoses:**
1. Rotator cuff tendinopathy
2. Shoulder dislocation and/or glenoid labral tear
3. Occult Humerus fracture
4. Infection

**Initial Test and results:**
- Left shoulder and humerus radiographs were normal. Due to the disposition of the patient, the patient and his family were advised to go to the pediatric ER. A work-up revealed a normal WBC count, and an elevated CK and CRP. Urine and blood cultures were positive for MSSA. MRI of the shoulder and elbow revealed osteomyelitis of left scapular body with left periosteal abscess. Pediatric Orthopedic Surgery was then consulted and performed an incision and drainage (I&D) of the left supraspinatus, infraspinatus, and subscapularis abscesses.

**Final Diagnosis:** Acute MSSA osteomyelitis of left scapula with left periosteal abscess

**Treatments and Outcomes:** After surgical I&D, the patient clinically improved over a two-week hospital course and discharged after 4 weeks of IV antibiotics. He was then transitioned to oral antibiotics for an additional 8 weeks. At the 8-week clinical follow-up there was a complete resolution of shoulder and upper extremity pain.
TREATMENT AND OUTCOMES: Access to formal physical therapy was limited. The patient’s pain and numbness persisted despite oral medications and daily treatment with the athletic trainer so he was referred to the team chiropractor. During the initial chiropractic treatment, which consisted of trigger point release and stretching applied to the anterior scalene muscleculature and cervical distraction manipulation, the patient experienced a sudden and complete resolution of his pain and numbness. He remained symptom free for the rest of the season.

591 May 29 1:40 PM - 2:00 PM Abnormal Anatomical Etiology and the Resultant Bilateral Thoracic Outlet Syndrome: An Exploration Case Report

Jennifer Rizzo1, Brent M. Peterson2. 1Concordia University Irvine, Irvine, CA. 2BONA University, La Mirada, CA.

(History: 32-year-old healthy female presented to the vascular surgeon for right arm pain (pn) and a hand tremor. She was a mesomorph with forward head posture and was a volleyball athlete and triathlete.

Physical Examination: On physical examination, the patient had decreased c-spine range of motion with hypertonicity and tenderness of the supraclavicular fossa. Spurling’s maneuver was negative and his shoulder and elbow had full range of motion and strength. There was no significant laxity or pain with valgus stress of the elbow and his wrist and intrinsic hand muscle strength was intact. Skin was intact without discoloration or edema. Tinel’s was negative at the cubital and carpal tunnel, however, his sensation was slightly diminished throughout the ulnar nerve distribution.

Roos and Adson tests were positive.

DIFFERENTIAL DIAGNOSIS: UCL tear, Flexor pronator strain, ulnar neuritis, cervical radiculitis, thoracic outlet syndrome

Test and Results: Radiographic evaluation included views of the left elbow and cervical spine which were unremarkable. An MR arthrogram of the elbow was negative for any significant pathology.

Final Working Diagnosis: Acute on Chronic Neurogenic Thoracic Outlet Syndrome

TREATMENT AND OUTCOMES: The patient’s pain and numbness persisted despite oral medications and daily treatment with a several year history of persistent left upper extremity numbness presented with no mechanism of injury. Symptoms extended to the left arm pain with a substantial lateral nerve distribution.

MRI bilateral brachial plexus:
-Post-surgical edema, asymmetrically large right jugular vein, pec minor and subclavian muscle atrophy with scarring at SC joint. Brachial plexus matted in scalene compartment; left side normal

Diagnosis: Bilateral TOS with right pec minor impingement

TREATMENT AND OUTCOMES:
1. Scalenectomy of right scalenes and scar tissue removal
2. Paralyzed right diaphragm from surgery complication
3. Patient reports 75% improvement on right, 90% improvement on left.
standing, but full 170 degrees when supine. Right trapezius strength 4/5, remaining muscles 5/5 with scapula stabilized. Sensation intact and impingement maneuvers negative.

**DIFFERENTIAL:** 1. Spinal accessory nerve lesion. 2. Long thoracic nerve lesion. 3. Supraspinatus tendinopathy. 4. Long head biceps tendinopathy. 5. Adhesive capsulitis.

**RESULTS:** NCS: Normal left spinal accessory nerve CMAP to trapezius, abnormal right spinal accessory nerve with decreased amplitude and onset latency compared. EMG: Normal right deltoid, infraspinatus, serratus anterior, rhomboid major but abnormal right upper/middle trapezius findings with increased insertional activity, fibrillation potentials, positive sharp waves, polyphasic MUAPs and reduced recruitment.

**DIAGNOSIS:** Right complete spinal accessory neuropathy

**OUTCOME:** Custom anterior-wrapped to posterior shell stabilization brace fabricated. Once donned, improvement in abduction/biexion ROM quantified utilizing the Microsoft Kinect Motion Analysis. However, there was decrease in cross body adduction, and poor compliance long term due to weight and bulk. An updated lighter weight orthosis was fabricated, including a primary dynamic force strap for anteriorly directed pressure with a scapula plate shield intended to provide a superiorly directed force. The newer materials and design have provided significant improvement in function and compliance, indicating future treatment options for spinal accessory neuropathy.

**DIFFERENTIAL:** 1. Spinal accessory nerve lesion. 2. Long thoracic nerve lesion. 3. Acromioclavicular joint arthritis. 4. Glenohumeral joint arthritis. 5. Adhesive capsulitis.

**RESULTS:** 1. EMG: No deltoid denervation with carpal tunnel findings. 2. NCS: Normal left spinal accessory nerve CMAP to trapezius, abnormal right spinal accessory nerve with decreased amplitude and onset latency compared.

**OUTCOME:** Custom anterior-wrapped to posterior shell stabilization brace fabricated, including a primary dynamic force strap for anteriorly directed pressure with a scapula plate shield intended to provide a superiorly directed force. The newer materials and design have provided significant improvement in function and compliance, indicating future treatment options for spinal accessory neuropathy.

**HISTORY:** A 64-year-old expert male rower presented with persistent overhead weakness for 27 months of his right shoulder. He initially felt pain when lowering his arm after placing his canoe on top of his car. Patient denied any acute popping, tearing or swelling. After failed alternative treatments, patient completed MRI shoulder showing full thickness supraspinatus tear and subsequently underwent arthroscopic repair. Despite adherence to physical therapy, patient reported persistent weakness with overhead activity. After an MR arthrogram showed massive supraspinatus re-tear without labral pathology, patient obtained a second opinion at which time he was instructed that he has an "unrepairable torn rotator cuff".

**PHYSICAL EXAMINATION:** On inspection of his right shoulder, there is marked atrophy superior and inferior to spine of scapula. Patient has excellent functional ROM actively with significantly limited ROM when shoulder is stabilized - he is able to abduct to 100° and forward flex to 110°. Empty can, drop arm, lift off and belly press test are positive. Labral testing is negative and there is full ROM of neck. There is adequate deltoid musculature with equal sensation bilaterally. Patient has significant winging of scapula in all planes of motion.

**DIFFERENTIAL DIAGNOSIS:** 1. Massive rotator cuff tear. 2. Acromioclavicular joint arthritis. 3. Glenohumeral joint arthritis

**TEST AND RESULTS:** EMG: No deltoid denervation with carpal tunnel findings. X: Glenohumeral and AC joint arthritic changes. MRI right shoulder w/o contrast: massive rotator cuff (supraspinatus and subscapularis) tear.

**FINAL WORKING DIAGNOSIS:** Chronic right massive rotator cuff tear without deltoid denervation

**TREATMENT AND OUTCOMES:** 1. Physical therapy. 2. No reverse total shoulder arthroplasty indicated given no pain 3. Resume all activities as tolerated, may resume kayaking and canoeing.

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**Sitting.**

Sedentary behavior is recognized as a detrimental behavior to one’s health.

**PURPOSE:** To describe 10-year trends in Americans sitting time. **METHODS:** Data from 5 cycles (2007-2016) of the National Health and Nutrition Examination Survey (NHANES) were used in this analysis. During the 07-08 NHANES cycle, participants were asked: “How much time do you usually spend sitting or reclining on a typical day?” For the following NHANES cycles (09-16), participants were asked: “How much time do you usually spend sitting on a typical day?” Mean sitting time for the overall sample and for each sex separately were quantified. Regression analyses accounting for the complex, multi-stage design of NHANES were conducted to examine for linear trends and mean differences in sitting time between cycles.

**RESULTS:** 26,771 participants (51.5% females, 20 years of age or older) provided sitting time data for all cycles. Data are presented in Figure 1. Significant positive linear trends across cycles were observed for the overall sample and for each sex separately (p<.001). For the overall sample and men, mean sitting time was significantly higher at each successive cycle between 07-08 to 13-14. During 15-16 cycle, mean sitting time was significantly lower than 13-14 but not different from 11-12 for the overall sample (p=.16) and men (p=.34). For women, sitting time trends were similar to those observed among the overall sample and men with the exception that the 07-08 and 09-10 cycles were not significantly different from each other (p=.30).

**CONCLUSIONS:** Americans’ average self-reported sitting time increased between 2007 and 2014. 2016 data showed lower sitting time compared to 2014. Future NHANES waves will help determine whether Americans sitting time has reached a peak or if 2016 data were an exception.
Evidence suggests that physical activity (PA) may improve classroom behavior in elementary school children. Further, studies have shown that the most off-task children may exhibit greater benefit from acute bouts of PA. However, limited data exists in preschoolers. **PURPOSE:** To examine baseline relationships between PA and classroom behavior, and to identify if the most off-task preschoolers responded differently to PA compared to those least off-task. **METHODS:** Participants (n=31, age=3.8±0.8 years, 61% male) attended a university-based preschool. In week one of this two-week pilot study, children engaged in their typical curriculum. Week two included daily short bouts of PA that were integrated into early learning standards. PA was assessed with accelerometers worn on the lower back during preschool attendance. Trained researchers conducted weekly 10-minute classroom observations to quantify children’s classroom behavior [active engaged time (AET); passive engaged time, (PET); off-task motor, (OFT-M); off-task verbal, (OFT-V); off-task passive, (OFT-P)] using the Behavioral Observation of Students in Schools (BOSS) tool. Spearman correlations were used to examine baseline relationships between PA and classroom behavior variables. To test if children with high off-task behavior (HIGH) responded differently to PA compared to children with low off-task behavior (LOW), participants were categorized into tertiles based on baseline off-task behavior and groups were compared using t-tests. **RESULTS:** A negative correlation was observed between light intensity activity (min/day) and AET at baseline (r = -0.44, p < 0.02). Other significant relationships were observed. However, when classroom behavior following LOW in the most off-task children was examined, improvements were observed in OFT-M (HIGH = -36.5±5.4%, LOW = -10.5±5.7%, p < 0.001), OFT-V (HIGH = 16.7±2.8%, LOW = -5.7±3.3%, p < 0.0004), and OFT-P behaviors (HIGH = -19.6±7.6%, LOW = -12.0±7.1%, p < 0.01). **CONCLUSION:** Initial evidence for PA to improve classroom behavior among children who exhibited greater off-task behavior was observed and is consistent with previous findings. Future work should build on this acute study and examine chronic PA to limit classroom off-task behaviors. Supported by: NASPEM Marco Cabrera Student Research Award

**CONCLUSIONS:** A daily exercise oncology twitter campaign was able to engage a broad international audience and provide high levels of reach, indicating that this may be an effective strategy for communication and dissemination of exercise research.
low cardiorespiratory fitness level, while the LEPR, IGF1BP1 and ENO3 genes were significantly associated with a low cardiorespiratory fitness level in female survivors. Partial correlations between the cardiorespiratory fitness level and trainability genes were mainly observed in females.

**CONCLUSIONS:** For an identical level of MVPA in both survivors and control subjects, the cardiorespiratory fitness was significantly lower in survivors, which can be associated with variants in genes related to subjects’ trainability. These findings could allow better follow-ups tailored to survivors’ genetic profile and cardiorespiratory fitness. This study has important implications for survivors, physicians and researchers, which could help reduce at least some of the burden of long-term adverse effects of treatments.

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**601 Physical Activities in Northern Song Dynasty (906-1127), China: A Painting Analysis**

Weimo Zhu, FACSM, Shiantian Wen, Hai Yan. 1University of Illinois at Urbana-Champaign, Urbana, IL. 2Huzhou University, Huzhou, China.

Email: weimozhu@uiuc.edu

(No relevant relationships reported)

“Qingming Shanghe Tu, 清明上河圖 (“Painting of “Along the River during the Qingming Festival”) is a historical Chinese painting collected in Palace Museum, Beijing, China. Painted around 1101-1108 by artist Zeduan Zhang (1085-1145), this 24.8 cm x 528 cm painting captures the daily life of people and the landscape of the capital Bianjing of North Song Dynasty. Together, a total of 814 persons were included in the painting revealing the lifestyle and activities of all levels of the society then. Thus, it provides a golden opportunity to study physical activity (PA) pattern of people in China about 900 years ago.

**PURPOSE:** To examine people’s PA pattern in North Song Dynasty, China through analyzing a historical painting.

**METHOD:** After each person in the painting was numbered, they were coded by their age category, sex, activity engaged (using 2011 Compendium PA codes when apply), activity context, if labor-saving means was used, etc. The coded information was then analyzed using descriptive statistics.

**RESULTS:** Except for very few female adults and young children and two older adults, most of persons in the painting are male adults, reflecting the male-centered culture then. Most of PA, due to likely the painting was used to record activities related to a major festival, are recreation (miscellaneous) - standing; only one person is running; a few fast walking; many sitting either on chairs or on the ground; and none was doing traditional Chinese exercise. Some labor-saving efforts were already made then, e.g., using donkeys or cows to pull carriage, horses for riding and one case camel for carrying goods. Meanwhile, human power was still the most important source of mechanical energy then, e.g., rowing or pulling boats, carry persons using sedan chair, pushing wheelbarrows for transportations etc. Most noticeable and frequent human power activities are carrying heavy goods on men’s shoulders directly or through a carry pole.

**CONCLUSION:** It was noticed that labor-saving efforts were already made in a well-developed civilization society about 900 years ago in China although human power was the major source of mechanical energy then. Paint analysis of ancient paintings and graphics provides a unique and useful means to understand the evolution of human PA.

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**602 A Spring in Your Step: Exercise Training Increases Stretch-Shortening Cycle Potentiation and Walking Economy**

Shannon L. Mathis1, Stephen J. Carter2, Harshvardhan Singh1, Gary R. Hunter, FACSM1. 1University of Alabama in Huntsville, Huntsville, AL. 2Indiana University Bloomington, Bloomington, IN. 3University of Alabama at Birmingham, Birmingham, AL.

(Sponsor: Erica C. Hasson, FACSM)

Email: shannon.mathis@uah.edu

(No relevant relationships reported)

**PURPOSE:** Our objectives were to: (1) examine the effects of combined strength and aerobic training program on stretch-shortening cycle potentiation (SSCP) and net VO2 (inverse of walking economy) among older women and; (2) determine the relationship between SSCP and relative exercise intensity among older women.

**RESULTS:** Except for very few female adults and young children and two older adults, most of persons in the painting were male adults, reflecting the male-centered culture then. Most of PA, due to likely the painting was used to record activities related to a major festival, are recreation (miscellaneous) - standing; only one person is running; a few fast walking; many sitting either on chairs or on the ground; and none was doing traditional Chinese exercise. Some labor-saving efforts were already made then, e.g., using donkeys or cows to pull carriage, horses for riding and one case camel for carrying goods. Meanwhile, human power was still the most important source of mechanical energy then, e.g., rowing or pulling boats, carry persons using sedan chair, pushing wheelbarrows for transportations etc. Most noticeable and frequent human power activities are carrying heavy goods on men’s shoulders directly or through a carry pole.

**CONCLUSION:** It was noticed that labor-saving efforts were already made in a well-developed civilization society about 900 years ago in China although human power was the major source of mechanical energy then. Paint analysis of ancient paintings and graphics provides a unique and useful means to understand the evolution of human PA.

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**603 Differences in Sleep Quality and Adherence to Energy Intake and Physical Activity Recommendations during an 18-Month Behavioral Weight Loss Intervention**


(Sponsor: Edward L. Melanson, FACSM)

Email: seth.creasy@ucdenver.edu

(No relevant relationships reported)

**PURPOSE:** Long-term adherence to EI and PA recommendations during a behavioral weight loss interventions is difficult. It is possible that short sleep duration and/or poor sleep quality makes adherence to these recommendations challenging. In this analysis, we explored the association between sleep duration and sleep quality and adherence to EI and PA recommendations during an 18-month behavioral weight loss intervention.

**METHODS:** Adults (n=104, age: 18-55 years, BMI: 27-42 kg/m2) were enrolled in a behavioral weight loss program. Participants were prescribed a calorie-restricted diet (1200-1900 kcal/day) and were instructed to complete ≥300 min of moderate to vigorous physical activity (MVPA) per week. In this post-hoc analysis, participants were grouped based on adherence to EI (measured using 3-day food records) and PA (measured using the SenseWear armband) recommendations at 18-months. Adherence to the EI recommendation was defined eating ≤ individually prescribed calories determined using a validated prediction equation at 18 months. Adherence to the PA recommendation was defined as accumulating ≥300 min/week of MVPA in bouts of ≥10 min at 18 months. Sleep duration, sleep onset latency (SOL), wake after sleep onset (WASO), and sleep efficiency were calculated at baseline and 18 months using the armband.

**RESULTS:** Individuals who were adherent to both the EI and PA recommendations had significantly lower WASO at baseline (65.7±11.2 min) compared to non-adherent individuals (82.9±49.1 min; p<0.05). Individuals who were adherent to only the EI recommendation had significantly lower WASO (61.0±30.7 min) at baseline compared to those who did not meet the EI recommendation (81.5±44.0 min; p<0.05). Individuals who were adherent to only the PA recommendation had significantly lower SOL (37.0±21.1 min) at baseline compared to individuals who did not meet the PA recommendation (44.2±28.4 min; p<0.05). There were no differences in sleep duration or sleep efficiency between any of the groups.

**CONCLUSIONS:** Sleep quality at the beginning of an 18-month weight loss intervention may influence adherence to EI and PA recommendations during the behavioral intervention. Future behavioral weight loss interventions may be improved by focusing on improving sleep quality in addition to EI and PA.
Acute exposure to hypoxia results in a stress response categorized by sympathetic dominance, resulting in increased ventilation to prevent arterial desaturation. Heart rate variability (HRV) can be used as an estimation of overall stress and a provides understanding of the balance between sympathetic and parasympathetic autonomic regulation. PURPOSE: The purpose of this study was to determine whether resting heart rate variability at sea level is correlated with arterial desaturation and respiratory responses to acute normobaric hypoxia exposure equivalent to an altitude of 3500 meters. METHODS: Resting HRV, %SpO2, and respiratory rate was measured in 24 male and female subjects at sea level for 15 minutes. HRV was measured using Firstbeat Bodyguard2 and included RMSSD, High Frequency (HF), and Low Frequency (LF) components. Subjects then returned for a subsequent visit and resting HRV, SpO2 and respiratory rate were measured at rest in a normobaric hypoxic chamber (Colorado Altitude Training) set at either 3500 meters or sea level for control subjects. Correlation analysis using RStudio was performed. RESULTS: No significant correlation was observed between HRV in the time domain (RMSSD) and %SpO2 at rest (r=0.26, p=0.39), %SpO2 during exercise (r=-0.15, p=0.62), or respiratory rate during rest (r=0.42, p=0.15) when exposed to hypoxia. No significant correlation was observed between HRV in the frequency domain (LFHF Ratio) and %SpO2 at rest (r=-0.10, p=0.74), %SpO2 during exercise (r=-0.18, p=0.53), or respiratory rate during rest (r=-0.39, p=0.19) when exposed to hypoxia. CONCLUSION: Although exposure to acute hypoxia exerts a physiologic stress response, HRV as a measure of overall stress and the balance of sympathetic and parasympathetic balance does not seem to be predictive of the change in %SpO2 or respiratory rate.

Supported by The Doug Morton/Marilyn Brown Endowment for Biomedical Research, The Foundation for Aging Studies and Exercise Science Research, and The Borgenicht Program.

Predicting responses to acute hypoxia based on physiologic measures at sea level may be valuable in anticipating adverse responses to acute hypoxia. PURPOSE: The purpose of this study was to determine the arterial saturation response in men and women (18-33 years old) of varying fitness levels, at a normobaric altitude of 3500 meters. METHODS: 91 subjects (54 women, 37 men) completed a VO2peak test on a stationary exercise bike at sea level; to determine aerobic fitness (range 27.7-72.2 mL/kg/min). Each subject then performed an 8-10-minute bout of cycling in normobaric hypoxia corresponding to 3500 meters at 65% of their maximal heart rate at VO2peak (sea level). RESULTS: VO2peak was positively correlated with decreased oxygen saturation during exercise at normobaric hypoxia corresponding to 3500 meters. For women (n=54), a greater predictive response was observed with a linear model depicting a strong positive correlation between VO2 peak and oxygen desaturation in hypoxia (r=0.1643, p=0.001028). For men (n=37), a predictive response was also observed with a linear model that was slightly less significant compared to women subjects (r=0.1139, p=0.04412). Furthermore, a relationship between average oxygen saturation difference (resting SpO2 minus exercise SpO2) at normobaric altitude, and VO2 peak at sea level in women subjects (r=0.1855, p=0.01719) was observed. CONCLUSION: These results demonstrate that increased VO2 peaks in individuals at sea level, is predictive of higher arterial oxygen desaturation during exercise, in normoxic altitude (3500m), especially in women which may make them more susceptible to adverse responses to acute altitude exposure.

Supported by The Doug Morton/Marilyn Brown Endowment for Biomedical Research, The Foundation for Aging Studies and Exercise Science Research, and The Borgenicht Program.
Hypertension is a major risk factor for cardiovascular disease, and is present in 46% of the US adult population. An increase in one’s blood pressure (BP) (>10 mmHg) has been observed when individuals are exposed to altitude for 10-12 months. Less is known of the acute effect on BP in young healthy individuals when exposed to altitude. PURPOSE: The purpose of this study was to observe BP changes during rest and submaximal exercise in normotensive sea level (SL) individuals after 24 and 96 hours of altitude exposure (11,237ft). METHODS: Nine college students were asked to participate in five trials. Trials 1&2 determined their VO2max and 60% HR reserve (VL). Trials 3-5 assessed BP, O2 saturation, heart rate and submaximal exercise. RESULTS: Blood pressure increased (p<0.05) at 24h vs SL (160.6 ± 15.3 to 153.4 ± 16.5 mmHg), respectively. Resting SBP increased (p<0.05) at 96h vs SL (152.9 ± 16.6 mmHg) (91.3 ± 9.6 mmHg). Exercise SBP increased (p<0.05) at 96h vs SL (160.6 ± 15.3 to 153.4 ± 16.5 mmHg), respectively. Double product increased during rest (p=0.00) and exercise (p<0.05) at 24h (77.2 ± 7.9, 150.5 ± 23.6 bpm) vs SL, respectively. Heart rate increased at rest (p<0.005) and exercise (p<0.05) at 24h (77.2 ± 7.9, 150.5 ± 23.6 bpm) vs SL, respectively. Resting BP increased (p=0.05) at 24h (119.5 ± 9.5 mmHg) and 96h (122.2 ± 11.6 mmHg) vs SL (115.9 ± 9.9 mmHg). Resting DBP decreased (p=0.05) at 24h (78.5 ± 8.5 mmHg) and 96h (80.5 ± 9.4 mmHg) vs SL (71.3 ± 9.6 mmHg). Exercise SBP increased (p<0.05) at 96h vs VL (160.6 ± 15.3 to 153.4 ± 16.5 mmHg), respectively. Double product increased during rest (p=0.00) and exercise (p<0.05) at 24h (91.3 ± 9.6, 254.2 ± 8.2) and 96h (91.3 ± 25.9, 249.6 ± 10) vs SL (77.2 ± 10, 214.4 ± 10), respectively. CONCLUSION: These results demonstrate that when sea level individuals are acutely exposed to altitude, there is a significant decrease in O2 saturation, and a significant increase in HR, BP and DP after 24h and up to 96h. These hemodynamic changes are tolerable in young healthy individuals, but could be concerning in individuals with documented or latent CVD.

Cognitive function may be negatively impacted at high-altitude, which has important implications for decision making in such environments. The ability to predict changes in cognitive function at high-altitude may safeguard against potential adverse events in both novice and experienced high-altitude trekkers. Hypoxia results in compensatory increases in cerebral blood flow to maintain oxygen delivery. An inability to increase cerebral blood flow in this setting may contribute to cognitive performance at high-altitude. Cerebral reactivity to hypoxia at low-altitude may thus be a useful predictor of cognitive performance at high-altitude. PURPOSE: Determine if hypoxic reactivity of middle cerebral artery (MCA) mean blood velocity (Vm) at low-altitude predicts changes in cognitive function on a trek to Mt Everest Basecamp. METHODS: 17 Mt Everest Basecamp trekkers (n = 8 females; age = 26 ± 13 years; body fat = 19.5 ± 6.5%) underwent a 10-day trek from Kathmandu, Nepal to Gorak Shep, Nepal. Cerebral reactivity testing occurred at low-altitude (116 m). Vm of the left MCA was determined via transcranial Doppler under normobaric normoxia (NN, −2% HbO2) and hypoxia (NH, −10% HbO2). Exercise was increased at rest and during exercise. Changes in Vm were calculated as ΔVm = VmSL − VmNH. Cognitive function was assessed as accuracy and reaction time (RT) on a working memory task (2-back number matching task).

Medicine & Science in Sports & Exercise® May 28 – June 1, 2019

American College of Sports Medicine

Orlando, Florida
The cerebral blood flow velocity (CBFV) response to acute hypoxia during exercise has been known to increase. But, how hemodynamics might respond to exercise in hypoxic condition and be associated with the change of CBFV remains unclear.

**PURPOSE:** To determine the effects of hypoxia on CBFV and hemodynamics during bicycle ergometer exercise.

**METHODS:** In a randomized, double-blind, crossover study, Twelve healthy volunteers (22 ± 2 yrs) were asked to perform the bicycle ergometer exercise three times in two hypoxic (3150m and 1900m altitudes) and control (sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 125W. Acute normobaric hypoxic condition corresponding to the altitudes of 3150m and 1900m was maintained using low oxygen gas mixture for the whole procedure of 40 minutes. CBFV in middle cerebral artery (MCA) were measured at rest 15 minutes, 5 and 10 minutes during exercise, 10 minutes recovery using transcranial-Doppler sonography. Non-invasive electrical cardiometry was used to obtain cardiac output (CO), thoracic fluid content (TFC) and flow time corrected (FTC). All data were analyzed using two-way ANOVA with repeated measures and Pearson’s correlation.

**RESULTS:** CBFV in MCA in 3150m and 1900m was significantly higher than in control condition at 10 minutes during exercise (110 ± 20 vs. 154 ± 6 bpm, p<0.05). Heart rate (HR) in 3150m was significantly higher than in 1900m and control condition at 10 minutes during exercise (163 ± 10 vs. 154 ± 6 bpm, p<0.05). FTC in 3150m and 1900m was significantly lower than in control condition at 10 minutes during exercise (240 ± 20 and 254 ± 16 vs. 265 ± 18 ms, p<0.05). However, CO and stroke volume (SV) were not significant different between three conditions. **CONCLUSIONS:** These results suggest that exercise in normobaric hypoxic condition might increase CBFV, which might be independent of hemodynamic changes.

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**Reliability Analysis of the COSMED K5 Portable Metabolic System**

Lindsey E. White, Jacob P. DeBlois, Tiago V. Barreira. Syracuse University, Syracuse, NY.

Increased energy expenditure via physical activity has been shown to improve health outcomes. It is difficult to measure energy expenditure and physical activity outside the laboratory. **PURPOSE:** To determine the reliability of the COSMED K5 portable metabolic system.

**METHODS:** 27 (n=14 females) healthy adults (27 ± 5 yrs; 21.0 ± 8.2% body fat) completed a treadmill walking protocol. Participants completed 3 identical trials of 5-min stages that included standing and 6 walking speeds from 1.5 to 4.0 mph in 0.5 mph increments, with a 2-min rest between stages for a total of 47 minutes. Visit 1 consisted of wearing the K5 system. During visit 2 (1-7 days later), participants wore the K4 and K5 systems in a randomized, counter-balanced order. Oxygen consumption (VO2, ml/min⁻¹), carbon dioxide production (VCO2, ml/min⁻¹), ventilation (Ve, l/min⁻¹), metabolic equivalents (METs), respiratory exchange ratio (RER), and energy expenditure (EE, kcal/min⁻¹) were recorded breath-by-breath and averaged from minutes 2.5 to 4.5 from each stage for analysis. Reliability of the K5 was determined using an intraclass correlation coefficient (ICC) and coefficient of variation (CV).

**RESULTS:** As shown in Table 1, the ICC for standing ranged from 0.26-0.75 and CV ranged from 4.0-11.0%. During walking, ICC ranged from 0.41-0.88 and CV from 3.0-8.0%.

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**Table 1. Reliability of COSMED K5 in standing and at various walking speeds**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standing</th>
<th>1.5 mph</th>
<th>2.0 mph</th>
<th>2.5 mph</th>
<th>3.0 mph</th>
<th>3.5 mph</th>
<th>4.0 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2 ICC</td>
<td>0.47</td>
<td>0.64</td>
<td>0.72</td>
<td>0.76</td>
<td>0.76</td>
<td>0.78</td>
<td>0.85</td>
</tr>
<tr>
<td>CV (%)</td>
<td>9.0</td>
<td>8.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>7.0 ± 5.0</td>
<td>7.0 ± 5.0</td>
<td>6.0 ± 4.0</td>
<td>5.0 ± 4.0</td>
</tr>
<tr>
<td>VCO2 ICC</td>
<td>0.53</td>
<td>0.50</td>
<td>0.64</td>
<td>0.67</td>
<td>0.73</td>
<td>0.75</td>
<td>0.80</td>
</tr>
<tr>
<td>CV (%)</td>
<td>9.0</td>
<td>8.0 ± 6.0</td>
<td>7.0 ± 6.0</td>
<td>7.0 ± 6.0</td>
<td>7.0 ± 5.0</td>
<td>7.0 ± 5.0</td>
<td>7.0 ± 5.0</td>
</tr>
<tr>
<td>Ve ICC</td>
<td>0.75</td>
<td>0.74</td>
<td>0.80</td>
<td>0.77</td>
<td>0.79</td>
<td>0.83</td>
<td>0.88</td>
</tr>
<tr>
<td>CV (%)</td>
<td>8.0</td>
<td>7.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 4.0</td>
<td>6.0 ± 4.0</td>
<td>4.0 ± 4.0</td>
</tr>
<tr>
<td>METS ICC</td>
<td>0.65</td>
<td>0.54</td>
<td>0.56</td>
<td>0.65</td>
<td>0.66</td>
<td>0.74</td>
<td>0.82</td>
</tr>
<tr>
<td>CV (%)</td>
<td>8.0</td>
<td>8.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>7.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 4.0</td>
<td>4.0 ± 4.0</td>
</tr>
<tr>
<td>RER ICC</td>
<td>0.26</td>
<td>0.41</td>
<td>0.55</td>
<td>0.49</td>
<td>0.44</td>
<td>0.62</td>
<td>0.80</td>
</tr>
<tr>
<td>CV (%)</td>
<td>4.0 ± 3.0</td>
<td>3.0 ± 2.0</td>
<td>4.0 ± 3.0</td>
<td>4.0 ± 2.0</td>
<td>4.0 ± 3.0</td>
<td>4.0 ± 3.0</td>
<td>4.0 ± 3.0</td>
</tr>
<tr>
<td>EE ICC</td>
<td>0.50</td>
<td>0.62</td>
<td>0.71</td>
<td>0.74</td>
<td>0.75</td>
<td>0.78</td>
<td>0.84</td>
</tr>
<tr>
<td>CV (%)</td>
<td>9.0</td>
<td>8.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>6.0 ± 5.0</td>
<td>4.0 ± 4.0</td>
</tr>
</tbody>
</table>
CONCLUSIONS: The K5 provided reliable measures of VO\textsubscript{2}, V\textsubscript{CO2}, \text{RER}, METs, and EE across a variety of walking speeds, with higher reliability noted at 3.0-4.0 mph. Future studies should examine the reliability of the K5 during running and other activities.

**Board #3**

May 29 3:15 PM - 5:15 PM

**Free-living Evaluation Of Laboratory-based Machine Learning Algorithms For Activity Classification In Preschool Children**

Matthew N. Ahmad\textsuperscript{1}, Alok K. Chowdhury\textsuperscript{1}, Dylan Cliff\textsuperscript{1}, Toby Pavey\textsuperscript{2}, Markus Hagenbuchner\textsuperscript{2}, Stewart G. Trost\textsuperscript{1}, \textsuperscript{1}Queensland University of Technology, Brisbane, Australia. \textsuperscript{2}University of Wollongong, Wollongong, Australia.

Email: matthew.ahmadi@qut.edu.au

(No relevant relationships reported)

Machine learning (ML) classification models for accelerometer data are a potentially more accurate method to measure physical activity in young children than conventional cut-point methods. However, existing algorithms have been trained on laboratory-based activity trials. To our knowledge, no studies have evaluated the performance of classification algorithms trained on structured activity trials for preschool-aged children under free-living conditions, and none have used fine-grained video-based direct observation to evaluate algorithm performance.

**Purpose:**

To evaluate the performance of hip and wrist Random Forest (RF) and Support Vector Machine (SVM) activity classification algorithms for preschool-aged children (Trost et al. 2018) under free-living conditions.

**Methods:**

31 children (4.0 ± 0.9 yrs) were video recorded using a GoPro during a 30-minute unstructured active play session in a park while wearing an ActiGraph GT3X+ accelerometer on their right hip and non-dominant wrist. Direct observation was used to continuously code ground truth activity type and activity class using the Noldus Observer XT. Algorithm performance was assessed using overall accuracy and confusion matrices were generated to summarize class-level classification accuracy.

**Results:**

Accuracy for the hip and wrist RF algorithms was 69.4% (95% CI: 67.4 – 71.2), and 59.1% (95% CI: 57.1 – 61.1), respectively. Accuracy for hip and wrist SVM algorithms was 66.4% (95% CI: 64.4 – 68.3), and 59.3% (95% CI: 57.3 – 61.3), respectively. Classification was moderate for sedentary (71-77%), poor for light activity and games (58-79%), and moderate-good for moderate to vigorous activity and games (71-84%) and running (66-75%). Classification for walking (9-15%) was poor. When 15-second windows with multiple activities were excluded from analysis, overall accuracy was improved by 8-10%. Prediction of walking improved by 19-34%.

**Conclusion:**

The accuracy of laboratory-based activity classification algorithms for preschool-aged children was attenuated when tested on new data collected under free-living conditions. Future studies should develop and evaluate the performance of activity classification algorithms trained on accelerometer data collected under true free-living conditions.

**Board #4**

May 30 3:15 PM - 5:15 PM

**Insights On Free-living Sedentary Behavior Estimates Using A Hip- Or Wrist-worn Accelerometer**

Robert T. Marcotte, Greg J. Petrucci, Jr, Melanna F. Cox, Patty S. Freedson, FACSM, John W. Staudenmayer, John R. Sirard, FACSM. University of Massachusetts Amherst, Amherst, MA.

(Sponsor: John R. Sirard, PhD, FACSM)

Email: rmarcotte@umass.edu

(No relevant relationships reported)

**PURPOSE:**

The primary purpose was to validate existing methods to estimate sedentary behavior (SB) under free-living conditions using ActiGraph GT3X+ accelerometers (AG). The secondary purpose was to identify method-specific systematic errors that result in the misclassification of SB.

**METHODS:**

Forty-eight participants (age 20.4±1.3 years, 45.8% male) were video-recorded during four 1-hour sessions in different settings (home, community, school, environment) while wearing an AG on the right hip and non-dominant wrist. Videos were coded for postural orientation and activity type (e.g. walking). Observed time in sitting and lying postures were classified as SB (criterion measure). Twelve methods were applied to observed time in sitting and lying windows (600 15-sec periods). Systematic errors that result in the misclassification of SB were assessed using positive and negative predictive values (PPV, NPV).

**RESULTS:**

Threshold constants identified included 1) median VM < -5.5 minutes, 95%CI: -7.1, -3.8) and overestimated using ENMO44.8 (9.9 minutes, 95%CI: 9.9, 14.5). For the wrist, Sed Sphere was the only unbiased method. SB was underestimated using Wrist RF, CP15s376vm, Wrist TR, and CPM1853vm, ranging from -9.5 to -5.7 minutes. The majority of misclassified SB occurred during standing or sitting behaviors (67.0-96.7%).

**CONCLUSION:**

Accurate estimates of SB from a hip-worn AG can be achieved using either simpler count-based approaches (CPM100, CPM150) or machine learning models (Soj1x, Soj3x). Only the Sedentary Sphere may be suitable to estimate SB from the non-dominant wrist. Future work to distinguish standing from SB may lead to improvements in estimating SB. Supported by NIH NIDDK R01DK110148.
Automatic Segmentation of Walking Strides in Wearable Accelerometry Data with Adaptive Empirical Pattern Transformation

JACEK K. URBANEK1, Marta Karas2, William Fadel3, Marcin Straczkiewicz2, Jaroslav Hazelzak4, Ciprian Crainiceanu4

1Johns Hopkins School of Medicine, BALTIMORE, MD. 2Johns Hopkins School of Public Health, BALTIMORE, MD. 3Indiana University, Indianapolis, IN. 4Indiana University Bloomington, Bloomington, IN.

Email: jurbane2@jh.edu

(No relevant relationships reported)

There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). PURPOSE: To develop and test an integrated physical behavior score (PBS) in relation to all-cause and cause-specific mortality.

METHODS: Forty-eight participants (20.4 ± 1.3 years, 45.8% male) wore an AG on their non-dominant wrist during four, 1-hour sessions in free-living settings. Sessions were video-recorded and coded using a direct observation (DO) system that provided criterion measures for minutes and type of MVPA. Four previously developed AG processing models were applied to estimate MVPA minutes: raw acceleration and arm angle cut-point (sed-sphere), Euclidean norm corrected for gravity cut-point (ENMO), random forest (RF) and decision tree (DT) models. Mixed models were used to assess the difference between model estimated and DO measured MVPA minutes. Principle components analysis (PCA) was used to examine features of the AG data that were associated with MVPA.

RESULTS: DO identified 12.8 minutes of MVPA/session. Sed-sphere was the only model to accurately estimate MVPA minutes (bias [95% confidence interval] = 1.0 [0.4, 2.5] minutes). MVPA was overestimated using RF and DT (5.9 [3.3, 8.5] and 4.0 [2.4, 5.6] minutes, respectively) and ENMO significantly underestimated MVPA minutes (-10.7 [-12.9, -8.4] minutes). PCA showed that two principle components account for 89.4% of the variance in MVPA type (64.4% and 25.0%, respectively; Figure 1). The first principle component placed equal weight on three features (mean, standard deviation of acceleration vector magnitude and standard deviation of arm angle) while the second loaded on mean arm angle.

CONCLUSIONS: Sed-sphere was the only model to accurately estimate minutes of MVPA. PCA indicates that arm angle estimates aspects of MVPA beyond acceleration vector magnitude, and future research should use that feature.

Supported by NIH NIDDK R01DK110148

(No relevant relationships reported)
**B-38**  Thematic Poster - Special Needs

**Wednesday, May 29, 2019, 3:15 PM - 5:15 PM**

**Room: CC-102B**

**Chair:** Jennifer Lee Trilk, FACSM. University of South Carolina School of Medicine, Greenville, Greenville, SC.

(No relevant relationships reported)

**691**

**Board #1**

**May 29 3:15 PM - 5:15 PM**

**A Fit 5 Program for Adults with Developmental Disabilities in a Day Program**

Amber M. Chelette, Ouachita Baptist University, Arkadelphia, AR.

Email: chelettea@oubu.edu

(No relevant relationships reported)

**RESULTS:**

and velocities were recorded via sensors and an app (Garmin Connect).

and 0-20% PPO and 2-3 min cool-down). Real-time power, heart rate (HR), cadence

(2-3 min warm-up, 10, 1:1 min work/recovery phases at 90% peak power output (PPO)

in 1-3 hours of PA 2 times/week. Participants completed a baseline and post graded

baseline, S2 did not participate in regular physical activity (PA). S1 and S3 participated

**METHODS:**

Individuals with developmental disabilities were invited to participate in a weekly fitness program that utilized the Fit 5 resources at their community day program. Participants were given a Fit 5 booklet that provided instructions on making healthy choices. Participants attended one 45-minute exercise session per week for a total of six weeks. Exercise sessions included Level 1 and Level 2 exercises from the Fit 5 resource and targeted endurance, muscular fitness, flexibility, and balance. At each group exercise session, participants submitted a weekly record of their exercise, diet, and hydration and were prompted to continue healthy behaviors. A pre-test/ post-test design was used. Exactly one week before (pre-test) and one week after (post-test) the 6-week intervention, waist circumference, total modified push-ups performed, and total modified curl-ups were recorded for each participant. Repeated measures MANOVA was used to test the effect of time (pre-test, post-test) on the measures of waist circumference, total push-ups, and total curl-ups in order to evaluate the effectiveness of the intervention for improving body composition and muscular fitness. RESULTS: 18 individuals (Mean age: 43 ± 19; 11 females) have participated in the intervention to date. Pillar’s trace repeated measures MANOVA revealed a significant difference between measures of fitness on the pre-test and post-test ($F_{(5,39)} = 38.2; p < .001$). The total curl-ups (p < .001) performed between the pre-test (15+11) and post-test (23+13). Neither total push-ups performed nor waist circumference was significantly changed by the intervention ($p > .05$).

CONCLUSIONS: A 6-week intervention using the Fit5 resources was effective at improving muscular fitness for persons with developmental disabilities within a local community day program.

**692**

**Board #2**

**May 29 3:15 PM - 5:15 PM**

**Feasibility of a 6-hour Handcycling High Intensity Interval Training Program for Spinal Cord Injury**


Email: akoontz@pitt.edu

(No relevant relationships reported)

**PURPOSE:** Spinal cord injury (SCI) can be debilitating to one’s health, functional capacity, and quality of life. Specifically, SCI contributes to an elevated risk of preventable cardiometabolic and hypokinetic diseases. Many individuals with SCI have low levels of fitness due to barriers including lack of time, accessible equipment and awareness of exercises that are safe and effective. Using an indoor stationary handcycle to perform a high-intensity exercise program (HIIT) could be a time-efficient and accessible means of improving fitness. The primary aim of this study was to determine adherence, acceptance and fitness outcomes of a 6-hour HIIT program for non-ambulatory persons with SCI.

**METHODS:** Three men with SCI have completed the study to date (Table). At baseline, S2 did not participate in regular physical activity (PA). S1 and S3 participated in 1-3 hours of PA 2 times/week. Participants completed a baseline and post graded exercise test. The HIIT program consisted of 2, 25 min supervised at-home sessions (2-3 min warm-up, 10, 1:1 min work/recovery phases at 90% peak power output (PPO) and 0-20% PPO and 2-3 min cool-down). Real-time power, heart rate (HR), cadence and velocities were recorded via sensors and an app (Garmin Connect).

**RESULTS:** Subjects completed all 12 sessions and 10 bouts with the exception of S2 (7/10 and 8/10 bouts for sessions 1 and 4). S2 performed 3 unsupervised sessions verified via the app. Fitness outcomes were not apparent for S2 and S3 while S1 showed increases in VO2 (16.0 to 17.1 ml/kg), minute ventilation (37.9 to 42.0 ml/kg), and tidal volume (1.2 to 1.5 L) peaks after training.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age, SCI level, Years Post Injury</th>
<th>Baseline HR</th>
<th>Baseline PPO</th>
<th>HR Beats/min</th>
<th>Power Watts</th>
<th>Cadence Rev/min</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
<td>58, L5/S1, 24</td>
<td>89</td>
<td>50</td>
<td>85 (3)</td>
<td>51.8 (6.0)</td>
<td>57 (5)</td>
</tr>
<tr>
<td>S2</td>
<td>17, C5, 2</td>
<td>133</td>
<td>50</td>
<td>100 (3)</td>
<td>41.4 (4.5)</td>
<td>51 (13)</td>
</tr>
<tr>
<td>S3</td>
<td>30, C5/C6, 15</td>
<td>100</td>
<td>40</td>
<td>102 (3)</td>
<td>29.0 (2.8)</td>
<td>59 (5)</td>
</tr>
</tbody>
</table>

**CONCLUSION:** Feasibility was demonstrated by excellent adherence and remote monitoring of compliance with HIIT intensities. A greater number of weekly sessions and/or a longer training period are likely to lead to improvements in fitness parameters.

**693**

**Board #3**

**May 29 3:15 PM - 5:15 PM**

**Physical Activity, Sleep, And Stereotypic Behaviors In Youth With Autism Spectrum Disorder**

Justine M. Renziehausen, Paola M. Rivera, Baker M. Kayla, Nicholas A. Leahy, Jeanette M. Garcia. University of Central Florida, Orlando, FL.

(No relevant relationships reported)

**PURPOSE:** The purpose of this study was to compare the associations between moderate-to vigorous physical activity (MVPA), sedentary behavior (SB), sleep quality, and stereotypic behaviors in children with Autism Spectrum Disorder (ASD). METHODS: Activity levels and sleep quality were measured in 16 children with ASD (ages 8-17) using Actigraph GT9X Accelerometers. All participants wore the device on their non-dominant wrist for a period of seven days and nights. Parents completed the Aberrant Behavior Checklist (ABC) which examined child irritability, stereotypic behaviors, hyperactivity, inappropriate speech, and lethargy. Spearman correlations were used to examine associations between minutes of MVPA, sleep duration, and adverse behaviors.

**RESULTS:** Greater levels of MVPA were correlated with less stereotypic behaviors ($r_0 = -.62, p < .02$). Although they did not quite reach statistical significance, trends were seen for the associations between 1) longer sleep duration and lower ratings of hyperactivity ($r_0 = -.43, p < .3$); and 2) greater amounts of SB and higher ratings of lethargy ($r_0 = .4, p < .1$).

**CONCLUSIONS:** Adequate duration of sleep and participation in MVPA may be linked with fewer adverse behaviors in children with ASD. Future studies should examine larger samples of children with ASD over a longer duration to better determine causal mechanisms that may explain these associations between MVPA, sleep habits and ASD-related behaviors.

**694**

**Board #4**

**May 29 3:15 PM - 5:15 PM**

**Comparison of Energy Expenditure in Wheelchair Users During Active Video Gaming with Adapted Game Controllers**

Laurie A. Malone, FACSM, Sangeetha Patalabalanarayanan, Mohanraj Thirumalai. UAB/Lakeshore Research Collaborative, Birmingham, AL.

Email: lamalone@uab.edu

(No relevant relationships reported)

**PURPOSE:** Active video gaming (AVG) options are limited for individuals with mobility impairments due to inaccessibility of the gaming controllers. Two gaming controllers (Wii Fit balance board and gaming mat) were recently adapted for individuals with physical disabilities (www.rectech.org), thereby providing increased opportunities for AVG play. **PURPOSE:** To compare energy expenditure in persons with mobility impairment during seated AVG play using an adapted Wii Fit balance board (WFBB) and adapted gaming mat. METHODS: During the first lab visit, demographic data were collected, and participants completed a game play familiarization period. During the next two visits, metabolic data (COSMED) were collected during a 20-minute baseline, followed by two 10-minute bouts of game play. During one visit, participants played select Wii Fit Plus games on the adapted WFBB and during the other visit Active Life Explorer and Outdoor Challenge games were played on the adapted gaming mat. For all AVGs participants played seated. The adapted WFBB was designed so that the player could wheel onto the platform. For play using the adapted gaming mat, the mat was placed on a height-adjustable table. A paired sample t-test was computed to compare mean energy expenditure during game play on the adapted WFBB and gaming mat. RESULTS: Sample included 26 participants, 16 men, mean age 37.50 ± 12.77 yrs. All participants utilized a wheelchair for mobility and daily activities. Mean energy expenditure (MEs) during game play was significantly greater.
INTRODUCTION: For accurate physical activity assessment with accelerometers in adults with Down syndrome (DS), there is a need to examine if the relationship between the rate of oxygen uptake (VO\textsubscript{2}) and output from hip- and wrist-worn accelerometers across different activities and sedentary behaviors is different between adults with and without DS. In this study, we examined this question and we also evaluated the accuracy of hip- and wrist-worn accelerometers in estimating the VO\textsubscript{2}. METHODS: The sample included 16 adults with DS (10 men; age 31 ± 15 years) and 19 adults without DS (10 men; age 24 ± 6 years). We measured VO\textsubscript{2} using a portable spirometer (K4b\textsuperscript{2}, Cosmed) and accelerometer output (Vector Magnitude [VM]) with a hip- and a wrist-worn accelerometer (w=GTX-4T, Actigraph). We used multi-level regression to predict VO\textsubscript{2} from VM and group. Additional predictors included body mass index (BMI), age, height, weight, and sex. We evaluated the accuracy of the prediction with the absolute percent error and Bland-Altman plots. RESULTS: For both the hip and the wrist accelerometer, VM and group were significant predictors of VO\textsubscript{2}. (p ≤ 0.021). However, when BMI was added to the models, BMI was a significant predictor and DS was no longer significant for both accelerometer models. The final models included Vector Magnitude and BMI (p ≤ 0.001; R\textsuperscript{2} = 0.78 and 0.57, for hip and wrist accelerometer model, respectively). For the hip accelerometer, absolute percent error across all tasks and for both groups combined was 22.5 ± 27.4%, whereas, for the wrist accelerometer, error was 37.8 ± 38.0%. Absolute percent error across tasks combined and for each task separately did not differ between groups. The Bland-Altman plots indicated nearly zero mean error for both groups. However, error had somewhat greater 95% confidence intervals for the wrist- than the hip-accelerometer models. CONCLUSION: Adults with DS have different VO\textsubscript{2} to VM responses, but this is due to their higher BMI. Predictability of VO\textsubscript{2} from accelerometer output is better for a hip- than a wrist-worn accelerometer. These results may help advance physical activity assessment for adults with DS.

697 Board #6 May 29 3:15 PM - 5:15 PM
Comparing Gross Efficiency Between Rigid And Hydraulic Prosthetic Ankles During Graded Treadmill Walking
Isaac B. Yoder, Alexander J. Koch. Lenoir-Rhyne University, Hickory, NC.
Email: isaac.yoder@my.lr.edu
(No relevant relationships reported)

Recent advancements have led to the development of prosthetic ankles that actively influence exercise intensity include game selection, limited familiarization, and discomfort wearing the COSMED system. Adapted controllers for AVG play provide a viable option for increasing leisure-time physical activity in persons with mobility impairments. Supported by NIDRR grant 90ER0509-01-00.

698 Board #7 May 29 3:15 PM - 5:15 PM
Feasibility and Effectiveness of Community-Based Virtual Reality Group Exercise Training in Persons with Spinal Cord Injury
Ryan R. Porter, Kevin W. Koppera, Jennifer L. Trikl, FACSM\*. University of South Carolina School of Medicine Greenville, Greenville, SC. \*Roger C. Peace Rehabilitation Hospital, GHS, Greenville, SC. (Sponsor: Jennifer L. Trikl, FACSM)
(No relevant relationships reported)

Persons with spinal cord injury (SCI) are at an increased risk of physiological morbidity compared to their ambulatory counterparts in whom well-established, beneficial correlations exist between exercise, cardiorespiratory health and body composition. Furthermore, SCI who participate in sport may have reduced risk of physiological morbidity than SCI who are sedentary. PURPOSE: This pilot study was two-fold: 1) to determine whether differences exist in cardiorespiratory health and body composition between SCI athletes (ATHL) and sedentary SCI (SED); and 2) to determine whether an 8-week handcycle exercise training program is feasible in an SED SCI population, and if improvements in cardiorespiratory fitness and body composition occur. METHODS: Twenty-seven SED and six ATHL were recruited to participate in the study. All SED completed a graded hand cycling maximal exercise test for cardiorespiratory health and body composition testing (DEXA). SED participants were then randomized into a virtual reality intervention (VR) or waitlist (WL) group (e.g. offered VR after 8 weeks of WL). The intervention consisted of an 8-week community-based VR group hand cycling exercise training with a USA level 1 coach two days/week. Pre-post outcomes were measured in each group. RESULTS: Thirty-three SCI were recruited to participate (SED n=27; ATHL n=6). All ATHL and 17 SED participants (VR=9, WL=8) completed study protocol, with 10 (VR=1 and WL=9) lost to follow up. One participant was dropped from analysis due to not giving a full effort during testing as determined by investigators. ATHL had 23 physiological and anthropometric variables that were significantly different (p≤0.01) compared to SED including end expiratory VO\textsubscript{2} max (15.3 ml/kg/min), lower BMI (4.6 kg/m\textsuperscript{2}), and lower total body fat percentage (-10.4%). VO\textsubscript{2} max increased 16% in VR and 9% in WL, which was not statistically different. CONCLUSION: This study demonstrates the feasibility of a hand cycling program in SCI. ATHL had better outcomes associated with long term health compared to their SED counterparts. Though no significant changes were noted in VR compared to WL, changes in VO\textsubscript{2} max may be clinically relevant. A larger sample size or longer training period may be needed to observe significant differences in physiological health in an SED SCI population.

699 Board #8 May 29 3:15 PM - 5:15 PM
Effects Of Virtual Reality On Pain And Fatigue In Individuals With SCI
Daniel Azurdia, Angelica Alberto, Travis Watkins, Isabel Lorimer, Mercedes Fernandez, Mai Jara, Danica Tolentino, Ovande Furtado, Taeyou Jung. California State University, Northridge, Northridge, CA.
(No relevant relationships reported)

Background: Pain and fatigue are among the most commonly reported barriers to exercise for individuals with spinal cord injury (SCI). Previous studies have documented virtual reality’s (VR) pain and fatigue reducing properties. However, no study has investigated the benefits of using VR for reducing pain and fatigue during exercise in individuals with SCI. PURPOSE: To investigate the effects of using VR during exercise on perceptions of pain and fatigue in individuals with SCI. METHODS: A total of 18 individuals with traumatic SCI (aged 43.29 ± 17.5 years) participated in this repeated measure comparative study. Three visits were required from each participant. Baseline data was collected during the first visit. The following two visits consisted of a 6-minute exercise test using arm ergometry. Participants were randomly assigned to an exercise condition, either VR or non-VR. Participants rated their pain and fatigue using visual analogue scales and qualitative data was collected following the completion of the exercise test. Dependent variables included pain and fatigue. RESULTS: Repeated measures ANOVA showed statistically significant improvements in pain and fatigue scores. VR sessions decreased pain and fatigue by 34% and 36% respectively, as compared to non-VR exercise sessions. All p values were p < 0.05. In addition, three higher order themes emerged from qualitative analysis, positive psychological impact, positive physiological impact, and virtual reality enhancing exercise experience. Conclusion: Our results indicate that exercise in combination with VR can be effective in reducing pain and fatigue in individuals with SCI.
Sport specialization and menstrual dysfunction (MD) are of concern for high school athletes as they may contribute to sports injury. Limited evidence exists on the extent of sport specialization and prevalence of MD assessed at pre-season screening.

PURPOSE: The objectives of this study were to 1) determine the prevalence of sport specialization and MD, and 2) determine if sport specialization and MD are higher in team/ball sports than individual sports. METHODS: Seven hundred ninety-two (250 females, 542 males) athletes from 14 San Diego high schools participated in a pre-season screening clinic. The athletes completed a questionnaire regarding sport specialization, sport type (individual vs. team/ball sport), menstrual health. Sport specialization was determined by the athletes’ responses to 1) declared a primary sport, 2) quit other sports to focus on primary sport, and 3) trained >8 months/year in primary sport in the past year. Scores of 0-1 were considered low specialization, and scores of 2 and 3 indicated moderate and high sport specialization, respectively. MD was defined as >9 menstrual periods reported in the past year. RESULTS: Overall, 54.8% of the athletes were classified as low sport specializers, 38.4% as moderate sport specializers, and 6.8% as high sport specializers. Golf (42.9%), swimming/diving (18.8%), and tennis (15.8%) had the greatest percent of high sport specialization. High sport specialization was almost two times (OR=1.81, 95% CI: 0.9-3.4; p=0.07) greater among those whose primary sport was an individual sport (10.0%) than athletes participating in a team/ball sport (6.0%). Females (9.2%) were twice as likely (OR=1.94, 95% CI: 1.1-3.5; p=0.02) to highly sport specialize than males (5.7%). Twenty-four (9.7%) female athletes reported MD. Tennis (33.3%), cross-country (15.8%), and swimming (14.3%) had the highest percent of MD. Although a non-significant trend, females who reported MD were twice as likely (OR=2.01, 95% CI: 0.9-4.9; p=0.10) to participate in an individual sport (14.5%) as their primary sport than those whose primary sport was a ball/team sport (7.6%). CONCLUSIONS: Females were more likely to sport specialize than males. High sport specialization was most common among individual-type sports.

ASSOCIATION BETWEEN SPORT SPECIALIZATION AND LOW BMD AMONG FEMALE HIGH SCHOOL DISTANCE Runners

Mitchell J. Rauh, FACSM1, Michelle T. Barrack2, Adam S. Tenforde1, Michael D. Rosenthal1, Jeanne F. Nichols, FACSM1. 1San Diego State University, San Diego, CA. 2California State University Long Beach, Long Beach, CA. 3Spaulding Rehabilitation Hospital/Harvard Medical School, Charleston, MA. 4University of California San Diego, La Jolla, CA. Email: mrauh@sdstate.edu

PURPOSE: To assess whether decrease in percent body fat (%BF) is associated with low bone density. METHODS: Consecutive 22 freshmen girl runners (15y/o, 158cm, 45kg) during 7 years in competitive high school teams were evaluated over 2 years of training. DXA was performed at the preparatory phase (baseline) and repeated after 23 ± 2 months (follow-up). The runners were divided into 2 groups: negative (DEC, n=11) or positive (GAIN, n=11) changes of %BF (Δ%BF) during the period. The effect of the period and the group on the changes in bone mineral content (BMC) and density (BMD) of total body less head and z-score were analyzed by 2-way repeated measures ANOVA. As mean lean soft tissue mass (LSM) and fat mass (FM), paired t-test was used to compare between baseline and follow-up. Bivariate correlation analysis was used to examine the relationship between bone mineral accrual (ΔBMC and ΔBMD) and Δ%BF as well as the changes of FM (%FM) and LSM (ΔLSM). Written informed consent was obtained from the runners and their parents. RESULTS: %BF changed from 17.4 to 14.3 (DEC) and 15.0 to 18.4 % (GAIN). The percent of BMD significant effects on ΔBMC, ΔBMD, and z-score without interactions. Contrast showed significant increases in those variables, while the group of Δ%BF had no significant effect, indicating the values of DEC and GAIN were similarly increased; z-score was 0.20 and 0.04 to 0.22, respectively. The DEC runners gained LSM (34.2 to 36.1 kg) and reduced FM (7.7 to 6.4 kg) significantly, while the GAIN runners significantly increased FM (6.9 to 9.0 kg) without LSM change (36.1 to 37.0 kg). Neither Δ%BF nor ΔFM, but ΔLSM was significantly correlated with ΔBMC (r=0.45) and ΔBMD (r=0.55). CONCLUSIONS: Bone mineral was equally accrued among the runners of which %BF increased or decreased, where the accretion was associated with LSM gain. Competitive distance runners would develop leanness by not only losing FM but also gaining LSM (i.e., skeletal muscle) along with long-term exercise training. This would ameliorate an impairment of bone mineral acquisition by strict weight control.

EXAMINATION OF ENERGY AVAILABILITY AND INJURY PREVALENCE IN COLLEGIATE DANCERS

Kenya Moore1, Toni M. Torres-McGehee1, Erin M. Moore2, Elena Burrus3, Kelly Pritchett,4, Susan Anderson. 1University of South Carolina, Columbia, SC. 2University of South Florida, Tampa, FL. 3Central Washington University, Ellensburg, WA. Email: sportsmed.kinoshita@hosei.ac.jp

PURPOSE: To determine the association between sports specialization and low BMD in female high school distance runners. The association between sport specialization and low bone mineral density (BMD) is poorly described in this population. METHODS: Participants consisted of 64 female runners (age 15.6 ± 1.4y), not currently on birth control medication, who competed in interscholastic cross-country and distance track events in southern California. Each runner completed a survey on sport participation and menstrual function, and had her height and weight measured. Each runner’s spine and hip BMD were assessed using DXA, standardized to BMD Z-score by age and sex normative values. Sport specialization classifications were: low specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); moderate specialization (only distance running sport(s) for ≥8 months/year, or participation in distance running sport(s) ≥9 months/year and ≥1 other non-running sports); and high specialization (participation in distance running sport(s) for ≥9 months/year and no other sports. Multivariable logistic regression was performed to determine the adjusted odds ratio (OR) and 95% confidence interval (CI), adjusting for BMI and gynecological age. RESULTS: Overall, 21.9% of the runners were high sport specializers, and 37.3% and 40.6% were moderate and low sport specializers, respectively. Twenty-three (35.9%) runners had low BMD (Z-score < -1.0). After adjusting for gynecological age and BMI, high sport specializers were five times more likely (OR=5.4, 95% CI: 1.3-23.3; p=0.02) to have low BMD than low sport specializers. CONCLUSIONS: Our findings indicated that high sport specialization was associated with low BMD among female high school distance runners. Further investigation of this association is warranted as low BMD has been related to increased risk of stress fracture.
How are Adolescent Ballet Dancers’ Eating Attitudes Related to Social Media Viewing Habits?

Toni-Ann M. Triolo1, Catherine A. Schaeffer2, Robin L. Collen2, Alan M. Levine1. 1Marywood University, Scranton, PA; 2SUNY Potsdam, Potsdam, NY.

Social media has a great impact on adolescent’s behavior. Since many young ballet dancers spend many hours on dance websites, they may adopt unhealthy eating attitudes and behaviors that are depicted on-line. Objective: The purpose of this descriptive study was to evaluate dancers aged 10-16 years in Northeastern Pennsylvania (NEPA) to determine if there was a relationship between social media exposure and disordered eating attitudes. Methods: Participants included 39 white adolescent female dancers (13.7 ± 1.8 years) from five dance studios in Northeastern Pennsylvania who completed the Children’s Eating Attitude Test (ChEAT-26) and the Questionnaire of Exposure and Reinforcement Through Facebook (QERF) to assess eating attitudes and social media viewing practices. Data were analyzed using descriptive statistics and Pearson correlations. Results: Mean time spent dancing each week was 6.2 ± 2.0 hours. Mean ChEAT-26 score was 20.8±15. Over one-third (36%) of the dancers reported disordered eating attitudes and/ or behaviors. Mean QERF score was 26.2 ± 5.7. 87.5% of the dancers scored 23 or greater out of a possible 45, exposure to social media. Mean time spent on Facebook was 4.7 ± 2.8 hours per week, while mean time spent on Facebook looking at dance websites was 1.3 ± 1.2 hours per week. Although we did not observe a significant relationship between ChEAT and QERF, there was a trend (r=0.27, p=0.10) as social media exposure increased, disordered eating attitudes and behaviors also increased.

Conclusions: Adolescent dancers are at risk of developing unhealthy eating attitudes and behaviors. Their substantial exposure to social media, especially on dance websites, may play a role in accelerating problematic eating patterns. Since limiting young dancers’ social media exposure may well be problematic, parents, dance teachers, nutritionists and other health professionals must become aware of these issues and should consider interventions that model positive eating attitudes and behaviors.

Social media exposure increased, disordered eating attitudes and behaviors also increased.

The hypothesis of this study was that dancers return to their previous level of activity following open excision of a symptomatic os trigonum syndrome. METHODS: We followed 54 ankles (44 patients, 91% female, mean age 18.2 years) in patients who underwent surgery for posterior impingement. Dance style varied across patients but was largely ballet and included many professionals. All patients completed a specific rehabilitation protocol prior to surgical discussions and eventual excision of the os trigonum was done through an open approach. All patients then committed to a specific rehabilitation program and gradually returned to dance. Outcomes were evaluated with the Veterans Rand 12 Item Health Survey (VR-12) Mental and Physical Scores, Fast Function Index-Revised (FFI-R), Visual Analog Scale (VAS) scoring, and patient satisfaction preoperatively and postoperatively. This study was conducted in compliance and approved with a local Institutional Review Board (IRB). RESULTS: Most recent follow-up was a mean 32.3 months with data collected across a range of 6 weeks to 8 years post-operative. Between pre-operative and most recent post-operative assessments, there was no significant difference in VR-12 Mental Scores (mean scores of 55.4 and 53.9), however Physical Scores increased 37.8 to 51.2, respectively. Significant improvement was also seen in both the FFI-R cumulative score (63.2 to 42.4) and VAS (54% to 17%). Major complications included transient sural nerve paresthesia and scart tissue buildup that resolved over time. Overall, patients were extremely satisfied with their result (82.7% post-operative satisfaction). CONCLUSIONS: Open os trigonum excision is fairly simple, has a low complication rate, and proves to have a high success rate in returning athletes back to their sport of choice. In this study, dancers of varying level and primary style improved significantly according to various clinical measures and maintained thriving postoperative careers. Successful return to dancing relied greatly on well-structured physical rehabilitation therapy.

Body composition and bone mineral density (BMD) are important factors in sport performance and the overall short and long-term health of athletes. Despite this function, few investigations to date have documented total body composition in female collegiate athletes. Further, we are unaware of any studies examining both total body composition and BMD in this population. PURPOSE: To generate descriptive data for total body composition and BMD in a large sample of female collegiate athletes using dual X-ray absorptiometry (DXA) and examine differences between 10 competitive sports. METHODS: A total of 211 female collegiate athletes (19±1yrs; 167±8.9 cm; 54.9±6.1kg; 2.4% Asian, 15.2% Black, 1.4% Hispanic, 80.6% White, 0.5% Other) underwent DXA: basketball (BB; n=22), cross country (CC; n=11), field hockey (FH; n=25), gymnastics (GYM; n=23), lacrosse (LAX; n=42), soccer (SOC; n=27), swimming (SW; n=27), tennis (TN; n=11), track (held only); (TR; n=7), and volleyball; (VB; n=16). Descriptive statistics were calculated for total body fat percentage (%BF), and BMD. Differences in total %BF and BMD between sports were examined using a one-way Welch’s ANOVA test. Post-hoc testing was completed using the Games-Howell test. RESULTS: The mean total %BF was 27.8±5.1% (range: 23.0 ± 37.5%) while BMD was 1.300±0.11g/cm² (range: 1.17 ± 1.45g/cm²). TR had the highest %BF (37.5±5.5%), followed by TN (31.1±4.0%) and LAX (29.3±3.8%); CC (23.0±6.0%) and GYM (23.5±2.9%) had the lowest. For BMD, TR had the highest (1.45±0.07g/cm²), followed by BB (1.40±0.12g/cm²); VB (1.36±0.10g/cm²); CC (1.17±0.07g/cm²) and SW (1.22±0.06 g/cm²) had the lowest. Group mean differences in %BF (p<0.001; se = 0.26) and BMD (p<0.001; se = 0.35) were observed between teams. Specifically, GYM had lower %BF than BB, FH, LAX, SOC, SW, TN, and TR (mean difference range: -4.0 to -13.9%, all p<0.05). CC had lower BMD than BB, FH, GYM, LAX, SOC, TR, and FH (mean difference range: -0.11 to -0.28g/cm², all p<0.01). CONCLUSION: Total body composition and BMD measures varied across female collegiate sports. These findings may assist sports medicine and strength and conditioning practitioners with identifying appropriate goals values for %BF and BMD in female collegiate athletes across various sports.

The Female Athlete Triad is a pervasive, multifactorial morbidity amongst collegiate female athletes, particularly those participating in endurance sports. Cross country coaches’ awareness of the Triad within all NCAA divisions is unknown. PURPOSE: To assess National collegiate Athletic Association (NCAA) cross country coaches’ awareness of the Triad components. METHODS: Ninety-nine Division I-III NCAA cross country coaches were sent an email containing a request to disseminate a web-based survey to cross country coaches in their respective conferences. The web-
School choice legislation has increased the number of public charter schools and about 7000 were licensed in DC and 44 states in 2018. Health authorities advocate that schools provide diverse physical activity (PA) programs to enable students accrue at least 50% of their daily recommended 60 min of moderate-to-vigorous physical activity (MVPA). School websites have great potential to provide information about PA and be a catalyst for students participating in school PA programs. Investigations of websites relative to PA are rare, and no studies assessing the PA content of charter school websites have been published. PURPOSE: To complete a quantitative content analysis of PA-related information on the websites of U.S. charter elementary schools. METHODS: During spring 2018 we conducted a content analysis of a stratified random sample of U.S. charter elementary schools (n=759) for information specific to PA. RESULTS: Nearly all schools (97%) had a functioning website, but these rarely mentioned PA program opportunities: PE (34.1%), PA clubs (13.7%), interscholastic sports (9.1%), recess (7.9%), and intramurals (5.5%). No website identified all 5 program types and 52.0% did not mention their school provided a PA program at all. Information on PE was scarce. Only 7.1% of sites mentioned a PE curriculum and only 2.8% and 2.0%, respectively, mentioned its sequence or content. A PE teacher was mentioned on 37.4% of websites, but only 6.1% indicated he/she had specialist PE training. Only 4.6% of sites identified PE frequency and only 2.7% mentioned length. Similarly, only 7.9% of websites mentioned recess. There were no significant associations between school age, size, or type (i.e., elementary vs. elementary/middle combination) with websites mentioning PE, having a PE teacher, or offering one or more PA programs. CONCLUSIONS: This is the first study to complete a quantitative content analysis of information about PA programs on the websites of a nationally representative sample of elementary charter schools. Results show that PE and PA is essentially ignored on elementary charter school websites across the country. As they are public “windows” designed to convey important information to constituents, we recommend all schools assess their websites to ensure they provide comprehensive messaging about PA.

Physical activity (PA) determinants differ depending on the population being studied. PURPOSE: A PA predictive model for an underserved community was generated and further insight of the results were gained by conducting focus groups with parents and school staff. METHODS: Previous literature was used to identify PA predictors and to form constructs of a survey. The survey was given to 35 families at a school-based event. Cronbach’s alpha was used to assess construct reliability, and a stepwise regression was run to determine predictors. Significant predictors were presented and discussed with community focus groups. RESULTS: Parental PA support (a=5), parental perceived barriers (a=8), parental dietary intake (a=8), PA beliefs (a=6), screen time (a=6), and gender were included in a forward stepwise regression. The overall model was significant (p<0.01), where parental support of PA (B=−0.567, p=0.024), gender (B=0.462, p=0.010), and PA beliefs (B=−0.579, p=0.016) were significant predictors of PA. CONCLUSION: This innovative approach enabled community participants to prioritize their actions more efficiently in addressing the most pressing determinants contributing to low levels of physical activity among their children. These results will contribute significantly to the design of a subsequent physical activity intervention among community children and their families.
Variations in Preschoolers’ Physical Activity Across the School Year


Email: Connnie.Tompson@med.uvm.edu

(Purpose: To examine variations and sex differences in preschoolers’ physical activity (PA) across the school year, with and without a PA intervention.

Methods: The Kiddie CATs on the Move PA curriculum was implemented in preschools over 22-weeks, 2-3 times per week by classroom teachers and college students enrolled in a service-learning course. Accelerometer was used to measure PA during the school day at 5 time points across the year (2 Baseline, Fall, Winter, 3 Intervention (Fall, Winter, Spring)). A total of 68 children (M_age = 4.15 ± 0.63, 33 males, 35 females) with ≥2 days of valid data at each time point were included in analyses. Minutes per hour of moderate-to-vigorous (MVPA) and total PA (light + MVPA) were calculated. Paired-samples t-tests were used to examine sex differences at each time point. A series of 5 (time) x 2 (sex) mixed model ANOVAs were used to examine PA across assessments and whether or not patterns of change in PA varied by sex.

Results: Boys engaged in significantly more total PA than girls during the Winter Baseline assessment (17.3±4.0 vs 15.0±4.8 min/hr, p < 0.04). Boys engaged in significantly more MVPA (min/hr) than girls during the Fall Baseline (9.6±2.4 vs 8.3±2.7, p < 0.04), Fall Intervention (10.2±3.1 vs 8.7±2.8, p < 0.04) and Winter Baseline (9.2±2.5 vs 7.4±2.9, p < 0.01). For the combined sample, total PA, F (4, 264) = 6.81, p < 0.001, and MVPA, F (4, 264) = 9.43, p < 0.001, varied across the time points. Total PA (min/hr) was significantly higher at all intervention time points compared to baseline winter (17.2±7.4, 17.9±6.1, ps < 0.01) and spring intervention also significantly higher than fall baseline (17.9 ± 6.9, p < 0.01). MVPA (min/hr) was significantly higher at all intervention time points compared to winter baseline (9.4, 9.1, 9.8 vs 8.3, p < 0.05) and spring intervention was significantly higher than fall baseline MVPA (9.8 vs 8.9, p < 0.01). The pattern of change in PA across assessments did not vary based on child sex.

Conclusions: Findings highlight the importance of structured programs to promote preschoolers’ PA, especially during winter months when PA appears to decline. Although there were no sex differences in the pattern of PA change for boys and girls, girls consistently engaged in less PA than boys during the year and future decline. Although there were no sex differences in the pattern of PA change for boys and girls, girls consistently engaged in less PA than boys during the year and future decline. Although there were no sex differences in the pattern of PA change for boys and girls, girls consistently engaged in less PA than boys during the year and future decline.

Supporting Physical Health Of Black Male Faculty Through A Wellness-integrated Professional Development Program: FIT Leaders

Emily R. Martini1, Turhan Carol1, Carl M. Maresh, FACSM2, Joshua J. Joseph1, Elizabeth J. Lyons1. 1The Ohio State University, Columbus, OH; 2The Ohio State University Wexner Medical Center, Columbus, OH. (Sponsor: Carl M. Maresh, FACSM)

Email: martini.36@osu.edu

(Purpose: An intervention strategy examining the integration of professional development and wellness for black male faculty at an R1 university was conducted. The intervention was directed at supporting the retention and academic promotion of black male faculty through minimizing the impact of culturally relevant physical discrimination, etc.) challenges. The implications on the physical health of the (i.e., hypertension, obesity) and cognitive (i.e. John-Henryism, social isolation, etc.) challenges. The implications on the physical health of the (i.e., hypertension, obesity) and cognitive (i.e. John-Henryism, social isolation, etc.) challenges.

Methods: A 24-week intervention brought together black male faculty of differing ranks at a university fitness center twice per week. Each participant was assigned a personal trainer and received weekly brief phone counseling to assist with adjusting goals, problem solving, and technical issues; a Likert-scale rating of > 4 (from 1 to 5) was the threshold for acceptability.

Results: Twenty-four participants indicated that the device was overly complicated; satisfaction of using satisfaction scales that evaluated the smartphone interface, game application, and technical issues; a Likert-scale rating of > 4 (from 1 to 5) was the threshold for acceptability.

Conclusions: The intervention was directed at supporting the retention and academic promotion of black male faculty through minimizing the impact of culturally relevant physical discrimination, etc.) challenges. The implications on the physical health of the (i.e., hypertension, obesity) and cognitive (i.e. John-Henryism, social isolation, etc.) challenges.

Acceptability of a Walking Intervention Among Inactive Adults Using a Smartphone-Based Gaming Application

Jason R. Bentley1, Zakkoyya H. Lewis-Trammell2, Maria C. Swartz2, Elizabeth J. Lyons1. 1University of Texas Medical Branch, Galveston, TX; 2Loyola Marymount University, Los Angeles, CA.

Email: jasbentl@utmmb.edu

(Purpose: To assess the acceptability of a 12-week walking intervention that used an active game delivered on a smartphone among community-dwelling adults.

Methods: Forty adults were randomized to receive the intervention or a wait list control. The 20 randomized to the intervention (9 males, age 46.9±13.4 years, BMI 33.1±9.77 kg/m2, 70% Caucasian) chose an activity goal starting at ≥ 60 mins/wk, increasing it over the 12-week duration to ≥ 150 mins/wk. They were instructed to use the smartphone game “Zombies, Run!” while walking due to its popularity and low-cost, and received weekly brief phone counseling to assist with adjusting goals, problem solving, and relapse prevention. The acceptability of the intervention was determined using satisfaction scales that evaluated the smartphone interface, game application, and technical issues; a Likert-scale rating of ≥ 4 (from 1 to 5) was the threshold for acceptability.

Results: Acceptance of the smartphone hardware was 4.25 ± 0.63, with 2 participants indicating that the device was overly complicated; satisfaction of the gaming application was 4.37 ± 0.75, although 2 participants found the zombie game disinteresting; and, after completion of the intervention was 4.11 ± 0.74, with 2 participants reporting problems with either the game or device.

Conclusions: Among our target population, a smartphone-based gaming intervention was acceptable over a 12-week walking program. This intervention has the potential to be a valuable public health program.
Conclusions: Daily caloric consumption over time (experimental: -41.0 calories; comparison: -143.3 calories) was shown to be a better predictor of cardiovascular events and mortality compared with MetS. High blood pressure is the most frequent factor of MetS. General guidelines for hypertension and hyperglycemia are known components of the metabolic syndrome. Massive adrenergic stimulation during high-intensity exercise has been associated to high blood pressure (BP) and glucose concentration. The predictive value of exercise-induced hypertension is an area of active research. An exaggerated and persistent hyperglycemia induced by intense exercise has been described in type-1 diabetes. For healthy subjects is not clear if BP and glycemic responses during maximal exercise are correlated with resting BP and glycemic values within the span of normal range.

Purpose: To find the association between resting and maximal exercise BP and glycemic responses in healthy young adults.

Methods: An exploratory analysis was conducted on 145 young adults (63 female) aged 18-25 deemed healthy by medical and anthropometric evaluation (body mass index 18.4 - 24.9) as well as laboratory tests, including a complete metabolic profile. All subject had normal resting BP, glycated hemoglobin A1c (HbA1c) and fasting glucose concentration (FG) values. On a separate day subjects performed a maximal ramp cardiopulmonary exercise test (CPET) on a cycle ergometer, capillary blood glucose concentration (cBG) and BP were measured every 2.5 minutes. Pearson product-moment correlations between resting and exercise parameters were assessed with a significance level <0.05. Separate analysis were made for males and females.

Results: The analysis for the female group is presented: at maximal workload, cBG was correlated with HbA1c (r=0.29, p<0.016) while diastolic BP was correlated with resting diastolic BP (r=0.26, p=0.034). Overall, maximal cBG was correlated with HbA1c (r=0.27, p=0.025) and FG (r=0.27, p=0.026) and maximal systolic BP was correlated with resting systolic BP (r=0.27, p=0.0009).

Conclusions: For healthy young females BP and glycemic parameters at rest were positively associated with cBG and BP responses at or near maximal workloads during CPET. In otherwise healthy adults with resting BP and FG values in the upper limit of normal, acute intense exercise could play a role unmasking early subclinical cBG and BP changes in the metabolic syndrome continuum. The predictive and prognostic role of these findings remains to be determined.

Supported by COLCIENCIAS Grant number 120356934972, 713-2013.

B-41 Free Communication/Slide - Exercise and Cardiovascular Risk Factors

WEDNESDAY, MAY 29, 2019

Ambulatory blood pressure (BP) derived from the large central arteries has been shown to be a better predictor of cardiovascular events and mortality compared with peripheral ambulatory brachial blood pressure. Currently, however, it is unknown if exercise, either intermittent or continuous bouts, influence ambulatory central BP.

Purpose: To examine the ambulatory central blood pressure response over 24 hours following a moderate intensity intermittent (MII) bout of aerobic exercise compared to a moderate intensity continuous (MIC) bout.

Methods: Eight, non-hypertensive males (61.5 ± 2.4yrs) performed three trials in a randomized order: control, MII (3X10 minutes at 50-60% heart rate reserve (HRR)) with 5 minutes of seated rest), and MIC (30 minutes continuous at 50-60% HRR). Total work performed during the exercise trials was matched. Ambulatory brachial and central hemodynamics (Santech Oscar 2 with SphygmoCor) were averaged over 24 hours, and divided by time of day (Morning, Afternoon, Evening, and Nighttime) and compared among each trial.

Results: No differences (P=0.05) between CON, MII, and MIC were observed for any variable. Brachial and central hemodynamic variables were lower (P<0.05) during Nighttime (Ni) compared to other times of day, independent of trial. Brachial SBP was lower (P=0.05) during Ni (120.5±4.5 mmHg) compared to morning (Mn, 131.6±5.6 mmHg); afternoon (An, 132.3±5.2 mmHg) and evening (Ev, 134.4±5.3 mmHg). Central SBP was lower during Ni (112.7±4.4 mmHg) compared to morning (Mn, 120.8±4.9 mmHg); afternoon (An, 119.3±4.5 mmHg) and evening (Ev, 120.6±4.5 mmHg).

Conclusion: An acute bout of moderate intensity exercise in accordance with the physical activity guidelines, independent of delivery mode (continuous or intermittent), did not influence 24 hour ambulatory brachial or central hemodynamics in middle-aged and older men. Moreover, we show that reductions in central hemodynamics during night time hours (i.e., dipping) is not compromised after exercise. Future work should explore different exercise parameters to better understand the influence of acute exercise on ambulatory central hemodynamics.
To compare the blood pressure (BP) response to a bout of supra maximal aerobic interval exercise (SIE) alone or in combination with antihypertensive medication in MetS hypertensive patients. Methods: Twelve patients chronically medicated with angiotensin II receptor 1 blockade antihypertensive medicine (AHM), underwent 3 trials separated by 1 week in a randomized order: a) control trial without exercise and substituting their AHM by a placebo (PLAC); b) placebo medicine and a morning bout of SIE (PLAC+SIE) and c) combining AHM and exercise (AHM+SIE). Acute and ambulatory blood pressure responses were measured for 21-h after treatments. Repeated-measures crossover, double-blind, placebo randomized design was used. Results: Acutely (i.e., 20 min after treatments), systolic blood pressure (SBP) were reduced similarly after PLAC+SIE (- 9.7 ± 6.0 mmHg, P<0.001) and AHM+SIE (-10.4 ± 7.9 mmHg, P<0.001). Chronically (21-h following treatments) SBP remained reduced after PLAC+SIE (125 ± 12 mmHg, P<0.022) and AHM+SIE (122 ± 12 mmHg, P=0.013) in comparison to PLAC (132 ± 16 mmHg). The BP reduction in PLAC+SIE faded out at 4 a.m., whilst in AHM+SIE continued over the complete measurement period (Figure 1). At nighttime BP reduction was larger in AHM+SIE than PLAC+SIE (-5.6 ± 4.0 mmHg, P=0.006). Conclusion: Our data show that a bout of supra maximal aerobic interval exercise in combination with antihypertensive medication in the morning elicits a sustained blood pressure reduction that lasts at least 21-h. Exercise potentiates the effects of antihypertensive medicine reducing blood pressure longer and at a larger magnitude than exercise alone.

Figure 1

Methods: One hundred and one individuals (54M/47F) with a mean age of 63.5 ± 0.8 years and body mass index (BMI) of 28.3 ± 0.5 kg/m² were divided into either the HVA group and one group included dietary intervention with aerobic training results in the most robust LP-IR improvement. In individuals with prediabetes, incorporating dietary intervention with aerobic training elicits a synergistic training effect on LP-IR. Conclusion: On average, STRRIDE interventions improved LP-IR. Our results provide compelling evidence that adding resistance to aerobic training elicits a synergistic training effect on LP-IR. Abstracts were prepared by the authors and printed as submitted.

Purpose To examine the effects of amount, intensity, and mode of exercise training on Lipoprotein Insulin Resistance Index (LP-IR; a relatively new spectroscopic multimarker of insulin resistance) across 10 exercise interventions from the STRRIDE study. Methods A total of 531 men and women with dyslipidemia [STRRIDE I (n=222) and STRRIDE AT/RT (n=142)] or prediabetes [STRRIDE-PD (n=167)] were randomized to either control group or one of 10 exercise interventions, which ranged from 8.22 kcal/kg/week (KKW); intensities of 50-75% VO_{2max}; and durations of 6-9 months. Two groups included resistance training and one group included dietary intervention (weight loss goal of 7%). Fasting blood samples were obtained at both baseline and 16-24 hr after the final exercise bout. NMR spectroscopy was performed at LabCorp to determine LP-IR score, which is comprised of six lipoprotein subclass and size parameters. LP-IR score ranges from 0 (most insulin sensitive) to 100 (most insulin resistant). Paired t-tests determined post- versus pre-intervention change score significance within groups (p<0.05). Study-specific ANCOVA determined differences between groups. Results The inactive control group did not significantly change LP-IR. After training, seven of the 10 exercise groups significantly improved LP-IR, ranging from -4.0 ± 7.6 to -12.5 ± 14.2. The figure displays change scores across all groups. The Aerobic plus Resistance group resulted in significantly greater change than the Resistance only group in STRRIDE AT/RT. The Moderate plus Diet group had significantly greater LP-IR change than all other groups in STRRIDE-PD. Conclusion On average, STRRIDE interventions improved LP-IR. Our results provide compelling evidence that adding resistance to aerobic training elicits a synergistic training effect on LP-IR. Conclusion: On average, STRRIDE interventions improved LP-IR. Our results provide compelling evidence that adding resistance to aerobic training elicits a synergistic training effect on LP-IR. It’s essential for glucose metabolism disorders people to monitor the change of blood glucose, heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) during and after exercise in order to prevent hypoglycemia and CVD risks. PURPOSE: To determine blood glucose after aerobic exercise in glucose metabolism disorders people, and to monitor recovery of HR and SBP. METHODS: By PAR-Q and OGTT, 58 subjects were divided...
An inadequate position while performing an ergometric test (ET), specifically by grasping tightly the front or side rails, can lead to a misinterpretation of a person’s physical capacity and hemodynamic responses. PURPOSE: This study has compared heart rate variability (HRV) kinetics throughout an ET executed in two different positions. Wherefore, was tested the hypothesis of an overestimated autonomic dynamic in ET while performed in an incorrect position. METHODS: Thirty-five undergraduates (21.08 ± 2.98 years old) of both sexes, volunteered to undertake two treadmill ET on Ellesstad protocol, in non-consecutive days. The first test (T1) was performed in an inadequate position and, after seven days, the second test (T2) without holding the front or side rails of the treadmill. Autonomic function was measured by HRV during both tests and resting. Repeated comparisons of HRV variables on each stage of Ellesstad protocol on ET were performed with two way ANOVA and multivariate linear regression, considering P-values of <0.05. RESULTS: Estimated value of peak oxygen uptake (VO2) was 22.4% higher in T1 (P=0.0001) when compared to T2. Overall, parasympathetic pathway was deactivated earlier in T2 than in T1, showed by NNxx (P=0.005) and HF (P=0.05). In stage two, mean values of HF in T2 corresponded to 32% of values in T1 (P=0.048). Stage three presented a difference of 60% (P=0.014) in LF between means reached in T1 and T2. An association of LF and VO2 was verified in early stages of both ET’s. Each increase of one ms2 in LF added up 0.013ml.kg.min in VO2 mean. CONCLUSION: When performed on the right positioning, the duration of the test is closer to real effort undertaken. Parasympathetic component stays activated for a longer period when the person grasps the rails of the treadmill because maximum effort is reached later.
A 32 year old male cross country skier presented with a multi-year history of right posterior “deep” buttock pain. He endorsed associated radiation down his posterior right thigh, leg and into the plantar foot. He described “burning” and “tingling” that increased with prolonged sitting and standing. Surgical history was significant for bilateral hiparthroscopic surgeries for femoral acetabular impingement. He denied any significant weakness or change in bowel/bladder function.

**DIFFERENTIAL DIAGNOSIS:**
S1 Radiculopathy
Sacroiliac Joint Dysfunction
Piriformis Syndrome
Hip Osteoarthritis
Proximal Hamstrings Tendinopathy
Iliofemoral Impingement Syndrome

**TEST AND RESULTS:**
Lumbar spine x-rays showed anterolisthesis of L5 on S1 with associated disc space narrowing and MRI showed paracentral disc protrusion at L5-S1. Electromyogram showed evidence of a chronic, inactive right S1 radiculopathy. Ultrasound of the right hip identified a small nerve fascicle, separate from the sciatic nerve, appearing to pierce the piriformis muscle. MRI of the pelvis with lumbosacral plexus protocol demonstrated the sciatic nerve coursing deep to the right piriformis muscle and identified the right S2 nerve root coursing through the piriformis muscle.

**FINAL WORKING DIAGNOSIS:**
Piriformis syndrome resulting in active, compressive, right S2 neuritis
Superimposed, chronic, inactive right S1 radiculopathy

**TREATMENT AND OUTCOMES:**
Extensive PT with plateau in improvement.
No relief with right S1 selective nerve root block.
Ultrasound guided piriformis corticosteroid injection provided temporary relief of buttock pain.
Ultrasound guided sciatic nerve hydrodissection coupled with neural flossing provided several months of relief and allowed the patient to return to cross country skiing.
Surgical referral for consideration of piriformis release.

**HISTORY:** A 41-year-old male Bulgarian was lifting in a Masters Championship in Barcelona in the 105 kg weight class. The first series was the snatch with his first attempt at 115 kg (254 lbs) going well and without pain. On his second attempt at 121 kg (267 lbs) he experienced some anterior left thigh pain. He attempted the third at 126 kg (278 lbs) unsuccessfully. After a short break he attempted the clean and jerk series first at 145 kg (320 lbs) and had a good lift. He attempted his second clean and jerk at 150 kg (331 lbs) at which point his pain increased and he forfeited the last attempt. Overnight at his hotel his pain intensified, and he sought care at a local ER. He was subsequently discharged with no imaging, intervention, or treatment plan.

**PHYSICAL EXAMINATION:** Appreciable difference in thigh size, no erythema with mild lacy bruising over left knee and distal to the knee joint. Right thigh measuring 65cm and left thigh measuring 72cm. Marked tenderness to palpation over the superior quad tendon and over the bodies of the rectus femoris and vastus lateralis. Limited hip and knee flexion, with endorsed pain in anterior thigh and superior aspect of patella. Sensation intact, Palpable femoral, DP, PT pulses. **DIFFERENTIAL DIAGNOSIS:**

**TEST AND RESULTS:**
Plain film showed superior pole avulsion fracture of the left patella and soft tissue swelling suggestive of hematoma. MRI obtained 4 days following evaluation indicated significant diffuse edematous changes of muscle and fascia with interstitial hematoma and evidence of muscle body rupture of the vastus lateralis. **FINAL WORKING DIAGNOSIS:** Left vastus lateralis rupture with avulsion fracture of the superior pole of the patella **TREATMENT/OUTCOMES:** Sent back to ER, radiograph obtained, placement in a long leg splint and LMWH given. Inability to obtain better imaging in Spain due to cost. Orthopedic evaluation upon return to Bulgaria within 4 days of injury with subsequent MRI. Patient treated conservatively with rehab and no surgical intervention.
Initial treatment was a diagnostic ultrasound guided (USG) intraarticular hip injection with local anesthetic with no response. This was followed by an USG femoral nerve diagnostic hydrosedation with lidocaine that provided short term relief. 1 week later, she received an USG femoral nerve hydrosedation with 15cc of DSW and sent for femoral nerve focused therapy. At 3 month follow up she had relief of her symptoms. She is now assistant coach for the rowing team with no symptoms.

**733**
May 29 4:15 PM - 4:35 PM
**Acute Proximal Posterior Thigh Pain in a Division 1 Women's Soccer Player**
Alyssa Nephi, Steven Schaaf, Kentaro Onishi. UPMC, Pittsburgh, PA. (Sponsor: Brian Davis, FACSM)
Email: npham@upmc.edu

(No relevant relationships reported)

**HISTORY:** A 22-year-old female soccer player for a Division 1 College team with a previous history of contralateral hamstring injury a year ago presents to the training room with acute onset left posterior thigh pain. She was seen in the training room 5 days prior with an ache in the posterior thigh. Sideline ultrasound was unremarkable for any abnormality at that time. Pain worsened while performing a drill during practice so she presents for re-evaluation.

**PHYSICAL EXAMINATION:** No obvious gait abnormalities. No ecchymosis over posterior thigh. Tender to palpation at left proximal semitendinosus muscle belly but no palpable defect noted. Resisted knee flexion/hamstring activation and reverse plank reproduced pain. Strength was full and symmetric and sensation intact in bilateral lower extremities.


**TREATMENT AND OUTCOMES**
Right hip radiographs: No acute fracture, mal-alignment or osseous findings. Mild antalgic gait.

**TESTS AND RESULTS**
Trochanter bursitis
Ischial bursitis
Adductor strain

**734**
May 29 4:35 PM - 4:55 PM
**Right Lateral Hip Injury - Squash**
Jacqueline M. Spangenberg, Monica E. Rho. Shirley Ryan AbilityLab, Chicago, IL
Email: js spansenber @ csrdalab.org

(No relevant relationships reported)

**HISTORY:** 55 year old elite male squash player felt a sudden onset of hip pain mid match. As he lunged to his left to return a ball, his left leg was in the stance phase and his right leg was in the swing phase, crossing over his body towards his left side. While mid-swing of the right leg, he heard a pop in his right hip and could not bear weight on his right leg. The next day, he began to ambulate with a hiking stick for assistance. He reported to the outpatient sports medicine clinic 10 days after the injury presenting with lateral hip pain described as focal, dull and rated 1/10.

**PHYSICAL EXAMINATION**
5/5 strength in hip flexors, knee flexors and extensors. Tenderness to palpation of the anterior rim of the right iliac crest. No tenderness to palpation of the right PSIS, buttock, or greater trochanter. No pain with passive hip flexion, internal or external rotation. Pain with hip abduction in the side-lying position on the right, worse with the hip extended and with clamsmills. Pain with single leg hop on the right. No sign of an ankle gait.

**DIFFERENTIAL DIAGNOSIS**
Hip osteoarthritis
Iliopsoas tendinitis
Trochanter bursitis
Tear of gluteus medius muscle
Lumbar paraspinous muscle strain

**TESTS AND RESULTS**
Right hip radiographs: No acute fracture, mal-alignment or osseous findings. Mild degenerative disease of the visualized lower lumbar space.
B-43 Clinical Case Slide - Spine I  
Wednesday, May 29, 2019, 3:15 PM - 4:35 PM  
Room: CC-306

736 Chair: Joseph Ihm, FACSM. Shirley Ryan AbilityLab, Chicago, IL.  
(No relevant relationships reported)

737 Discussant  
Olusean A. Olufade. Emory University, Johns Creek, GA.  
(No relevant relationships reported)

738 Discussant  
Prakash Jayabalan. Shirley Ryan AbilityLab/Northwestern University, Chicago, IL.  
(No relevant relationships reported)

739 May 29 3:15 PM - 3:35 PM  
Bilateral Upper Extremity Weakness in a Wrestler  
Kimberly S. Casten, Adam Lewno. University of Michigan, Ann Arbor, MI. (Sponsor: Robert Kinningham, FACSM)  
(No relevant relationships reported)

HISTORY: A 19-year-old male college Wrestler with a history of right labral repair presented with 4-month insidious 10/10 neck pain and band-like pain over his shoulders. In the last month he developed bilateral dorsal hand paresthesias with shoulder fatigue while wrestling. After a month off, symptoms would emerge after 2.5 minutes of wrestling and progressively longer. No illness, increase in activity, color changes, temperature differences, loss of dexterity.

PHYSICAL EXAMINATION:  
General: Well-developed male  
Skin: No rashes or lesions  
Vascular: Normal pulse and capillary refill  
Neuromuscular: Normal muscle bulk and tone. Normal range of motion, strength, deep tendon reflexes, and sensation to light touch and pinprick in the bilateral upper extremities. Positive Trommer reflex bilaterally, otherwise negative special testing of the cervical spine, shoulder, scapula, and neurovascular bundle.

DIFFERENTIAL DIAGNOSIS:  
1. Cervical Radiculopathy  
2. Transient quadriparesis  
3. Supraspinal or Auxillary Mononeuropathy  
4. Brachial Plexopathy  
5. Thoracic Outlet Syndrome  
6. Myopathy  
7. Quadrilateral Space Syndrome  
8. Spinal cord injury  
9. Cervical facet pathology

TEST AND RESULTS:  
Cervical MRI identified absent right C5 pedicle with no spinal cord signal abnormality. C5 and C6 spinal nerve roots were separate with no dural extension. Cervical CT showed no fracture of the right C5 pedicle; likely congenital absence. Anterior and posterior columns were normal. Cervical radiographs revealed no dynamic instability. Bilateral upper extremity electrodiagnostics were normal with no axillary or supraspinal mononeuropathy, upper trunk plexopathy, or radiculopathy.

FINAL WORKING DIAGNOSIS: Congenital absent right C5 pedicle with C6 subluxation

TREATMENT AND OUTCOMES:  
1. Neurosurgical consultation which confirmed spinal stability with no restriction on sporting activities  
2. Progressed from limited sporting activities including aerobic activities without upper body utilization and non-Olympic lower body weight lifting without barbell utilization, to stabilization exercises aimed at cervical musculature, trapezius, deltoids, and rhomboids. 
3. Return to sport in process, focusing on Folk style wrestling given less submission and upper extremity rapid force transmission.
To investigate shock absorption mechanisms between the tibia and sacrum of fatigued, shock absorption is expected to shift from active to passive structures, during the last part of the Half Marathon shock absorption decreased, resulting in an increased PSA. We speculate that fatigue caused the shock absorption mechanism to shift from active to more passive structures during the last part of the Half Marathon. Future research should determine if shock absorption by passive structures is sufficient to prevent overuse injuries.

**METHODS:** 8 trained athletes (5M 3F, 32.1±9.2 years, 177.4±8.1 cm, 67.8±7.5 kg) performed a Half Marathon during competition. A total of 8 IMUs (240 Hz) were placed at the feet, tibia, upper legs, sacrum and sternum. Parameters of interest included two indicators of impact: peak tibial acceleration (PTA) and peak sacral acceleration (PSA), and the knee angle at midstance (MS). Mean values over 100 strides were calculated bilaterally during three periods in the Half Marathon (1st km, halfway and 20th km). Paired sample t-tests were used to test for statistical differences in the parameters between the three periods.

**RESULTS:** Both PTA and PSA increased significantly during a Half Marathon, despite a unilateral increase in knee angle at MS.

**CONCLUSIONS:** In the first part of the Half Marathon, an increase in PTA did not increase PSA, probably due to an increase in shock absorption by active structures (i.e. unilateral increase in knee angle at MS). During the last part of the Half Marathon shock absorption decreased, resulting in an increased PSA. We speculate that fatigue caused the shock absorption mechanism to shift from active to more passive structures during the last part of the Half Marathon. Future research should determine if shock absorption by passive structures is sufficient to prevent overuse injuries.


**PHYSICAL EXAMINATION:** Skin normal without warmth, erythema. Vague tenderness in region of L buttock and SI joint. Full lumbar spine and hip ROM. Negative SLR. Mild non-specific back discomfort with FABER. Normal lower limb neurovascular exam.

**DIFFERENTIAL DIAGNOSIS:** Septic sacroiliac arthritis with iliacus abscess and secondary osteomyelitis; aspirate grew staphylococcus aureus (MSSA).

**FINAL WORKING DIAGNOSIS:** A Burst Abscess

**TEST AND RESULTS:** Outside lumbar x-rays negative for fracture, showed minimal degenerative disc changes. We obtained hip/pelvis radiographs showing significant erosions and destructive changes of L SI joint. An urgent MRI showed fluid-filled and widened SI joint, severe inflammatory sacroiliitis with extensive erosions and bone marrow edema, widespread reactive muscle edema (iliacus showing fluid collection/early abscess at SI joint); SI joint aspirate was obtained.

**TREATMENT AND OUTCOMES:** Patient was treated with 6 wks of oxacillin and responded well. He returned to baseline physical activity at follow up; repeat x-rays showed SI joint sclerosis and patient was counseled on SI joint arthritis.

**METHODS:**

- 1, Steven Morrison2, Shane Caswell3, Nelson Cortes3, Austin Peay State University, Clarksville, TN; 4Old Dominion University, Norfolk, VA; 5George Mason University, Manassas, VA.

**DIFFERENTIAL DIAGNOSIS:**

- 1. SI Joint Dysfunction
- 2. Lumbar Radiculopathy
- 3. Piriformis Syndrome
- 4. Lumbar or Sacral Compression Fracture
- 5. Metastatic Cancer
- 6. Sacroiliitis

**PHYSICAL EXAMINATION:**

- Skin normal without warmth, erythema.
- Vague tenderness in region of L buttock and SI joint.
- Full lumbar spine and hip ROM.
- Negative SLR. Mild non-specific back discomfort with FABER. Normal lower limb neurovascular exam.

**DIFFERENTIAL DIAGNOSIS:**

- Septic sacroiliac arthritis with iliacus abscess and secondary osteomyelitis; aspirate grew staphylococcus aureus (MSSA).

**FINAL WORKING DIAGNOSIS:**

- A Burst Abscess

**TEST AND RESULTS:**

- Outside lumbar x-rays negative for fracture, showed minimal degenerative disc changes.
- We obtained hip/pelvis radiographs showing significant erosions and destructive changes of L SI joint.
- An urgent MRI showed fluid-filled and widened SI joint, severe inflammatory sacroiliitis with extensive erosions and bone marrow edema, widespread reactive muscle edema (iliacus showing fluid collection/early abscess at SI joint); SI joint aspirate was obtained.

**TREATMENT AND OUTCOMES:**

- Patient was treated with 6 wks of oxacillin and responded well.
- He returned to baseline physical activity at follow up; repeat x-rays showed SI joint sclerosis and patient was counseled on SI joint arthritis.

**RESULTS:**

- Both PTA and PSA increased significantly during a Half Marathon, despite a unilateral increase in knee angle at MS.

**CONCLUSIONS:**

- In the first part of the Half Marathon, an increase in PTA did not increase PSA, probably due to an increase in shock absorption by active structures (i.e. unilateral increase in knee angle at MS).
- During the last part of the Half Marathon shock absorption decreased, resulting in an increased PSA. We speculate that fatigue caused the shock absorption mechanism to shift from active to more passive structures during the last part of the Half Marathon.
- Future research should determine if shock absorption by passive structures is sufficient to prevent overuse injuries.

**REFERENCES:**

- Evidence suggests that running mechanics may differ between runners based on their weekly mileage; greater weekly mileage (WM) may act as a protective mechanism against injury. While the interaction between coordination patterns and WM has been investigated, interaction between lower extremity (LE) kinematic variability and WM has not.
- PURPOSE: To compare changes in LE kinematic variability between low (LM) and high mileage (HM) healthy runners after a prolonged run.
- METHODS: 23 healthy participants (27.4±7.7 yrs., 1.70±0.11 m, 67.9±15.4 kg, 16.3±5.6 km/week) were included in the LM group. Participants ran on a treadmill for 30 minutes at a self-selected training pace. 3D kinematic data were collected after 5 minutes of running and again at the end of run at 200Hz using reflective markers placed on the lower body with 6 infrared cameras. Variables of interest included ankle, knee and hip sagittal and frontal plane angles. Standard deviation (SD) and coefficient of variation (CV) were calculated for each dependent variable (DV) at the beginning and end of the run. Approximate entropy (ApEn) was also calculated for each DV at both time intervals. Two repeated measures ANOVAs with time and joint as the within-subject factors and group as the between-subject factor, were used to compare kinematic variability. Post-hoc analyses were conducted for significant interactions. Alpha level was set at 0.05. RESULTS: Average running speed for the LM and HM group were 2.5±.3 m/s and 2.9±.4 m/s, respectively. In the sagittal plane, a significant interaction was found between joint and group (F3,39=10.9, p<.001). Specifically, the HM group demonstrated greater amounts of variability (SD) than the LM group (LM=25.7±3.0; HM=29.5±3.7). No other statistically significant differences were attained.

**CONCLUSIONS:**

- Kinematic variability differed between the LM and HM groups, but only for the knee in the sagittal plane. Ankle and hip sagittal plane movement was comparable between the LM and HM groups. This may suggest that movement of the knee and hip do not differ in response to having to control variability at the knee.
- When assessing kinematic variability, it is important to consider the weekly mileage of each runner.

**REFERENCES:**

- Evidence suggests that running mechanics may differ between runners based on their weekly mileage; greater weekly mileage (WM) may act as a protective mechanism against injury. While the interaction between coordination patterns and WM has been investigated, interaction between lower extremity (LE) kinematic variability and WM has not.
- PURPOSE: To compare changes in LE kinematic variability between low (LM) and high mileage (HM) healthy runners after a prolonged run.
- METHODS: 23 healthy participants (27.4±7.7 yrs., 1.70±0.11 m, 67.9±15.4 kg, 16.3±5.6 km/week) were included in the LM group. Participants ran on a treadmill for 30 minutes at a self-selected training pace. 3D kinematic data were collected after 5 minutes of running and again at the end of run at 200Hz using reflective markers placed on the lower body with 6 infrared cameras. Variables of interest included ankle, knee and hip sagittal and frontal plane angles. Standard deviation (SD) and coefficient of variation (CV) were calculated for each dependent variable (DV) at the beginning and end of the run. Approximate entropy (ApEn) was also calculated for each DV at both time intervals. Two repeated measures ANOVAs with time and joint as the within-subject factors and group as the between-subject factor, were used to compare kinematic variability. Post-hoc analyses were conducted for significant interactions. Alpha level was set at 0.05. RESULTS: Average running speed for the LM and HM group were 2.5±.3 m/s and 2.9±.4 m/s, respectively. In the sagittal plane, a significant interaction was found between joint and group (F3,39=10.9, p<.001). Specifically, the HM group demonstrated greater amounts of variability (SD) than the LM group (LM=25.7±3.0; HM=29.5±3.7). No other statistically significant differences were attained.

**CONCLUSIONS:**

- Kinematic variability differed between the LM and HM groups, but only for the knee in the sagittal plane. Ankle and hip sagittal plane movement was comparable between the LM and HM groups. This may suggest that movement of the knee and hip do not differ in response to having to control variability at the knee.
- When assessing kinematic variability, it is important to consider the weekly mileage of each runner.
Proximal redistribution of joint work to the hip occurs following intensive running in novice runners [1] and might explain the reduced running economy following prolonged running [2]. These findings in novice might be different in well-trained runners due to their training status. PURPOSE: The purpose of this study was to assess if proximal redistribution of joint kinetics following a running bout is observed in well-trained runners. METHODS: 14 well-trained male runners with habitual rearfoot strike patterns (76±22km/week) completed 5 running trials at a speed equivalent to ±35% of their long run pace while 3D kinematic and ground reaction force data were collected before and after a treadmill run equal to 25% of weekly mileage (19±6km). Joint powers and work were calculated from these data using Visual3D. Percent contribution of each joint work relative to total lower limb joint work was computed. Paired samples t-tests were used to compare joint kinetics before and after the run (p<0.05). Cohen’s d effect sizes were computed to assess mean difference magnitudes. RESULTS: Peak ankle negative power (Table 1) and hip negative work (14±3.6%, p=0.004; d=0.33) showed significant pre- to post-run effects. Positive ankle (p=0.066; 49.5±7.3%, p=0.35; d=0.16) and hip relative work (26.2±10.1%, post: 27.1±8.9%, p=0.53; d=0.10) were unaffected by the long run in these well-trained male runners. CONCLUSIONS: These findings suggest that previously reported distal-to-proximal shift in positive joint work in novice runners following a running bout [1] is not observed in well-trained male runners. This might be the result of chronic training exposure in these trained runners and suggest a preservation of mechanical joint output despite prolonged running exposure. Differences in run type (intense vs steady prolonged run), foot strike, and gender might also be responsible for these differences between studies.

Table 1: Peak negative and positive joint powers (W kg⁻¹) before and after the prolonged run (mean±SD)

<table>
<thead>
<tr>
<th>Joint Variable</th>
<th>Pre-Run</th>
<th>Post-Run</th>
<th>p-value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle negative power</td>
<td>-8.4±2.0</td>
<td>-7.8±2.1</td>
<td>0.005</td>
<td>0.33</td>
</tr>
<tr>
<td>Ankle positive power</td>
<td>10.2±2.2</td>
<td>9.7±2.3</td>
<td>0.02</td>
<td>0.34</td>
</tr>
<tr>
<td>Knee negative power</td>
<td>-13.5±2.6</td>
<td>-12.8±2.3</td>
<td>0.16</td>
<td>0.39</td>
</tr>
<tr>
<td>Knee positive power</td>
<td>4.6±1.2</td>
<td>4.6±1.2</td>
<td>0.99</td>
<td>0.00</td>
</tr>
<tr>
<td>Hip negative power</td>
<td>-3.3±1.9</td>
<td>-3.4±2.1</td>
<td>0.73</td>
<td>0.03</td>
</tr>
<tr>
<td>Hip positive power</td>
<td>4.3±1.9</td>
<td>4.5±2.1</td>
<td>0.57</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Note: % of pelvic power; | suggestive of positive work.

Running with an jogging stroller becomes a viable option for exercise in individuals serving as caregivers. Previous research has shown that stroller running leads to altered kinematics, but for many studies, running velocity was not constant between conditions. Some studies have reported altered trunk and pelvic motion during prolonged running [1], but the ASD group demonstrated less hip extension at toe off (2.97±1.07° ASD, 3.66±1.07° CON, p=0.10) compared to the control group. Additionally, the ASD group showed a shorter swing phase (0.40±0.05s ASD, 0.47±0.05s CON, p=0.10) compared to the control group. CONCLUSION: Prolonged running whereas stroller running leads to altered kinematics, but for many studies, running velocity was not constant between conditions. Some studies have reported altered trunk and pelvic motion during prolonged running [1], but the ASD group demonstrated less hip extension at toe off (2.97±1.07° ASD, 3.66±1.07° CON, p=0.10) compared to the control group. Additionally, the ASD group showed a shorter swing phase (0.40±0.05s ASD, 0.47±0.05s CON, p=0.10) compared to the control group. CONCLUSION: Prolonged running

May 29 3:45 PM - 4:05 PM Immediate Effects of a Textured Insole on Running Biomechanics in Rearfoot Strikers
Ann-Uriel H. Knausenberger, Matthew F. Moran, Justin C. Wager. Sacred Heart University, Fairfield, CT. New Balance Sports Research Laboratory, Lawrence, MA.

Running biomechanics are influenced by footwear and insole properties. The sensorimotor system, specifically subcutaneous plantar receptors, play a role in initiating adaptive gait mechanics. Designing to increase afferent signaling via plantar surface deformation, an insole inlaid with a textured heel-plate (TI) is proposed to precipitate gait changes during running. PURPOSE: To compare biomechanical patterns during over-ground running between the TI and a non-textured insole (NI). METHODS: Nineteen rearfoot strike runners (24.9±5.7 yo; 6.0; 13 F) performed twenty, 35-meter running trials under TI and NI conditions. Insole conditions were counter-balanced, and velocity was controlled (±5%). Plantar sensation was assessed using a 3.61g monofilament applied to seven standardized sites. Thirty-six reflective markers (da=16–20 cm), affixed bilaterally to lower extremity bony landmarks, were tracked via a 10-camera motion analysis system (120 Hz), and ground reaction forces were collected (1200 Hz). Visual3D and a custom Matlab script were used to determine lower extremity kinematics and kinetic variables. Perceived insole comfort was scored with a visual analogue scale. Dependent variables were analyzed using paired-samples t-tests; for data that violated assumptions, a Wilcoxon signed-rank test was utilized. RESULTS: Kinetic measures did not differ significantly between insole conditions; impact peak (NI=1.46±0.58 BW, TI=1.50±0.44 BW, p=0.74), active peak (NI=2.37±0.16 BW, TI=2.35±0.15 BW, p=0.28), loading rate (NI=35.9±12.2 BW/s, TI=34.0±13.2 BW/s, p=0.26), peak braking (NI=31.03 BW, TI=32.06 BW, p=0.69) and peak propulsion (NI=27.05 BW, TI=27.04 BW, p=0.28). A significant increase in ankle internal rotation angle at initial contact was observed in the TI versus NI (NI=5.9±5.9°; TI=7.3±5.9°, p<0.01, d=0.24), however, no other significant kinematic differences were detected. NI (md=9.0°) was rated as significantly more comfortable than TI (md=8.1°) (p=0.026, p<0.05). CONCLUSION: Because kinematic and kinetic variables did not vary significantly between the TI and NI, the efficacy of the TI as a method of immediately altering running mechanics in a population of rear foot strikers should be further investigated. Insoles provided by: ShoeCue Inc (ShoeCue, Orleans, MA)
control group demonstrated more hip extension at toe off, which could suggest greater forward propulsion of the body. Greater propulsion is also associated with shorter ground contact times, and requires greater stability. The ASD group exhibited greater time in stance phase, and less time in swing phase, which could suggest potential balance deficits and less effective running patterns in college students with ASD.

Manipulation of stride frequency (SF) influences gait mechanics of forward running, regardless of body weight support (BWS). Nevertheless, no research has investigated the influence of a change in SF on physiological and perceptual responses during backward running with BWS.

**Purpose:** To investigate influence of a change in SF on physiological and perceptual responses during backward running at different levels of BWS. **Methods:** Nine participants (33.2 ± 12.1 years) ran forward and backward at 0%BWS, 20%BWS, and 50%BWS conditions on a lower body positive pressure treadmill. The SF conditions consisted of forward and backward running at preferred stride frequency (PSF), PSF+10%, and PSF-10%. Oxygen uptake (VO₂), heart rate (HR), rating of perceived exertion (RPE), and muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius were measured. VO₂, HR, RPE, and muscle activity from lower extremity were analyzed using a 2 (running direction) x 3 (BWS) x 3 (SF) repeated measures analysis of variance (n = 0.05). RESULTS: VO₂, HR, RPE, and muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius were significantly different between SF conditions (P<0.05). For example, VO₂, HR during running at PSF+10% were significantly higher than when running at PSF, regardless of running direction and BWS (e.g., 27.7 ± 5.7 ml/kg/min and 24.9 ± 4.3 ml/kg/min in VO₂ for PSF+10% and PSF during forward running at 50%BWS, respectively). However, RPE was not different between SF conditions (P>0.05). CONCLUSION: These observations suggest that manipulation of SF (i.e., a 10% change in SF from the PSF) during running may have greater impact on physiological responses than on perceptual responses, regardless of running direction and BWS.

Supported by JSPP Grant Number 16K01663.

**CONCLUSIONS:** AVLR among FIA reflective of forefoot strike was low, but AVLR varied considerably among FIA associated with rearfoot striking, indicating a distinct nonlinear relationship. This supports that dichotomous treatment of FIA does not appropriately estimate AVLR and may bias models utilizing AVLR to assess injury risk.

**Purpose:** To compare the effects of two types of interval training, High-Intensity Interval Training (HIIT) and Sprint Interval Training (SIT), on anthropometric measures and cardiorespiratory fitness in healthy young women. **Methods:** A randomized clinical trial in which 40 young active women (age, 30.4±6.1 years; body mass index, 24.8±3.1 kg·m⁻²; peak oxygen consumption (VO₂peak), 34.9±7.5 ml·kg⁻¹·min⁻¹) were randomly allocated into a SIT or HIIT group. The SIT group performed four bouts of 30 s all-out cycling efforts interspersed with four minutes of recovery (passive or light cycling with no load). The HIIT group performed four bouts of four-minute efforts at 90-95% of peak heart rate (HRpeak) interspersed with three minutes of active recovery at 50-60% of HRpeak. The protocols were performed three times per week (Monday, Wednesday, and Friday) for eight weeks. At baseline and after eight weeks of intervention, waist circumference, skinfolds (triceps, subscapular, suprailiac, abdominal and thigh), body mass and BMI were measured by standard procedures and cardiorespiratory fitness was assessed by cardiopulmonary graded exertion test on an electromagnetically braked cycle ergometer. **Results:** The HIIT and SIT groups improved, respectively, 13.5±2.5% (P<0.001) and 16.9±2.3% (P<0.001) in VO₂peak after intervention, with no significant difference between groups. Sum of skinfolds reduced 15.8±7.9% and 22.2±6.4% (P<0.001) from baseline (P<0.001) for HIIT and SIT groups, respectively, with greater reduction for SIT compared to HIIT (P<0.005). There were statistically significant decreases in waist circumference (P<0.001) for the HIIT (-3.1±1.1%) and SIT (-3.3±1.8%) groups, with no significant difference between groups. Only SIT showed significant reductions in body weight and BMI (p<0.005). No significant difference (P>0.05) was found in dietary intake between the HIIT and SIT groups at baseline and after eight weeks of training. **Conclusions:** Eight weeks of HIIT and SIT resulted in improvements in anthropometric measures and cardiorespiratory fitness, even in the absence of changes in dietary intake. In addition, the SIT protocol induced greater reductions than the HIIT protocol in the sum of skinfolds.

**Conclusion:** The training effect of track-sprinted cycling largely depends on the completed riding intensity on track or ergometers. Especially before the big events, coaches normally arrange a training plan of gradually decreased volume. Meanwhile, the training intensity should be kept or increased, which is difficult to be achieved. **Purpose:** To investigate the effect of seven high-intensity interval training (HIIT) sessions with increased intensity on track or ergometers. Especially before the big events, coaches normally arrange a training plan of gradually decreased volume. Meanwhile, the training intensity should be kept or increased, which is difficult to be achieved. **Conclusion:** The training effect of track-sprinted cycling largely depends on the completed riding intensity on track or ergometers. Especially before the big events, coaches normally arrange a training plan of gradually decreased volume. Meanwhile, the training intensity should be kept or increased, which is difficult to be achieved.
Middle-aged women often have a tendency to gain weight due to decreased basal metabolic rate and physical activity. In order to make women’s elderly life more quality, women’s physical fitness in middle age is an issue that needs attention.

**METHODS:** Twenty-four middle-aged women (age: 45.0±7.2 yrs; height: 160.3±5.0 cm; weight: 61.6±7.1 kg; body fat percentage: 38.3±7.1%) participated in the study who were paired by CV to perform high-intensity interval training (HIIT, 130% CV , running 2 minutes with 1 minute recovery, repeated 7 times) or moderate-intensity continuous training (MICT, 90% CV, running 20 minutes) 3 times a week for 12 weeks. Participants were asked to wear the Mi band II 3 weeks before and during the intervention period to record the number of steps and sleep status.

**RESULTS:** The body fat percentage (HIIT group: 39.7±4.5% to 38.5±4.7%, MICT group: 36.9±3.2% to 35.7±3.3%) and maximal oxygen uptake (HIIT group: 36.9±3.2% to 35.7±3.3) and maximal oxygen uptake (HIIT group: 36.9±3.2% to 35.7±3.3% to 33.3±5.0 ml/min/kg). The increase in VO2peak was greater in the HIIT group than the MICT group (HIIT: 771±52 ml/min/kg vs. MICT: 730±47 ml/min/kg; p < 0.05). Cardio-pulmonary fitness, body composition, and sleep quality in middle-aged women. To investigate the effects of different percentages of critical velocity (CV) training on cardio-pulmonary fitness, body composition, and sleep quality in middle-aged women.

**CONCLUSIONS:** A specific pre-compensation training phase with obviously increased exercise intensity should improve the lactate buffer and transportation capacity of blood significantly. The achieved intensity in HIIT should be the decisive factor for the improvement of anaerobic exercise capacity.
No differences in performance improvement (-0.2 ± 0.4 %Δ in 5km time) or running economy were observed between groups (p=0.05). Resting HR (2.7 ± 0.5 vs. 2.3 ± 0.7 %) and HRV (SDNN 5 ± 2 vs. 11 ±4 %) were improved in both groups but were not different between conditions (HIT vs. HIT+Heat, p>0.05). However, SBP (1 ± 2 vs. 2 ± 2 %), DBP (-0.6 ± 0.7 %Δ), and PWV (0 ± 1 vs. -2 ±2 %) only decreased in the HIT+Heat (HIT vs. HIT+heat, respectively, all p=0.05). Improvements in jump velocity (-3 ± 5 vs. 8 ± 5 %) and power (-2 ± 5 vs. 9 ± 6 %) tended be greater in HIT+heat (p=0.08-0.10). CONCLUSION: Short-term HIT combined with heat stress did not improve running performance or economy more than HIT alone, but did significantly improve blood pressure, vascular stiffness, and tended to improve muscle function in thermoneutral conditions. Further work exploring longer training and/or greater heat stress in larger populations, or those with vascular dysfunction, is warranted.

RESULTS: Group level (mean ± SD) increases in PP (0.9 ± 1.1 W.kg⁻¹), AP (0.3 ± 0.6 W.kg⁻¹), AP (0.4 ± 0.4 W.kg⁻¹) and CP (16.8 ± 15.6 W) were observed (all p<0.05). Non-responders to PP (17/25, 76 %), AP (9/25, 36 %), and CP (10/25, 40 %) were all identified. Adverse responses in AP and MP (1/25, 4 %) were also observed. Global non-responders to SIT were identified (4/25, 16 %), who did not improve any performance measure. All other participants improved at least one performance measure. Of participants that improved CP a large subset (10/15, 67 %) also improved CP a large subset (10/15, 67 %) also improved training. Interestingly, n=4 participants improved CP in response to SIT without improving any anaerobic variable. CONCLUSIONS: This study’s findings indicate significant heterogeneity in the individual adaptations to SIT in measures of anaerobic and aerobic performance. Subsets of responders to multiple performance variables, as well as those who improved aerobic, but not anaerobic performance, were identified, demonstrating the wide range of adaptive responses to SIT.

The high-intensity interval training (HIT) has been used as an alternative to cardiorespiratory training performed continuously with submaximal intensity and prolong time. PURPOSE: The aims of this study were to propose a treadmill HIT protocol and verify the influence of six HIT sessions on intensities of ventilatory anaerobic thresholds (VATs) and substrate oxidation rates during submaximal continuous exercise (SCE). METHODS: Fifteen irregularly active men performed incremental treadmill exercise testing followed by submaximal work-rate running for 45min to determine VATs, VO₂max, peak velocity (V̇max) and substrate oxidation rates, before and after training period. The training period consisted of six HIT sessions, composed each one of eight sets of 60s running at 100% V̇max interspersed by 75s recovery, every 48h. RESULTS: Our study showed increases in VATs intensities of 4.5% for VAT1 and 8.8% for VAT2, reduction of 12.8% for carbohydrate oxidation (CHOox) and increase of 23.7% for lipid oxidation (LIPOx); as a result, the relative energy derived from LIPOx was 20.3% higher after the training period. V̇max was ~15 km/h, which produces the relative intensities of ~84%VO₂max e ~91%FATmax during the training period. CONCLUSION: The proposed protocol promoted similar adaptations and intensities which were described by the literature; but unlike others, it can be applied in irregularly active individuals.

High-intensity strength training is known to induce muscle strength gain and muscle hypertrophy. However, there are only few reports on the effects of high-intensity strength training on strength gain and muscle hypertrophy in males and females after high intensity resistance training. PURPOSE: To conduct a systematic review of a meta-analysis to compare changes in strength gain and muscle hypertrophy between males and females after high intensity resistance training. METHODS: To carry out present review, English-language literature searches on PubMed and SPORTDiscus databases were conducted from all time points up until June 2018. Combinations of the following keywords were used as search terms: “training intensity,” “strength training,” “resistance training,” “strength,” “muscle hypertrophy.” RESULTS: Thirty-five articles were included in the meta-analysis. The standardized mean differences for muscle strength gain were 1.27 (95% confidence interval [CI], 0.99-1.55) and 1.16 (95% CI, 0.45-1.87), in males and females, respectively. The standardized mean differences for muscle hypertrophy were 0.73 (95% CI, 0.41-1.05) and 0.31 (95% CI, 0.07-0.56) in males and females, respectively. CONCLUSIONS: Our results suggested that high-intensity strength training induces muscle strength gain and increases muscle hypertrophy in both males and females. However, in the case of muscle hypertrophy, females tend to have lower standardized mean difference than males after high-intensity strength training.
CONCLUSIONS: The findings of the study indicate that a 3-min duration of HIIT style warm-up may be enough to physically prepare individuals to improve flexibility and vertical jump. In addition, the data also suggests that the required/recommended duration for a warm-up protocol to prepare the body may be shortened with HIIT style warm-up. Future studies should compare and contrast the efficacy of varying work to rest ratio of HIIT style warm-up with other warm-up protocols to determine the most effective warm-up protocol.
RESULTS: Significant improvements were seen for squats in both groups (HIFT +3.9 ± 5.5 reps, t= 4.36, p < .001; TWT +3.8 ± 5.3 reps, t= 4.29, p < .001) and push-ups in TWT (+3.4 ± 4.5 reps, t= 5.67, p < .001). No significant changes were found for power or strength. Independent samples t-tests revealed no significant differences between groups.

CONCLUSIONS: After 8-weeks of either HIFT or TWT participants significantly improved muscular endurance, with no significant differences between groups. More detailed measures of strength (e.g., 1 rep max testing) should be examined in future research along with longitudinal changes in fitness comparing different training modalities.

781 May 29 2:00 PM - 3:30 PM
Effect Of Ethnicity On Change In Vo2max And Substrate Oxidation In Response To HIIT
Jamie DeRevere1, Todd A. Astorino1, Sean Walsh, FACSM2. 1California State University San Marcos, San Marcos, CA. 2Central Connecticut State University, New Britain, CT.

Introduction: About 20% of adults meet the 2008 Physical Activity Guidelines and this lack of physical activity increases individuals’ risk of heart disease, stroke, type-2 diabetes, and certain cancers which increases morbidity and all-cause mortality. Typically, moderate intensity continuous training (MICT) is prescribed to clients to improve overall fitness and health status, although a primary barrier to regular physical activity among sedentary individuals is lack of time. An alternative to MICT is high intensity interval training (HIIT) which significantly increases VO2max and fat oxidation, in turn improving exercise capacity and reducing health risks. One widely ignored aspect of individual response to exercise training is ethnicity, as there are minimal data examining the effect of ethnicity on responses to exercise training.

Purpose: To determine if ethnicity alters adaptive HIIT in sedentary women.

Methods: Inactive, non-obese women (age and VO2max = 24.3 ± 4.1 yr and 29.1 ± 2.1 mL/kg/min) participated in 9 sessions over a 3-week period of cycling-based HIIT (8-10 1-minute bouts at 85% VO2max interspersed with 75-sec recovery at 70% VO2max). Participants were Caucasian (C) (n=6) or Hispanic (H) (n=4). To assess VO2max, the initial work rate began at 30 or 40 W for 2-minute followed by a 15 or 20 W/min increase in power output until volitional exhaustion. To assess substrate oxidation, a 6-minute warm up began at 100% VO2max and subsequently work rate increased by 10% VO2max every 5-min during 4 remaining stages. These variables were measured pre- and post-training.

Results: Training elicited a HR equal to 88-94% HRmax. Data showed an increase (p=0.016) in VO2max in C (30.5 ± 1.3 vs 32.6 ± 3.9 mL/kg/min, 14%) with no significant groupXtime interaction (p=0.039). There was no change observed in H (p=0.005) for VO2max. Significant reductions in fat oxidation (p=0.009) and RER (p=0.000) were observed, indicating an increase in carbohydrate oxidation in response to training which differed based on ethnicity.

Conclusion: These data show HIIT induces significant increases in VO2max which are significantly higher in H in comparison with C. Additionally, ethnicity seems to mediate changes in substrate metabolism after interval-based exercise.

782 May 29 2:00 PM - 3:30 PM
High-Intensity Interval Training Does Not Induce Anti-Inflammatory Changes in Healthy Men
Paul Nagelkirk, James Sackett, Dan Farrell. Ball State University, Muncie, IN.

Email: pm nagelkirk@bsu.edu

No relevant relationships reported

Low-grade inflammation is associated with the risk of various chronic diseases, and the protective effects of a physically active lifestyle may be partially ascribed to the anti-inflammatory effects of exercise. The impact of moderate intensity exercise training on circulating pro-inflammatory molecules has received much attention in recent years. However, there are very few well designed and adequately powered studies on the influence of high-intensity interval training (HIIT) on circulating markers of inflammation.

Purpose: The purpose of this study was to examine potential changes in plasma concentrations of C-reactive protein (CRP), interleukin-6 (IL6), and soluble interleukin-6 receptor (sIL6r) following four (4w) and eight weeks (8w) of HIIT in healthy men.

Methods: Healthy, sedentary men participated in a HIIT program three days/week for eight weeks. Training bouts were modeled after the traditional Wingate test, consisting of repeated, 30-second bouts of maximal intensity cycling separated by 4.5 minute rest intervals. Training began with three bouts per day and an additional bout/day was added to the regimen every two weeks, progressing up to six bouts per day in the final two weeks. Plasma concentrations of CRP, IL6, and sIL6r were assessed by ELISA at baseline, 4w, and 8w. Statistical comparisons across the three time points were done using repeated measures ANOVA. Variables that deviated from normality were log transformed prior to analysis. Significance was set to p <0.05.

Results: 21 men (age: 25.5 ± 3 yrs, BMI: 26.7 ± 6.2 kg/m2) completed the study. No significant changes were observed for CRP during training (baseline: 1.5 ± 2.3, 4w: 1.0 ± 1.4, 8w: 2.2 ± 3.0 mg/L, p>0.05). Likewise, IL6 (baseline: 1.4 ± 1.6, 4w: 1.6 ± 1.7, 8w: 1.2 ± 2.2 pg/mL) and sIL6r (baseline: 36.3 ± 23.9, 4w: 27.8 ± 20.8, 8w: 32.6 ± 22.2 ng/mL) did not change with training (all p>0.05). Conclusion: Though it has been suggested that HIIT may reduce inflammation, results of the present study do not indicate HIIT influences specific inflammatory mediators in healthy young men. Future research should explore the potential anti-inflammatory benefits of HIIT in different populations and disease states.

783 May 29 2:00 PM - 3:30 PM
Mots-C Plasma Levels Following A Single Session Of MICT And HIIT
Zachary Fenne1, Kurt A. Escobar2, Roberto Nava1, Christine M. Mermier1, Fabiano T. Amorim1. 1The University of New Mexico, Albuquerque, NM. 2California State University, Long Beach, CA.
(Sponsor: Dr. Gibson, FACSM)
Email: zfennel@unm.edu

No relevant relationships reported

Acute moderate intensity continuous training (MICT) and high-intensity interval training (HIIT) result in increased mitochondrial transcriptional activity. The mitochondrial open reading frame of the 125 bRNA (MOTS-C) is a peptide encoded from mitochondrial DNA. This mitochondrial derived peptide can regulate skeletal muscle glucose uptake and fatty acid beta-oxidation. However, it is not known if MOTS-C concentrations are altered following an acute bout of MICT or HIIT.

Purpose: The present study investigated the effects of acute MICT and HIIT on MOTS-C levels in plasma pre- and 3 hours post-exercise.

METHODS: Ten recreationally active (> 150 min moderate-vigorous intensity aerobic activity per week ≥ 1 year) males (n=5; age 25.2 ± 1.1, VO2max 48.0 ± 4.9 ml/kg/min) and females (n=5; age 21.6 ± 3.6, VO2max 39.4 ± 7.7 ml/kg/min) were conveniently recruited for an initial study conducted at the UNM Exercise Physiology Laboratories. The original study, and the current expanded exploration were approved by the institution’s Institutional Review Board (IRB). Participants completed a health history, and physical activity history questionnaire. Based on criteria from the American College of Sports Medicine, all participants were considered low-risk. Utilizing a crossover design subjects performed an acute bout of MICT and HIIT exercise on a treadmill. The MICT bout consisted of 60 minutes at 75% of maximum velocity (Vmax) achieved during the VO2max test and the HIIT trial required two sets of 6 x 1-min bouts at 100% Vmax, with 5 minutes recovery at 3 MPH between sets. Trials were conducted at least 62 hours apart in randomized order and in a fasted state. Plasma samples were collected during a previously conducted study and frozen for future analysis. MOTS-C was measured from the previously collected samples obtained pre- and 3 hours post-exercise using an enzyme-linked immunosorbent assay.

RESULTS: There were no significant changes in plasma MOTS-C (p = 0.21) from pre to post-exercise for MICT (220.4 ± 62.9 vs 248.4 ± 45.2 ng/mL, respectively) or HIIT (p = 0.38) (227.9 ± 62.4 vs 246.9 ± 75.9 ng/mL, respectively).

CONCLUSION: Our findings show plasma MOTS-C does not increase in response to a single session of MICT or HIIT.

784 May 29 2:00 PM - 3:30 PM
Effects of Heart Rate Variability Modulation on High Intensity Functional Training Strength Outcomes
Brady K. Kurtz1, Nicholas B. Drake2, Justin A. Deblauw1, Derek Crawford1, Katie M. Heinrich1. 1Kansas State University, Manhattan, KS. 2Pittsburg State University, Pittsburg, KS.
(Sponsor: Craig Harms, FACSM)
Email: bkurtz@ksu.edu

No relevant relationships reported

PURPOSE: High Intensity Functional Training (HIFT) involves completing concurrent aerobic and resistance training functional movements at high intensity with the goal of increased fitness. We examined the effectiveness of using daily heart rate variability (HRV) status to modulate training intensity and increase performance outcomes. We hypothesized that HRV modulation for HIFT would facilitate strength improvements.

METHODS: Participants (n = 55) were healthy, untrained or recreationally trained adults not participating in a structured exercise program. Participants were randomly assigned to either HIFT (n = 29, age = 24.1 ± 4.1 years, 41.4% male) or HIFT-HRV (n = 26, age = 23.7 ± 4.5 years, 53.8% male) groups. Both groups underwent an 11-week training protocol which included: 2-weeks baseline HRV collection, baseline, midpoint, and post-intervention HRV assessments and fitness assessments, and 6 weeks of HIFT, 5 days/week. All participants recorded their HRV daily via validated mobile app throughout the study. HIFT-HRV participants’ exercise was modulated by reducing rate of perceived exertion based on their daily HRV statuses. Maximal strength was tested using the squat, overhead press, and deadlift in healthy men.

RESULTS: There were no differences in intervention fidelity between groups, which included adherence to HIFT (p = .21) and providing daily HRV data (p = .75). The HIFT-HRV group had their training modified 17.12 ± 6.75 days. Additionally, one-way RM-ANOVA indicated significant increases in the squat (HIFT = 114.0 ± 1.63 kg, F = 55.38, p < .001; HIFT-HRV = 114.4 ± 2.2 kg, F = 15.61, p < .001).
During running, the lower extremities are compared to a spring due to their ability to store and release energy. Recent evidence suggests a relationship between increased lower extremity stiffness and enhanced athletic performance, specifically in distance running. Current literature lacks information on the influence of fatigue on leg stiffness across multiple days in response to competition. PURPOSE: To determine how leg stiffness in runners was influenced in the 24- and 48-hour period following a cross country race. METHODS: Twenty-two collegiate cross-country runners (13 M, 9 F, 19.5 ± 1.4 years old) participated. Leg stiffness was measured 24h before a race and 24h and 48h post-race. Participants performed three static jumps (SJ) and three countermovement jumps (CMJ) on two force plates (AMTI OptoGait456458, Watertown, MA; 1000 Hz). During each jump, participants held a dowel across the shoulders to prevent arm swing. Participants then performed a hop test (HT) where they completed 10 straight unrestrained hopping with a metronome (2.2Hz). Leg stiffness was calculated, in agreement with previously reported methods, from the vertical ground reaction force of the 5th-7th hop of the HT. Repeated measures ANOVA and post-hoc analysis were used to assess significance (p < 0.05). RESULTS: A significant main effect was found for SJ height, CMJ height and leg stiffness. Leg stiffness decreased as significantly reduced 24h post-race (pre-36.84 ± 0.96 kN · m⁻¹, 24h post 33.11 ± 0.85 kN · m⁻¹, p < 0.05) and then increased significantly from 24h post-race to 48h post-race (36.84 ± 0.88 kN · m⁻¹, p = 0.015). No significant differences were found in post-hoc analysis for CMJ height (pre-30.81 ± 0.57 cm, 24h post-race 29.89 ± 0.60 cm, 48h post-race 31.44 ± 0.67 cm, p > 0.05) and eccentric utilization ratio (pre-race 1.24 ± 0.10, 24h post-race 1.20 ± 0.10, 48h post-race 1.22 ± 0.10, p > 0.05). SJ height increased significantly from 24h to 48h post-race (24h post 25.99 ± 0.65 cm, 48h post-race 27.19 ± 0.63 cm, p > 0.05). CONCLUSION: Following a cross country race leg stiffness significantly declined in a group of collegiate runners 24 hours post-race but returned to baseline 48 hours post-race. Sport scientists and coaches may be able to monitor leg stiffness as a metric to properly prescribe training regiments.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #23 May 29 2:00 PM - 3:30 PM Effects of Pulsed Electromagnetic Field Application on Aerobic Performance in Runners During Short-Term Altitude Training Tanuj Wadhli1, Nauris Tamulevicius1, Guilleramo R. Oviedo2, Ashmeet S. Anand1, Dror Vaknin2, Fraser Houston1. 1The University of Tampa, Tampa, FL. 2Universitat Ramon Llull, Barcelona, Spain. (No relevant relationships reported)

Pulsed Electromagnetic Field (PEMF) application increases microcirculation throughout the body and has been shown to be beneficial in clinical populations. In athletic populations, PEMF is used to improve recovery. Altitude training has long been used by endurance athletes to improve sea-level performance. PURPOSE: To determine if PEMF application during altitude training leads to greater improvements in VO2max and ventilatory threshold (VT) in cross-country runners. METHODS: Fourteen male NCAA cross-country runners (age: 19.07±0.92 y.o.) with initial VO2max of 73.13±5.65 mL/kg/min participated in the study. Subjects were randomly assigned to either the PEMF intervention (INT) (n=8) or a control group (CON) (n=6). VO2max and VT were evaluated using a metabolic cart at sea-level, pre- and post-training. Runners from sea level traveled to high altitude where they lived at 1322m above sea-level for 6 days. Six training sessions were performed at altitudes ranging from 881.25±148.87m to 1047.70±237.29m above sea-level with training sessions averaging a duration of 75.25±7.04 minutes, speed of 13.02±1.60 km/h and distance of 16.42±2.95 km. Subjects in INT received PEMF application prior to and after training, while subjects in CON did not. RESULTS: There was no significant difference in either absolute or relative VO2max. A main-effect of time was found for absolute VT (p<0.01), which changed from 3.35±0.52 L/min to 3.89±0.55 L/min, and VT relative to VO2max (p<0.01), which changed from 73.10±1.60% of VO2max to 87.08±1.82% of VO2max. There was no significant difference between groups for absolute VT (p>0.24) however, the INT group displayed a positive-trend for VT relative to VO2max (INT: 18.28%, CON: 9.68%; group*time p=0.07). Consequently, there was a main effect of time for heart-rate at VT (p<0.02), which changed from 168.10±3.25 bpm to 175.34±3.49 bpm, with no difference between groups (group*time p=0.11). CONCLUSION: While altitude training showed some positive adaptations in cross-country runners, the addition of PEMF did not improve these adaptations significantly. This can be attributed to the short duration of application, since a positive-trend was found for VT relative to VO2max. PEMF could have beneficial effects when combined with a longer duration of altitude training.

Board #24 May 29 2:00 PM - 3:30 PM The Effects of Hip Tightness on Running Mechanics and the FMS Deep Squat in Dill Track & Field Runners Samuel D. Rosario, Ana B. Freire Ribeiro. Augsburg University, Minneapolis, MN. (Sponsor: Dr. Mark Blegen, FACSM) Email: rosarioi@augsburg.edu (No relevant relationships reported)

Introduction: Running requires rapid hip movements. Increasing running speeds place increased loads on hip flexor and extensor muscles (Schache et al., 2011). It is unclear whether Division III track and field athletes with self-reported hip tightness would present altered sagittal plane hip mechanics while running and functional limitations when performing the Functional Movement Screen (FMS) deep squat. Objective: To investigate the relationship between hip tightness, as measured by the Functional Movement Screen (FMS) deep squat (DS), and running mechanics, as measured by the peak flexion and extension angles of the hip, femur, and tibia. Methods: Ten subjects completed the FMS DS and were filmed from both sides while running on a treadmill at 3 different speeds. Reflective markers were placed on the greater trochanter and lateral epicondyde of the femur. Absolute peak flexion and extension angles were obtained using Dartfish software. Results: DS was not a significant predictor of running mechanics. There were moderate positive correlations between peak hip flexion angles and DS. DS scores of 1 were associated with increased hip flexion ROM and decreased extension, especially on the left side. Runners who reported hip tightness had higher average DS scores. Conclusion: Self-reported hip tightness group showed earlier toe-off and increased flexion ROM during swing phase. Differences between groups were greater in hip extension.

Future studies could investigate these changes in running mechanics in different planes of motion and injury prevalence in runners with self-reported hip tightness.

Board #25 May 29 2:00 PM - 3:30 PM Prevalence And Spectrum Of Electrocardiogram Abnormalities In Amateur Marathon Runners xu wen. Zhejiang University, Hangzhou, China. (Sponsor: Stanley Sai-chuen HUI, FACSM) Email: wenxu@zju.edu.cn (No relevant relationships reported)

PURPOSE: The purpose of this study was to assess the prevalence and the spectrum of electrocardiogram (ECG) abnormalities in amateur marathon runners. METHODS: The participants of this study were contestants who participated in Hangzhou marathon (full marathon or half marathon) in 2015 and 2016. 12-lead ECG data of 24,210 amateur marathon runners aged 18-70 were included for analysis. The prevalence of ECG abnormalities were calculated and Chi square test was applied to compare the prevalence between different gender, age, weight status and sports performance groups. Logistic regression was utilized to determine the odds ratios of having certain ECG abnormalities in runners with good performance as compared with the runners with poor performance. RESULTS: Sinus bradycardia and sinus arrhythmia were found in approximate 15% and 5% of participants. Prevalence of left ventricular high voltage, T wave change and right axis deviation are also higher than 1%. Runners with better performance had higher odds ratios to have sinus bradycardia, left ventricular high voltage, right ventricular high voltage and atrioventricular block (AVB). CONCLUSIONS: Sinus bradycardia, sinus arrhythmia and left ventricular high voltage are the most common ECG abnormalities in amateur marathon runners. Sinus bradycardia and ventricular high voltage could be physiological adaptation after long-term marathon training, but ST-T change and axis deviation are not training-related ECG abnormalities.

Board #26 May 29 2:00 PM - 3:30 PM Running Economy of Highly-Trained Distance Runners in Marathon Racing Shoes Compared to Track Spikes Kyle R. Barnes1, Jordan Juzwiak1. 1Grand Valley State University, Wyoming, MI. 2Grand Valley State University, Allendale, MI. (Sponsor: Stephen Glass, FACSM) (No relevant relationships reported)

Running economy represents a complex interplay of physiological and biomechanical factors that are able to adapt chronically through training or acutely through other interventions such as changes in footwear. The Nike Vaporfly (NVF) shoe was designed for marathon running on the roads and has been shown to improve running economy by ~4% compared to other marathon shoes, however, during track racing distance runners traditionally wear a much lighter shoe with an embedded spike plate around the forefoot. PURPOSE: To determine if, and to what extent, the NVF shoes improve running economy compared with established track spikes (SPIKE) and marathon racing shoes (MAR). METHODS: 24 highly-trained runners (12 male, 12 female) ran 4x5 min trials on a treadmill while wearing each of the four shoe conditions: NVF, SPIKE, MAR, and the NVF matched in weight to the MAR shoe (NVF+), during three separate visits. (Visit 1) familiarization; (Visit 2) 14 and 18 km h⁻¹ run for men, 14 and 16 km h⁻¹ for women; (Visit 3) 16 km h⁻¹ run for men, 15 km h⁻¹ for women plus a VO2max test for both genders. We measured rates of oxygen uptake (VO2), carbon dioxide production (VCO2), and biomechanical measures (stride rate, contact time, stride length, flight time) were made at each run velocity and shoe condition. Differences in running economy while running in the four shoe conditions over three velocities was assessed using a two-way ANOVA with repeated measures. Multiple regression analyses were used to evaluate potential relationships between changes in biomechanical measures and running economy. RESULTS: The NVF shoe improved running economy by 2.6±1.3% compared to SPIKE, 4.2±1.2% compared to MAR, and 2.9±1.3% when matched in weight of the MAR shoe. Among the 24 subjects, the difference in running economy over the four velocities between the NVF and SPIKE shoes ranged from -0.50 to -5.34% and from -1.72 to -7.15% for NVF versus MAR. Correlations between changes in running economy and changes in biomechanical variables were either trivial or small (r < 0.27) but unclear. CONCLUSION: The NVF enhanced running economy compared to track spikes and marathon shoes and should be considered a viable shoe option for track and road racing.
PURPOSE: Anthropometrics, summer training volume, and functional movement including unilateral strength, flexibility and coordination have all previously been linked to athletic performance. The purpose of the current investigation was to determine the best predictor of mile time trial performance in division III cross country runners across the variables of body weight, functional movement screen (FMS), and total volume of miles run in the 14 weeks leading up to the start of the cross country season. METHODS: 31 subjects (M=22, F=9) aged (20 +/- 2 yrs) on a division III collegiate cross country team were asked to record and report summer mileage each week for the 14 weeks preceding the start of the season. Additionally, FMS tests were conducted on all subjects, as well as body weight measurement within the first week of the season. All subjects also completed a mile time trial run concomitantly. A multiple regression analysis was utilized to determine if FMS score, pre-season mileage, and/or body weight were significant predictors of mile time trial performance. RESULTS: The overall regression analysis revealed that FMS, body weight, and summer mileage were significant predictors of mile time trial performance (r= .41; p < .05). When covaried out, body weight was not significantly (p > .05) correlated with mile time trial performance for males or females (r = .35 , r = .27, respectively). Summer mileage was statistically significant (p < .05) to mile time trial results. Lastly, FMS testing was deemed not significant (p > .05) towards mile time trial performance. CONCLUSIONS: Summer running volume, as recorded in the 14 week period leading up to the cross country season is the best predictor of performance when compared to anthropometric data as well as functional movement screening. Cross country athletes should focus on utilizing the progressive overload principle to gradually increase running volume over the summer months in order to maximize in season performance.

The Effect of Plyometric versus Muscular Endurance Training on Cross Country Time Trial Results

Zack B. Murphy, Mikaela D. Lengwin, Elaina S. Biechler. Loras College, Dubuque, IA. (Sponsor: Vincent Paolone, FACS) Email: zakcary.murphy@loras.edu

PURPOSE: Traditionally, endurance runners have supplemented aerobic training with muscular endurance training. Recent research has suggested that plyometric training improves running efficiency and endurance performance, and hence may be a more effective option in comparison to muscular endurance training. The purpose of the current investigation was to compare the effect of a plyometric and power intervention to a muscular endurance intervention on running performance in division III male and female cross country runners. METHODS: Both plyometric and muscular endurance training groups were assigned using stratified selection based on 2-mile time trial results completed during the first week of cross country practice. Subjects (N=46; M=29, F=17) participated in a 9 week intervention in conjunction with the cross country season. The muscular endurance group participated in exercises with a high repetition, low intensity scheme, while the plyometric/ power group participated in explosive exercises with a low repetition, high intensity scheme. To ensure equal training time, proper technique, and safety, researchers coached both groups during each training session. An unpaired t-test was utilized to determine if significant differences existed in cross country race finish time based on group assignment. RESULTS: The unpaired t-test revealed there was no significant difference (T = 1.68 , p > .05 ) in race time to completion for the stratified predictors to the muscular endurance group (T= 1.2 +/-.308 vs 27.32 +/-.540, respectively). CONCLUSIONS: The plyometric/ power group was not significantly faster when compared to the muscular endurance group. However, on average the plyometric group was 20 seconds faster when compared to the muscular endurance group. Future interventions may need to be longer than nine weeks in order to elicit significant positive adaptations in endurance running as a result of the supplementation of plyometric training.

Relationship Between Hemoglobin Saturation and Performance in Collegiate Cross Country Runners

Mikaela D. Lengwin, Nathan E. Goslin-Klemme, Elaina S. Biechler. Loras College, Dubuque, IA. (Sponsor: Vincent Paolone, FACS) Email: mikela.lengwin@loras.edu

PURPOSE: Hemoglobin is essential for proper transportation of oxygen in the blood to muscles within the body. This is of especial importance and focus within endurance athletics as effects on performance can vary based on the level of hemoglobin saturation. Previous research mainly focused on the significance of higher hemoglobin levels improving performance, while the significance of negative effects from low levels is still of equal importance. The purpose of this study was to investigate the relationship between hemoglobin saturation and running performance in collegiate division III cross country runners. METHODS: Hemoglobin saturation level was measured by capillary puncture and analyzed with a hemoglobin meter and test cartridges of 34 collegiate cross country runners (11 females, 23 males). Endurance performance was measured by two-mile time trial in minutes. A linear regression analysis was utilized to show the relationship between levels of hemoglobin saturation and time trial performance. Further, a one sample t-test was utilized to compare the averages of males classified with low levels of hemoglobin saturation and those in the normative range and those in the strongly low range.

RESULTS: There was no significant correlation between hemoglobin saturation and two-mile time trial performance for both males (R= .268; p > .05) and females (R= .282; p > .05). Subjects were also classified as low hemoglobin if values were < 12 mg/dl for females, and < 13 mg/dl for males. Male subjects classified within the standard levels (mean=10.4870 ± .817599 min) had significantly faster (t(15)=-3.126; p=0.007) two-mile times in comparison to subjects who were below this standard (mean=11.12586 min) with a mean difference of .638860 min. CONCLUSIONS: Hemoglobin saturation levels are important in cross country athletes. The relationship, however, is more important and significant when saturation levels go below the normal range compared to those within the range. Runners categorized as low in hemoglobin saturation see significant decreases in performance for two-mile time trials compared to those in the normal range.

The functional movement screen (FMS) is a battery of seven fundamental movement patterns that include the Deep squat (DS), hurdle step (HS), in line lunge (ILL), shoulder mobility (SM), active straight leg raise (ASLR), trunk stability push up (TSPU), and rotary stability (RS) (Cook et al., 2006). FMS tests are scored on a 0 to 3 scale, for a composite score of up to 21 points. PURPOSE: To describe the FMS scores of DIII cross-country and track and field athletes and compare them to normative values for experienced distance runners, as reported by Agresta (2014). METHODS: Ten NCAA Division III cross-country and track and field athletes (6 sprinters and 4 distance runners) were screened by one level 1 FMS certified tester. RESULTS: Mean DS was 1.9 (SD=0.57), mean HS was 1.7 (SD=0.48), mean ILL was 2.1 (SD=0.57), mean SM was 2.4 (SD=1.07), mean ASLR was 2.4 (SD=0.84), mean TSPU was 2.6 (SD=0.7), and mean RS was 1.9 (SD=0.32). The mean composite score was 15 (SD= 1.76). When compared to the normative values established by Agresta (2014), DIII runners scored higher on SM by 0.3%, ASLR by 12.5%, TSPU by 24.2%, RS by 21.1%, and total FMS score by 12.7%. Results were the same for DS and ILL and lower on the HS by 5.9%. DISCUSSION: Despite having higher mean scores than the norm, three individuals had composite scores below the suggested threshold of 14 (Kiesel, 2007, Chorba, 2010, Hotta, 2015) and eight participants had scores of one and zero in individual tests, suggesting that the composite score alone is not sensitive enough to capture these asymmetries/imbalance. Overall scores were higher than the normative values by Agresta (2014), but similar to mean composite values of 16.4 for young adult runners reported by Loudon et al. (2014). CONCLUSIONS: The mean composite score for DIII cross-country and track and field runners was 12.7% higher than the scores for experienced runners in Agresta (2014). Future studies should continue to establish normative values for NCAA DIII cross-country and track and field runners.
HIIT is a common training method incorporated for all fitness levels and been shown to improve athlete performance. However, these results were shown in sedentary and recreationally active populations and little research has been done with the Division I collegiate athlete population. PURPOSE: This study questioned whether HIIT could increase performance within this level of athletes, specifically middle distance runners (800/1500 m).

METHODS: A total of six Division I Collegiate level (800/1500 m) runners completed the study (three males, three female). The participant completed four weeks of HIIT, consisting on two HIIT workouts per week. The HIIT consisted of four 20-s Wingate tests with 4-min recovery between each. Both pre- and post-performance tests were completed, consisting of a run to volitional exhaustion, RPE, HR, which were collected on a treadmill. Stride length and stride frequency, were also measure during a 1500 m time trial on the track.

RESULTS: Significant differences were not found for performance pre- and post-training intervention, with respect to time to completion of the 1500 m time trial (pre-intervention: 5.0 ± 0.7 min; post-intervention: 4.8 ± 0.5 min; p = 0.23), and time to volitional exhaustion (pre-intervention: 20.1 ± 1.2 min; post-intervention: 19.7 ± 1.3 min; p = 0.14). RPE (p = 0.64), HR (p = 0.09), stride length (p = 0.09), and stride frequency (p = 0.78), showed no significant changes pre- and post-intervention.

CONCLUSIONS: HIIT did not impact 800/1500 m middle distance runner’s performance, suggesting it can maintain performance, providing alternative training methods.
CONCLUSIONS: The results indicate that VO₂ has strong correlations with running velocity, force, and power, and that HR has strong correlations with running velocity and power. VO₂ and HR are indicators of exertion in running conditions. Since the runners were in a steady-state condition, these results suggest that an increase in exertion—indicated by cardiovascular and metabolic responses—also requires an increase in kinetic measures. Because the NMT requires users to self-propel, the results suggest mechanics of running on a curved-NMT may influence physiological responses.

803 Board #37  May 29 2:00 PM - 3:30 PM
Evaluation of Running Performance in Recreationally Active Individuals at Submaximal Speeds: Shod vs. Barefoot Conditions
Matthew Miltenberger, Nicholas Roughan, Gavin Moir, Shala Davis, FACSM. East Stroudsburg University, East Stroudsburg, PA. ( Sponsor: Dr. Shala Davis, FACSM)
Email: mmiltenber@esu.edu

The concept of barefoot running (BFR) is to purposely change foot strike patterns to promote metabolic efficiency, however exposing normally shod runners to BFR may have detrimental effects on overall running performance. PURPOSE: The purpose of this study was to evaluate the differences in physiological variables in running performance when individuals were acutely exposed to BFR. METHODS: This study consisted of 9 college aged males, (22.67±1.0 y/o, 78.36±10.5 kg, 178.36±4.5 cm, and 14.60±3.27% body fat), who engaged in aerobic exercise at least twice a week with no prior BFR experience. Subjects were blindly asked during each condition to self-select running speeds that they could maintain for 10 min. Variables collected included speed, VO₂, HR, RER, VE, LRPE, SRPE, and foot pain. RESULTS: Data analysis revealed no statistically significant differences in physiological variables between conditions. However significant differences were seen between selected running speed and foot pain. Results indicated that subjects decreased their running speed by .98mph (p=0.004) and experienced greater amount of foot pain (+2.11, p=0.02) when in the BFR condition. CONCLUSIONS: The findings of this study suggest that acute exposure to BFR may decrease overall running speed during a workout and subjects may also experience a greater amount of foot pain compared to shod running. Caution should be used when introducing the concept of BFR to athletes or recreational runners.

804 Board #38  May 29 2:00 PM - 3:30 PM
Relationship Between Training Load and Intensity and Next Day Resting Heart Rate in Running.
Julio Morales, Keith Fallon. Lamar University, Beaumont, TX. Email: jmorales@lamar.edu

No relevant relationships reported.

Resting heart rate (RHR) is a commonly used indicator used to monitor adaptations in aerobic conditioning. In long distance training, measures such as heart rate and distance covered are used as indicators of intensity and workload to affect changes in aerobic conditioning. However, there appears to be a need for more information on possible interactions between measures of intensity and workload and their effect on RHR as an indicator of adaptation. PURPOSE: To examine the relationship between training load (LOAD) and training intensity (INT) on next day RHR. METHODS: Seven middle-long distance runners, members of a Division I varsity team participated in the study during a cross country season in the fall. Variables were morning RHR, INT measured using Borg’s Ratings of Perceived Exertion 16-point scale and LOAD expressed as miles run. Variables were recorded by each participant on each training day and were aggregated for a total of 224 data points among the seven participants. Correlation and Multiple Regression analyses were used to examine the relationship between the variables. RESULTS: Significant correlations were found between LOAD and INT (.392) and between INT and next day RHR (.200). Multiple Regression found that HR has strong correlations with running velocity, force, and power, and that HR has strong correlations with running velocity and power. VO₂ and HR are indicators of exertion in running conditions. Since the runners were in a steady-state condition, these results suggest that an increase in exertion—indicated by cardiovascular and metabolic responses—also requires an increase in kinetic measures. Because the NMT requires users to self-propel, the results suggest mechanics of running on a curved-NMT may influence physiological responses.

Abstracts were prepared by the authors and printed as submitted.
Soccer is a sport characterized by intermittent efforts and by a variation of intensity between the first and the second half-times of the match. The sprints, actions performed at high speeds and which demand a high energy expenditure, are among the several parameters which can be used to evaluate the performance capacity of the players along a match.

PURPOSE: To compare the sprints performed by professional players of different playing positions along Soccer matches.

METHODS: Twenty-two professional Soccer players (weight = 76.4 ± 5.2 kg; height = 179.9 ± 6.2 cm; BMI = 23.7 ± 1.7 kg/m²) participated in the study. The Polar Team Pro® GPS system was used to measure distances and speed of the subjects during the games. The number of sprints at speeds above 25 km/h were registered in the first and in the second halves of the matches.

RESULTS: The average number of sprints (> 25 km/h) was 13.3 ± 6.4 sprints per game. There was a difference amongst playing positions (Expected P = 0.039 and Calculated P = 0.042) and there was a difference between the second half and the first half–time match time. The number of sprints of mid-fielders and forwards, but not of full-backs and half-backs, was reduced in the second half-time.

CONCLUSIONS: There was a difference in the number of sprints between players of different positions and also a difference between the first and the second half–times. This information may be used by coaches in conducting training sessions and in matches.

Average number of sprints in the 10 matches

<table>
<thead>
<tr>
<th>Player Position</th>
<th>1st half</th>
<th>2nd half</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-backs</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Half-backs</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Midfielders</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Forwards</td>
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<td>7</td>
<td>15</td>
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Physical training programs are designed to improve sport performance. To augment these programs, specific injury prevention protocols can be included. However, structured physical training programs alone could reduce injury risk.

Purpose: To determine the effects of a structured offseason training program on physical performance and modifiable LE injury risk factors.

Methods: Twenty-three male collegiate soccer players were enrolled (20 ± 1.54 yrs.). Body fat percentage (BF%), aerobic capacity (VO2max), vertical jump, anaerobic power (Wingate), bench press (IROM), Y-balance (YB) bilaterally and weight bearing lunge ankle dorsiflexion (WBDF) bilaterally were measured pre and post a 12-week physical training program.

Results: Performance measures of BF%, VO2max, vertical jump, and Wingate were not significantly different after the 12-week program. Bench press IROM (177.22 ± 31.44 lb) was the only statistically significant performance measure (p=0.002).

Conclusion: The regular soccer training did in a VR room. Results: For VR-G, Ka, Ks, and Kfa increased from 53.6±9.5, 26.1±11.8, and 18.6±14.9 at M0 to 62.9±10.0 (t=6.138, p<0.001), 38.0±13.2 (t=2.596, p=0.05), and 31.9±16.0 unit (t=2.442, p=0.05), respectively. For OT-G, Ka, Ks, and Kfa were not changed from 58.8±8.9, 35.9±15.5, and 19.6±13.6 at M0 to 63.1±5.7, 29.1±10.0, 22.2±12.8 unit, respectively. No differences were found in 3 kicking variables at M0 and M6 between two groups. Conclusion: The regular soccer training and the extra kicking training improved the kicking speed and accuracy in VR-G, while OT-G maintained their performance. VR soccer kicking training program could be a potential substitutional and additional training model for young soccer players. (This research project was supported by the Sports Promotion Fund of Seoul Olympic Sports Promotion Foundation from Ministry of Culture, Sports and Tourism, project # sf2016122016)
published data on Division II female soccer athletes (Field et al., 2018). Freshman demonstrated lower BF% than returners initially but returners BF% trended downward at the latter part of the season. Future research should continue to examine physiological profile changes over time while expanding sport performance testing metrics to obtain a more comprehensive snapshot of the Division II female soccer athlete.


809 Board #43 May 29 2:00 PM - 3:30 PM
Use Of Muscle Saturation Oxygen As A New Marker Of Fatigue In Female Soccer Players
Aldo A. Vasquez-Bonilla1, Ismael Martinez-Guardado2, Jeffrey M. Mjaanes M. Mjaanes, FACSM3, Samantha Guerrero-Flores2, Rafael Timón2, Guillermo Olcia3.
1National Pedagogical University Francisco Morazán, San Pedro Sula, Honduras. 2University of Extremadura, Cáceres, Spain. 3Northwestern University, Evanston, IL. (Sponsors: Jeffrey M. Mjaanes, FACSM)
Email: alvasquez@alumnos.unex.es
(No relevant relationships reported)

According to UEFA, a paucity of relevant studies has led to a significant increased interest in women’s soccer research. Additionally, early detection of muscle fatigue could have profound impact on injury prevention and recovery in many sports including soccer. Measurement of muscle oxygen saturation (SmO2%) with non-invasive near infrared spectroscopy (NIRS) technology has been investigated as a possible indicator of fatigue, however no clear protocol exists regarding interpretation of NIRS data or its application for training assessment or fatigue detection.

PURPOSE: To evaluate SmO2% kinetics and relate it to markers of fatigue induced by an official match.

METHODS: 12 female soccer players (age 19 ± 3 years, weight 59.1 ± 5.7 kg, height 1.61 ± 0.05 m, Fat 18.5 ± 3.5%). They were evaluated pre-match (PRE) and 24 hours after an official match (POST). Blood plasma parameters were measured including Blood Urea Nitrogen (BUN), Glutamate-Pyruvate Transaminase (GOT) Lactate Dehydrogenase (LDH), Creatine phosphokinase (CPK), and total hemoglobin (THb). Additional outcomes were assessed including rate of perceived exertion (CR-10 Borg scale), Visual Analog Scale (VAS=1-10), and “Repeated Ability Sprint Test” (RAST) using a portable “Muscle Oxygen Monitor” (MOXY) placed in the gastrocnemius muscle of the dominant leg to measure SmO2%.

Deoxygenation rate (De-Oxy) and Reoxygenation Rate (Re-Oxy) were calculated. For statistical analysis, T-test, Pearson correlation and mechanical inferential statistics were applied to measure the magnitudes of change.

RESULTS: Average SmO2% during test RAST increased after market (23 ± 8 vs. 29 ± 8 p <0.05; %N = 19.1%); as well minimum SmO2% values (12 ± 8 vs. 21 ± 8 p <0.05) and maximum values (31 ± 8 vs. 36 ± 8 p <0.05). Other fatigue markers increased too after market, LDH (282 ± 45 vs. 341 ± 79 IU/L p<0.05) and VSA pain (3.2 ± 1.7 vs. 5.1 ± 1.7 p <0.01). It was also found that a higher Re-Oxy correlated with increases in LDH (r = -0.88 p <0.01), VSA pain (r = 0.61 p <0.05) and BUN (r = 0.84 p <0.01). Taken together, the decrease in SmO2% was considered as the best performance in the RAST test (r = -0.79 p <0.01).

CONCLUSIONS: MOXY monitor can be used as a novel, non-invasive method to identify post-match fatigue in female soccer players through measurement of SmO2% kinetics and the rate of reoxygenation.

810 Board #44 May 29 2:00 PM - 3:30 PM
Effects of Video Feedback on Kicking Performance and Temporal Patterns in U-10 Soccer Players
Bernat Buscà, Marc Quintana, Joan Aguilera-Castells, Mònica Solana-Tramunt, Jose Morales, Ainhoa Nieto. FPCEE Blanquerna. Ramon Llull University, Barcelona, Spain.
Email: bernath@blanquerna.uel.es
(No relevant relationships reported)

Kicking is a crucial motor skill in soccer. Accuracy and velocity are the two primary factors responsible for kicking performance. Coaches and practitioners design programs with practice sessions in which kicking actions are involved.PURPOSE: To examine the effects on kicking performance of different types of extrinsic video feedback such as slow-motion video feedback (SMVF) or normal video feedback (NVF), with additional velocity feedback, in comparison with no feedback (NF) was applied to measure the magnitudes of change.

RESULTS: Thirty male children soccer players (mean age: 8.9 ± 0.8 years) asked to perform series of dynamic soccer kicks. Their kicking performance was measured in terms of accuracy and velocity, and the motor skill pattern variations were assessed in terms of temporal variables of approach time (ATIME), the last step time (LASTIME) and the foot descent time (DTIME). Players performed 4 blocks of 5 kicks with a 30-second rest period and a retention block of 10 kicks 2 days later.

RESULTS: Results showed significant differences both the SMVF and NF groups in terms of performance (F3,27 = 3.97, p <0.05; ηp 2 = 0.227). SMVF group significantly improved performance during the practice phase but not in retention. Significant differences of the coefficient of variation (CV) were found in the main temporal variables of the action (F1,18 = 6.96, p = 0.00; ηp 2 = 0.44). Univariate analysis showed a significant effect of group on LSTIME (F1,18 = 4.07, p = 0.015; ηp 2 = 0.06) and DTIME (F1,18 = 16.99, p = 0.00; ηp 2 = 0.16) but not on ATIME (F1,18 = 1.28, p = 0.30; ηp 2 = 0.16).

CONCLUSIONS: The type of multimodal feedback (slow motion video and velocity) significantly affects the acute kicking performance in children and its temporal pattern. The present study suggests possible benefits of using slow-motion video feedback in the learning sessions of children soccer players. The accessibility of such technology using low-cost cameras or mobile phones makes this finding especially relevant. Coaches and practitioners can induce significant changes in kicking performances (and other motor skills) and temporal patterns. This study is inconclusive about the retention of these changes and has not studied the transfer in learning.

811 Board #45 May 29 2:00 PM - 3:30 PM
Lower and Upper Body Muscle Characteristics among Collegiate Baseball and Soccer Players
Savannah Ange, Pragya Sharma Ghimire, Peter Gaither, Sara Rogers, Leland Nielsen, Martin Carmichael, Amir Bhochhibhoya. Lander University, Greenwood, SC.
Email: psghimire@lander.edu
(No relevant relationships reported)

Increased muscular strength in athletes has a profound effect in the development of sports skills including jumping, throwing, sprinting, and change of direction abilities. Sports, such as soccer and baseball, differ largely in specific characteristics needed for success. To date, few studies have reported differences in sports specific skills between these two sports to measure and quantify the neuromechanical capacity.

PURPOSE: To compare both lower and upper body strength among collegiate baseball (BB) and soccer (SC) players.

METHODS: In this non-randomized cross-sectional study, 19 baseball and 19 soccer players, age ranges from 18-25 years completed the protocols. Lower body strength and power were assessed by a two-leg press maximal strength test (1RM) and vertical jump test (Just Jump Mat, Tendo Sports Machine), respectively. Upper body strength was assessed by a handgrip (HG) test using handgrip dynamometry (Takei, Japan).

RESULTS: Independent sample t-test showed BB players (88.05 ± 7.1 kg) were significantly heavier than SC players (72.1 ± 7.2 kg) (p=0.05). However, weight-adjusted upper body strength and leg power were not significantly different between the two groups. BB players had significantly higher jump height (HJ), time in air, and 1RM leg strength compared to SC players (p<0.05). CONCLUSIONS: BB players showed significantly higher lower muscle strength compared to SC players, however no differences were observed for peak power. These results provide a quantitative measure of the performance difference between these two sports, reinforcing the need for further research along with large sample size to assess the possible differences in training effectiveness and inherent characteristics between BB and SC players.

Table 1. Athlete Performance Variables (Adjusted Mean ± SE)

<table>
<thead>
<tr>
<th>Variables</th>
<th>BB Players (n=19)</th>
<th>SC Players (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in air(s)*</td>
<td>0.72 ± 0.01</td>
<td>0.64 ± 0.01</td>
</tr>
<tr>
<td>Jump Height (inches)*</td>
<td>25.99 ± 0.79</td>
<td>20.10 ± 0.79</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>1.42 ± 0.02</td>
<td>1.39 ± 0.02</td>
</tr>
<tr>
<td>Power (Watts)</td>
<td>1125.99 ± 25.62</td>
<td>1075.14 ± 25.62</td>
</tr>
<tr>
<td>Relative Power (Watts/kg)</td>
<td>13.99 ± 0.31</td>
<td>13.31 ± 0.31</td>
</tr>
<tr>
<td>I RM (Kg)</td>
<td>355.54 ± 14.88</td>
<td>300.43 ± 14.88</td>
</tr>
<tr>
<td>Rt HG (Kg)</td>
<td>44.91 ± 2.36</td>
<td>41.15 ± 2.36</td>
</tr>
<tr>
<td>Lt HG (Kg)</td>
<td>42.51 ± 2.20</td>
<td>42.20 ± 2.20</td>
</tr>
</tbody>
</table>

*Significant p<0.05; **Significant p<0.01; Rt, Right; Lt, Left

812 Board #46 May 29 2:00 PM - 3:30 PM
Performance Implications of Arousal State in Female Collegiate Soccer Players
Adam Lowe1, Neil M. Johannsen1, Brian A. Irving, FACSM1, Jack Marucci2, Shelly Mullenix3, Arnold Nelson, FACSM3, Guillaume Spielmann4, Erik Lind5. 1Louisiana State University, Baton Rouge, LA. 2State University of New York-Tork-Cortland, Cortland, NY. (Sponsor: Brian A. Irving, FACSM)
(No relevant relationships reported)

Arousal, defined as a blend of physiological activation and psychological awareness, prior to collegiate soccer matches may have important implications on performance. How various arousal states are related to measures of sport-specific performance and

Abstracts were prepared by the authors and printed as submitted.
the hormone cortisol in and around matches in female collegiate soccer players is largely unknown. **PURPOSE:** To investigate the effect of arousal state on passing performance and salivary cortisol in female collegiate soccer players. **METHODS:** Eighteen NCAA Division I female soccer athletes (20.2±1.1 y) participated in this study during the spring season. One hour before five competitive matches, the Activation-Deactivation Adjective Checklist (AD-ACL) was administered to assess tension arousal (TA) and energy arousal (EA) using tiredness (Ti), energetic (E), tension (Te), and calmness (C) subscale scores. Salivary samples were collected via synthetic swab placed under the tongue 1 hour before, and 30 minutes after each match. Enzyme-linked immunoassay test (ELISA) was used to analyze salivary samples for cortisol. Passing performance was defined as percentage of total attempted passes received by a teammate. **RESULTS:** Pre-match subscale scores (out of 4, [mean, ±SD]) for the five competitions were: Ti: 1.9±0.8, 1.7±0.9, 1.6±0.6, 1.6±0.8, 1.4±1.5, respectively; E: 2.9±0.6, 3.1±0.7, 3.2±0.4, 3.0±0.6, 3.0±0.6, respectively; Te: 1.7±0.5, 2.1±0.5, 1.9±0.4, 1.7±0.5, 1.7±0.5, respectively; C: 2.1±0.5, 2.0±0.5, 2.0±0.4, 2.0±0.5, 1.8±0.6, respectively. Passing performance for the five competitions was 73.6±14.1%, 81.6±9.6%, 79.1±8.6%, 74.6±8.8%, 76.6±12.1%, respectively. **CONCLUSIONS:** Collapsed across matches, Ti and C scores demonstrated negative associations approaching significance with passing performance (both p = 0.06, r = -0.28). E score was positively associated with passing performance (p = 0.04, r = 0.30). Collapsed across matches, post-match cortisol was significantly higher than baseline-estimated values (p = 0.03). Percent change in cortisol pre- to post-match in the first match was associated with E score (p = 0.04, r = 0.72). **CONCLUSIONS:** Higher energy-arousal states were associated with improvements in passing performance. Cortisol response may be mediated by energy arousal. Future investigations should examine mediating factors of pre-match arousal states.
Czech young male soccer players (n=29, age 19±5.04 yrs) volunteered for this study. The KT consisted of the subjects running at maximum speed between cones positioned in a “K” pattern on a field with non-slip running surface. The subjects started and ended running at the intersection of the “K” pattern with two conditions: touching a photocell with the foot (KT_foot) or a contact switch placed on the top of each cone with the hand (KT_hand). The 505 COD test allowed subjects a “flying start” with a 10 m run-up before crossing the timing gates, a five-meter sprint, turn 180° either right or left at full-speed. Linear sprinting was also evaluated with subjects sprinting 5 (S5) and 10 m (S10) from a static position. The subjects performed two trials of each test, and the time of test execution was measured in seconds. Pearson correlation coefficient test was used to correlate two dependent variables, and independent t-test was used to test differences between KT_foot and KT_hand. P<0.05. RESULTS: The correlation tests between dependent variables showed weak to moderate correlations. Specifically, 0.56 p=0.05; 0.58 p<0.05; 0.55 p<0.05. There was a significant difference between the two conditions. CONCLUSION: Significant differences were found between KT_foot and KT_hand. The KT_hand protocol was faster and a more natural motor pattern than KT_foot. The speed variables exhibited significant heterogeneity. Speed and agility are not dependent; therefore, each component of speed must be considered independently when designing training programs for young soccer athletes.

Tensiomyography (TMG) has been shown to be a non-invasive technique to assess the contractile properties of skeletal muscle which may have application in assessing the effectiveness of warm-up procedures prior to training and athletic competition. Purpose: The purpose of this study was to evaluate the effects of three different warm-up protocols on TMG variables and sprint performance in collegiate male soccer athletes. Methods: Fifteen collegiate male soccer athletes (age = 20.1±1.3 y, height = 176.6±6.9 cm, body mass = 78.2±6.7 kg, body fat percentage = 12.9±3.6%) participated in the study. The three testing days consisted of: pre- and post-TMG assessments; warm-up protocol (Dynamic (DYN); plyometrics (PLY); and passing patterns (SOC)); and two 20-m sprints. Pre- and post-TMG assessments were completed for the biceps femoris (BF) and rectus femoris (RF) of both legs for all participants. The DYN warm-up protocol consisted of a six-minute jog followed by nine minutes of dynamic stretching. The PLY warm-up protocol consisted of a six-minute jog followed by nine minutes of plyometric exercises. The PAS consisted of a five-minute jog followed by a passing pattern drill typically used in advanced soccer athletes termed the “Rondo.” Repeated measures ANOVA’s (condition x leg x time) were used to evaluate displacement (Dm) and contraction time (Tc) in the BF and RF. A repeated measures ANOVA was used to evaluate the fastest of the two 20-m sprint times between conditions. Results: Results showed no significant interactions for Dm (BF: 2.831±3.5088mm; RF: 6.793±2.8533mm) or Tc (BF: 20.04±24.000ms; RF: 26.87±29.38ms), however, a main effect for time (p=0.005) was found for BF Tc with a significant decrease times pre (22.24±10.99ms) to post-warmup (20.47±5.01ms). Significant differences (p=0.05) between conditions for 20-m sprint performance were also noted (DYN: 2.76±0.27 s; PLY: 2.64±0.13 s; SOC: 2.62±0.15 s). Conclusion: In collegiate male athletes, the warm-up protocols did not appear to have differential effects on specific TMG variables, while differences in sprint performance were seen. The warm-up procedures decreased Tc as evaluated by TMG; however, further research is needed to examine the influence of this change on performance.

817 Board #51 May 29 2:00 PM - 3:30 PM Tensiomyographic And Sprint Assessments Following Different Warmup Protocols In Collegiate Male Soccer Athletes

Chad H. Herring, Michael J. Redd, Tristan M. Starling-Smith, Jeffrey R. Stout, David H. Fukuda. University of Central Florida, Orlando, FL. (No relevant relationships reported)

In 2006, new category of motor disorders was established: musculoskeletal ambulation disability symptom complex (MADS). MADS is defined as an increased rise of falls and isolation due to an age-related decline in balance and walking ability. PURPOSE: To examine physical, mental and dietary functions of older community-dwellers using balance assessment, physical, and cognitive function tools, and eating habit questionnaire and understand the MADS in older women. CONCLUSIONS: This study provides evidence on the use of eccentric protocols in amateur soccer players, showing significant changes in the balance and explosive strength, after 4 weeks of training, giving sustenance to introduce eccentric exercises in warm-up programs and injury prevention.

B-56 Exercise is Medicine®/Poster - EIM - The Elderly and Their Health Problems

Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

819 Board #53 May 29 3:30 PM - 5:00 PM Physical, Cognitive and Dietary Characteristics of Older Women with Declines in Balance and Walking Ability

Yasu KIMURA1, Mamoru Hisatomi, Kazuko Ohki2, Junko Kawai, Toshinobu Ikekami2, Mieko Shimada3, Nobuko kay4, YongHong Kong5, FACSM. 1Sugiyama Jogakuenn Univ., Nagoya, Japan. 2Sugiyama Jogakuenn Univ., Nagoya, Japan. 3Chiba Prefectural Univ. of Health Sciences, Chiba, Japan. 4The University of Arizona, Tucson, AZ 85721-0038, AZ. (Sponsor: Nobuko Kay Hongu, FACSM) Email: yasuok1944@yahoo.co.jp (No relevant relationships reported)
In Taiwan, frailty patient can receive post-acute rehabilitative care in hospital after they leave acute care hospital. The post-acute care program is proposed by the Ministry of Health and Welfare in Taiwan for functional recovery of the frailty patient. The post-acute care program including strengthening, flexibility, cardiopulmonary, and balance exercise. PURPOSE: To evaluate the functional recovery of the frailty patient in Taiwan with a two-weeks of regular exercise training. METHODS: Twelve frailty elderly (Age: 83 ± 5.5 years of age) just leave acute medical care were included in this study. The patient must have one of the underlying diseases include dementia, chronic kidney disease, Parkinsonism, and Chronic Obstructive Pulmonary Disease. The therapeutic interventions were regular exercise training including strengthening, flexibility, cardiopulmonary, and balance exercise for two weeks. Before and after intervention, Functional outcome were evaluated. Data collection from multiple variables was conducted using questionnaire and examination including Barthel index, IADL, Clinical Frailty scale, Confusion Assessment Method, and Mini Nutritional Assessment-Short Form. RESULTS: The result shows significant improvement in Barthel index, Clinical Frailty scale, and Mini Nutritional Assessment-Short Form (p < .05). Among other tests, there is no significant difference. CONCLUSION: Two-week exercise training program can improve functional outcome of frailty patient during post-acute care.

Table 1 Sample sizes in age and exercise behaviour groups combined and in the “Young” group (Table 2).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Blood Glucose (mmol/L)</th>
<th>Plasma Insulin (mu/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combined (Sedentary)</td>
<td>Combined (Active)</td>
</tr>
<tr>
<td></td>
<td>6.0 (0.2)**</td>
<td>5.3 (0.1)</td>
</tr>
<tr>
<td></td>
<td>48.8 (4.6)**</td>
<td>26.8 (2.8)</td>
</tr>
<tr>
<td>Sedentary</td>
<td>5.7 (0.3)*</td>
<td>4.7 (0.2)</td>
</tr>
<tr>
<td></td>
<td>45.6 (5.7)*</td>
<td>25.5 (4.1)</td>
</tr>
<tr>
<td>Active</td>
<td>6.0 (0.4)</td>
<td>38.1 (8.8)</td>
</tr>
<tr>
<td></td>
<td>5.6 (0.2)</td>
<td>22.6 (4.0)</td>
</tr>
<tr>
<td></td>
<td>7.5 (1.0)</td>
<td>60.9 (11.6)</td>
</tr>
<tr>
<td>Old</td>
<td>5.9 (0.4)</td>
<td>43.2 (8.0)</td>
</tr>
</tbody>
</table>

Note: * = p < 0.05, ** = p < 0.01, and *** = p < 0.001 between Active and Sedentary groups.
the benefit of the incentive is lost when the intervention ends. Thus, we focused on social network incentives that leveraging the power of peer pressure to regulate behavior.

**METHODS:** We conducted a three month, randomized controlled study using pedometers. The effects of incentives on physical activity were measured six months post-intervention. Participants were 39 elderly women over 65 years of age, residing in Kumamoto, Japan. The financial incentive (FI) group received a payment ranging from US$40 to US$60 per month depending on the number of steps taken during the intervention. For the other group, we provided a social network incentive (SNI) in addition to the financial incentive. The SNI+FI group walked in three people to use the power of peer pressure.

**RESULTS:** A two-way ANOVA revealed that in terms of physical activity, there was a statistically significant interaction between group and time (p<0.01). The FI group showed no statistically significant improvement in physical activity during the observation period.

**CONCLUSIONS:** Our results suggest that combining financial incentives and social network incentives are more effective than financial incentives alone. Especially, the effect can continue in post-intervention.

### Board #58 May 29 3:30 PM - 5:00 PM
#### Does High-Cadence Cycling Improve Emotional Recognition in Individuals With Parkinson’s Disease?

**Bryan Dowdell,1 Sara Harper,1 Alena Varner,1 Jin Hyun Kim,2 Brandon Pollock,3 Angela Ridgel, FACSMD.1 Kent State University, Kent, OH. The University of Alabama at Birmingham, Birmingham, AL. Wadsworth-Veterans Health Care Administration, North Canton, OH. (Sponsor: Angela Ridgel, Ph.D, FACSMD)**

(No relevant relationships reported)

Parkinson’s disease (PD) is a progressive neurodegenerative disease that can lead to cognitive dysfunction including deficits in emotional recognition, which is the ability to identify different facial expressions. This deficit has been shown to lead to difficulties in social interaction and communication. High cadence cycling is a unique rehabilitation modality that has been shown to improve motor function in PD, but it is not known how this modality alters cognition.

**PURPOSE:** To examine if three bouts of high-cadence cycling improved emotional recognition in individuals with PD.

**METHODS:** Individuals with PD (N=20) completed three sessions of high cadence cycling (48 hours apart), on a custom motorized stationary cycle, consisting of a 5-minute warm-up at 50 revolutions per minute (rpm), 30 minutes of high cadence cycling between 75-85 rpm, and a 5-minute cool down. Emotional recognition was assessed using a computerized cognitive assessment battery at baseline and after the three cycling sessions. Individuals with PD in the control group (N=15) did not cycle and just underwent baseline and post testing. The percentage increase in accuracy of accurately identified emotions and the average reaction time to correctly select an emotion (emotion bias) was used for the analysis of the overall emotion domain. Z-scores were used for the analysis. Independent samples t-tests were run for the change scores between the intervention and control group.

**RESULTS:** Both groups displayed negative z-scores representing an emotional recognition deficit. There was no significant difference between the cycling and control group in the overall emotion domain (p=0.76). Cycling resulted in a z-score improvement in the emotion domain by 0.22 while the control group improved 0.14. Cycling did significantly improve “disgust” emotion accuracy compared to the control group (p<0.05).

**CONCLUSIONS:** Three bouts of high-cadence cycling specifically improved “disgust” emotional recognition compared to the control. However, there was no significant difference between groups in the overall emotion domain. While high-cadence cycling might be a valuable rehabilitation modality for improving motor function in individuals with PD, the efficacy for improving emotional recognition and potentially social interaction is unclear.

### Board #60 May 29 3:30 PM - 5:00 PM
#### Effect Of Acute Specific Exercise And WuQinXi On Hand Function Of Patients With Parkinson’s Disease

**Tian Wang, Guiping Xiao, Kunchen Jie, Zhenlan Li, Zhen Wang, Jie Zhuang. Shanghai University of Sport, Shanghai, China. Email: 724793513@qq.com**

(No relevant relationships reported)

**PURPOSE:** The aim of the study was to study the improvement of hand movement speed and flexibility in patients with Parkinson’s Disease (PD) by an acute exercise of specific exercise and WuQinXi.

**METHODS:** This study selected 45 patients with PD (22 males and 23 females) from the patients training camp of Shanghai University of Sport. They were divided into two groups: 22 patients(11 males and 11 females),age67.17±15.8 into Wu Qin Xi intervention group and 23 patients in the specific exercise intervention group(12 males, 11 females),age 65.52±15.8. According to the patient’s Hoehn-Yahr stage, Wu Qin Xi and specific exercise were divided into three groups: 1-1.5 group, 2-2.5 group, and ≥3 group. Two groups of subjects were given 60 minutes’ specific exercise and Wu Qin Xi intervention training. The specific exercise is consisted with several different health-care Qigong, which specifically target at the patients with Parkinson’s Disease. The Purdue pegboard test, which has good predictive and concurrent validity. The test data were analyzed by SPSS 24.0. The paired sample t test was used for the pre- test and post-test in the group; p-value of <0.05 was adopted.

**RESULTS:** After the intervention, the specific exercise group had significantly improved the three scores of Dominant hand, the Both hand and the assembly subtest (P<0.05) especially for the patients whose Hoehn-Yahr stage from 1-1.5 ,these three scores were improved. The patients whose Hoehn-Yahr stage from 2-2.5 only improved in the assembly subtest, and the patients whose Hoehn-Yahr stage ≥3 phase did not significantly increase in either four scores (P>0.05). After the intervention, the Wu Qin Xi group showed significant improvement in the Dominant hand, Nondominant hand and assembly subtest (P<0.05), especially for the patients whose Hoehn-Yahr stage from 1-1.5 ,these three scores were improved. There was no significant increase in the four scores in patients whose Hoehn-Yahr stage from 2-2.5 and ≥3 (P>0.05).

**CONCLUSIONS:** The acute exercise intervention of specific exercise and Wu Qin Xi can improve the speed and flexibility of hand movement in Parkinson’s patients. The effect of specific exercise is more obvious for patients whose Hoehn-Yahr stage from 1-1.5.

### Board #61 May 29 3:30 PM - 5:00 PM
#### The Role of ‘Exercise Is Medicine’ in Asia: Perspectives for the Older Adult Population

**Chae-Hee Park1, Kiyoji Tanaka, FACSMD;2 JueHoon Seol1,2, Andiara Schwingel1, Wojtek Chodzko-Zajko, FACSMD1,3,4**

1Korea National Sport University, Seoul, Korea, Republic of. 2University of Tsukuba, Tsukuba, Japan. 3University of Illinois at Urbana-Champaign, Urbana-Champaign, IL. (Sponsor: Wojtek Chodzko-Zajko, FACSMD)

(No relevant relationships reported)

Asia is home to the largest older adult population in the world, and the proportion of people aged 65 and over is projected to rapidly grow in all Asian countries. Many chronic diseases and conditions are prevalent in older adults, and regular exercise and physical activity can help prevent and manage many of these conditions. A significant component of Asian cultures is the promotion of active lifestyles, where many older adults would have the opportunity to exercise for free or at low cost. However, if seniors have a chronic condition and no previous experience with exercise, it is not always easy to start an exercise routine without specialized information and appropriate instruction. Exercise is Medicine (EIM) was created to help seniors with...
chronic diseases to incorporate exercise into their everyday lives. PURPOSE: Due to the initial development of EIM within Western cultures and traditions, the purpose our work was to examine how best to adapt, implement, and disseminate EIM for the older adults in Asia. METHODS: From April, 2017 to September, 2018 numerous discussions were held between researchers and practitioners from Asian countries who had between 15 to 30 years of experience in the area of aging and physical activity. Additionally, research articles, reports, and web-sites related to EIM were reviewed and analyzed and presented among EIM personnel in Asia. RESULTS: The results have been divided into three sections. The first section provides a historical overview of EIM development in Asia. The second presents an assessment of the potential role of EIM for older adults in Asia. The final section provides a blueprint for the development of an extended concept of EIM as a stimulus for further conversations and discussions among the medical, exercise, and health related communities. CONCLUSION: EIM has the potential to play an important role in the prevention and management of chronic diseases in Asia, and improving quality of life among Asian seniors.

828 Board #62 May 29 3:30 PM - 5:00 PM Effect Of Wu Qi Xn Exercise On The Quality Of Life Of Parkinson’s Patients
Kuncheng Jie, Guiping Xiao, Zhenlan Li, Tian Wang, Jie Zhuang, Zhen Wang. Shanghai University of Sport, Shanghai, China. Email: 724793513@qq.com (No relevant relationships reported)

PURPOSE: To determine the effect of 12-wk Wu Qi Xin exercise intervention on the quality of life of Parkinson’s patients.

METHODS: 23 Parkinson (PD) patients (12 men and 11women; age in 65.65±4.82 yr.) were recruited to participate in a 12 wk Wu Qi Xin, a traditional Chinese exercise, intervention in the Pai Training Camp of Shanghai University of Sport, China. Patients’ clinical status was assessed with Unified’s Disease Rating Scale (UPDRS) parts I-III, and Quality of life’s Disease Questionnaire (PDQ-39). The assessments were conducted before and after the intervention group, which included 120-minute Wu Qi Xin exercises, twice a week for 12-wk. The paired sample t test was used for the pre- and post-test difference. RESULTS: A statistically significant pre- and post-test difference were found after the 12-wk Wu Xin Xintervention: UPDRS score decreased by 23% (p<0.01); UPDRS part I score decreased by 28% (p<0.003); part II decreased by 20% (p<0.004); part III decreased by 24% (p<0.036) and PDQ-39 score decreased by 30% (p<0.001). – CONCLUSIONS: Wu Xin exercise could improve the quality of life of PD patients.

829 Board #63 May 29 3:30 PM - 5:00 PM Significant Improvement In Dxa Scores Is Observed With Osteoporotic Patients When High Force, Short Duration Stimulus Is Created
Jason M. Conviser, FACSM, Jenny Conviser, Joe Koehler, Ascend - Consultation in Health Care, Chicago, IL. *Performance Health Systems, Northbrook, IL. Email: j.conviser@onesmallworldusa.com (No relevant relationships reported)

PURPOSE: Determine if high intensity short duration forces applied to bone results in improved DXA measures. The relationship between bone geometry and mechanical influences on bone suggests that when significant forces are applied to bone, the compression will stimulate an adaptive response, commonly known as Wolff’s Law. However traditional exercise as a treatment for osteoporosis has generally not been able to create the forces needed to stimulate bone growth in a safe and effective manner. METHODS: Twenty-six women aged 63 with diagnosis of osteoporosis participated in a one-year study using a novel exercise device that allows bone to adapt to significant forces. A subset (9 individuals) with age 63 with diagnosis of osteoporosis participated in a one-year study using a novel exercise device that allows bone to adapt to significant forces. RESULTS: Of the 26 subjects, 16 individuals demonstrated a significant reduction p<.05 (improvement in bone) in their mean DEXA score, while 6 had no significant change and 4 individuals showed a further degradation. Forces required to significantly improve bone were 2 - 10x multiples of body weight. Of those who continued for an additional year, 6 demonstrated additional improvements p<.05 while 3 were not significantly different.

CONCLUSIONS: These data suggest that a non-pharmacologic exercise solution is available to individuals diagnosed with osteoporosis. Further study is required with larger sample sizes and more diverse demographics. Additional research is needed to validate this approach as a viable and safe strategy for bone reformation.

830 Board #64 May 29 3:30 PM - 5:00 PM Improving Functional Capacity And Physical Activity Through Education: Four-year Follow-up Of Parqve Study
José M. Rodrigues da Silva,1 Marcia Uchoa de Rezende,2 Tânia Carvalho Spada,1 Lucila da Silva Francisco,2 Helenilson Pereira dos Santos3, Júlia Maria D’Andréa Greve1, Emmanuel Gomes Ciolac1. *Post-graduate Program in Movement Sciences, São Paulo State University - UNESP, Bauru, Brazil. 1Faculty of Medicine, University of São Paulo, Institute of Orthopedics and Traumatology, São Paulo, Brazil. 2Faculty of Medicine, University of São Paulo, Institute of Orthopedics and Traumatology, São Paulo, Brazil. 3Universidade Guarulhos, Guarulhos-SP, Brazil. Email: capoeiragaefa@hotmail.com (No relevant relationships reported)

PURPOSE: The objective of the present study was to analyze what changes the long-term recommendation of regular physical exercises could cause in individuals with knee osteoarthritis (KOA) during 4 years of follow-up.

METHODS: Individuals undergoing care for primary KOA (N = 153; age = 67 ± 2st) in the public health system were randomly assigned to either an educational (GI; n = 83) or control group (GC; n = 70). The volunteers were asked to respond to the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC™) for the assessment of pain, function, and quality of life. The short version of the International Physical Activity Questionnaire (IPAQ) (validated in the Brazilian population) was used to assess the level of daily physical activity in all volunteers. Functional capacity was evaluated at baseline (pre), and at 24 and 48 months follow-up, and included the sit-and-reach test, 6-min walk test (6MWT), timed up and down stairs test (TUDST), Timed Up and go test (TUGT), and sit and lift five times test (FTSST).

RESULTS: The Body mass index (BMI) significantly decreased (3.5%) after 24 and 48 months of follow-up in the GI (P<0.05), while a slight increase was observed in the GC. The GI group presented improved (P<0.001) TUGT (27%) and FTSST (36.5%) performance after 48 months of follow-up. The GC did not change during the same period. In the GI, the total WOMAC score fell by 8.0 points, WOCAM pain decreased by 2.5 points, and WOMAC stiffness decreased by 0.5 point, while being higher in the GC (P<0.001). There was also an increase (P<0.001) in the prevalence of “active” (26.6%) and “very active” (30%), as well as a reduction in sedentary prevalence (12.5%) in the GI during follow-up. No significant improvements were observed in the sit-and-reach, TUDST, and T6C™ tests in either group.

CONCLUSIONS: The results suggest that a program promoting regular physical exercises could be an effective tool to improve physical fitness, functional capacity, quality of life, and level of daily physical activity in individuals with KOA, even over a long period.

831 Board #65 May 29 3:30 PM - 5:00 PM Intergenerational Multicomponent Training Strategy to Improve Cardiovascular Risk Factors and Quality of Life in Elderly
Raquel Silva, Andreia Pizarro, Joanna Carvalho. Faculty of Sport - University of Porto, Porto, Portugal. Email: raquelesterlima@hotmail.com (No relevant relationships reported)

With the aging process, there are several changes in the body composition, a reduction of the lean mass and a progressive increase of the fat mass (FAT%). The percentage of fat mass (FAT%) and arterial stiffness (cPWV) are shown to be risk factors for the development of cardiovascular diseases, but the association between both is not established, especially during aging. Research shows the main benefits of intergenerational programs in community-based population reflects a better perception of quality-of-life and prevention of cardiovascular diseases. Purpose: The objective of this study was to analyse the effects of a 6-month intergenerational exercise program on body composition, arterial stiffness and quality of life of elderly users of day-care centers. Methods:This is a randomized clinical study with a sample of 37 individuals (27 intervention group- IG and 10 control groups- CG) with a mean age of 76.68 ± 9.96 years attending day centers in Porto. Body composition (FAT%) was evaluated by double-energy bone densitometry (DEXA); Arterial stiffness was measured as carotid-femoral pulse wave velocity (cPWV) using the SphygmCor device (AiCor Medical, Australia). In brief, sequential and consecutive carotid and femoral pressure waves

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were registered with parallel electrocardiogram recording and the quality of life was self-reported in the SF-36 questionnaire, with a scale of 0-100, where a higher score indicates a better quality of life. The pre and post intervention differences were analysed using the krushkal wallis test Results: The %FAT had a decrease of 1.83 ± 2.33% with in IG (before = 38.70±7.62% after = 38.67±6.92%) in relation to CG (before = 39.92±6.78; after = 41.48±5%), (p = 0.952). The values of cPWV increased 7.34; 3.79 in IG (before = 39.50±13.42 after = 46.84±7.12) in relation to CG (before = 42.82±12.96; after = 45.35±11.14) (p=0.042). Regarding the self-reported quality of life, there were no significant differences (p=0.176) between GI (before = 39.50 ± 13.52 after = 46.84 ± 12.74) and the CG (42.82±12.96 after 45.35±11.14) . Conclusion: The results show that an integrational exercise program can reduce arterial stiffness in the elderly when compared to older people not involved in an exercise program.

### 832 Board #66 May 29 3:30 PM - 5:00 PM

**Title:** Barriers of Being Active: Differences Between Two Generations  
**Authors:** Benedetta Tosi, Martina Rosselli, Gabriele Mascherini, Cristian Petri, Gianluca Galanti, Pietro Amedeo Modesti. University of Florence, Florence, Italy.  
**Contact Email:**  

**PURPOSE:** Physical inactivity and sedentary behaviors are nowadays included among principal risk factors for cardiovascular disease and mortality and have the highest Population Attributable Fraction, especially for women. Regular exercise reduces the risk of cardiovascular diseases, obesity, hypertension, diabetes, depression, and anxiety. However, no studies have determined the optimal loads that maximize power outputs for both sexes. Plate loaded machines are the most common equipment used by recreational lifters; load engagement and hip abdication showed a significant main effect for load (p<0.033) with optimal load at 60-70%1RM, 50-70%1RM, and 50-60%1RM, respectively. Hip adduction produced significant age x load (p<0.031) and sex x load (p<0.034) interactions. 50-70%1RM was optimal for both age groups, but older persons produced significantly higher PPREL at 40%-60%1RM. For load x sex, optimal load was 50%-70%1RM for both sexes; however, PPREL occurred at 70%1RM for men and 50%1RM for women. Analysis for the calf raised showed a significant age x load interaction (p<0.001) where PPREL was 40%-70%1RM for young and 50%-80%1RM for older participants. **CONCLUSIONS:** Different optimal load ranges are required for individual plate-loaded exercises depending on age and sex. Younger persons and men optimize power at lower loads than older persons and women.

### 833 Board #67 May 29 3:30 PM - 5:00 PM

**Title:** Optimal Loads for Power in Young and Old Men and Women Using Plate-Loaded Resistance Machines  
**Authors:** Keri Strand1, Lucrezia Lucchi1, Tamara Gonzalez Coto2, Nicholas Cherup1, Joseph F. Signorile1. University of Miami, Coral Gables, FL.  
**Contact Email:** kxs353@miami.edu  

**PURPOSE:** Power affects quality of life and sports performance across age. Plate-loaded machines are the most common equipment used by recreational lifters; however, no studies have determined the optimal loads that maximize power outputs using this equipment.  

**METHODS:** Fourteen older men (69.4 ± 6.7 y.), 21 older women (69.8 ± 7.9), 24 young men (21.0 ± 2.2 y.) and 22 young women (20.7 ± 1.5 y.) participated in two sessions of strength and power testing. They performed ten different plate-loaded exercises to determine their 1RM, and peak power output (PP). Power was tested at 40, 50, 60, 70 and 80% 1RM using a linear position transducer. PP was expressed relative to the highest power produced after = 46.84 ± 12.74 and the CG (42.82±12.96 after 45.35±11.14) . Conclusion: The results show that an integrational exercise program can reduce arterial stiffness in the elderly when compared to older people not involved in an exercise program.

### 834 Board #68 May 29 3:30 PM - 5:00 PM

**Title:** Evidence-based Fall Prevention Program. A 5-year Evaluation.  
**Authors:** Harry Papadopoulos, Pacific Lutheran University, Tacoma, WA. (Sponsor: Eli Lankford, FACSM)  
**Contact Email:** papadoha@plu.edu  

**PURPOSE:** The participants were 19 community-dwelling elderly adults (7 males, 12 females, 69.4 ± 5.3yrs) who took part in exercise classes under the leadership of an expert exercise instructor, held once a week over 10 weeks. They subsequently performed independent exercise practice following the same schedule for 1 year. The exercise program emphasized aerobic exercises such as walking, muscle strength training for the trunk and limbs, and recreational activities. The participants completed physical fitness assessments before and after the 10-week instructor-led exercise classes and at the 1-year follow-up. This assessment comprised 12 items designed to evaluate physical fitness levels, including hand-grip strength, sit-up, sitting trunk flexion, standing on one leg with the eyes open, 10-m walking time, 10-m obstacle walk, functional reach, the 30-s chair sit to stand test, the timed up and go test, the 5-second stepping test, whole body reaction time, and the 6-minute walk test. The participants Falls among older adults are common, costly, and preventable. Stay Active and Independent (SAIL) is a public domain exercises program that emphasizes on strength and balance to prevent falls in older adults. **PURPOSE:** To evaluate the physical function of older adults participating in the SAIL program over multiple years.  

**METHODS:** Data were collected from multiple locations in Washington State that offer the SAIL program. Physical functioning was assessed using the 8-foot up and go test, the 30-second bicep curl test, and the 30-second chair stand test. A total of one hundred and forty-nine participants completed the baseline assessment. One hundred and forty-three individuals completed the test a year after the baseline assessment, but declined in subsequent years. A paired-sample t-test was used to evaluate differences in mobility and strength between baseline and the first year of participation in the SAIL program. A repeated-measures ANOVA was used to evaluate differences in functional assessments among years 1 through 5. Significance was set at p < 0.05.  

**RESULTS:** After one year of participation, all functional assessments were significantly different (p < 0.01) compared to the baseline measurements. The 8-foot up and go test improved by 8.3% (7.2 ± 2.9 vs. 6.6 ± 2.3), the 30-second bicep curl test increased by 7% (17.1 ± 4.9 vs. 18.3 ± 4.9), and the 30-second chair stand test improved by 12.2% (13.9 ± 5.2 vs. 15.6 ± 5.6). During the five years post baseline, the average time to complete the 8-foot up and go test was less than 7 seconds, but there were no significant differences (p ≤ 0.05) in strength differences among years. The average upper body strength for SAIL participants increased for four years. There was a significant (p < 0.04) number of repetitions completed in 30 seconds between year 3 and year 1 (19.8 ± 5.2 vs. 17.8 ± 4.9). Finally, the average number of chair stands in 30 seconds increased for four years. There was a significantly higher number of repetitions in year 3 compared to year 1 (19.1 ± 7.5 vs. 17.1 ± 6.3, p < 0.01) and to year 2 (19.1 ± 7.5 vs. 17.6 ± 7.6, p < 0.01).  

**CONCLUSIONS:** These results indicate that the SAIL program was successful in maintaining mobility and increasing upper and lower body strength levels of individuals over 5 years. These results suggest a potential decline in the risk of falling for SAIL participants.
were instructed to wear the accelerometer on their waistline all day. RESULTS: The participation rate of exercise classes and exercise practice was 90.0 ± 11.0% and 76.5 ± 14.6%, respectively. Change was observed in the 10-min walking time (pre: 5.80 ± 1.48 sec and post: 4.93 ± 0.57 sec, p<.05), 10-min obstacle walk (pre: 4.56 ± 0.82 sec and post: 3.88 ± 0.66 sec, p<.05), and timed up and go test (pre: 4.83 ± 0.59 sec and post: 4.33 ± 0.53 sec, p<.05) performance after completion of the 10-week program. Furthermore, these changes were maintained at the 1-year follow-up. Although no significant change was observed in the 6-minute walk test after the 10-week exercise classes, a significant change was apparent at the follow-up (pre: 629.9 ± 51.8 m and follow-up: 677.1 ± 54.7 m, p<.05). CONCLUSIONS: Our results clearly indicated that even low-frequency, continuous exercise can help improve and maintain physical fitness. However, probably because the independent exercise practice simply continued the activities of the 10-week exercise program, we observed no further effects by the 1-year follow-up.

Older adults aged 60+ years are particularly vulnerable to the exposure and negative health consequences related to sedentary behavior (SB). There is limited evidence for the feasibility and effectiveness of SB interventions in older adults. PURPOSE: The purpose of this study is to explore the feasibility and acceptability of using a seated elliptical device (SED) to replace SB with a light-intensity physical activity (LPA) in the homes of older adults. METHODS: Twenty older adults (mean ± SD, 71.9 ± 5.3 years) participated in this feasibility study. Each participant was outfitted with hip-mounted activity monitor and SED in the home for seven days. Participants were randomly assigned to one of four pedaling duration groups (15, 30, 45, and 60 min/day) and instructed to accumulate SED pedaling at a self-selected light-intensity during designated exercise times. RESULTS: There was 100% adherence across all four pedaling duration groups with no significant difference in total pedaling days completed (p=.241) and a significant linear group trend (p<.001) for minutes pedaled per day. The 45 and 60 min group accumulated greater minutes per day of pedaling than the 15 and 30 min groups (p<.005) with no significant differences between the 45 and 60 min groups or the 15 and 30 min groups. Across groups there was a 4.3% to 11.3% reduction in daily SB (Cohen’s d: 0.72 to 1.57) and 8.3% to 23.6% increase in LPA (Cohen’s d: 0.41 to 1.2) on pedaling days. Participants’ perceptions of using the SED were positive. CONCLUSIONS: Older adults were successfully able to exceed 60 minutes of daily pedaling without altering or interrupting their typical daily behaviors. The long term impact of these daily changes in LPA on health and function in aging populations are to be determined.

In young adults, a cadence (steps/min) of 100 steps/min has been associated with absolutely-defined moderate intensity, measured in metabolic equivalents (METs; 1 MET=3.5 mL/kg/min). However, less is known about how cadence is associated with relatively-defined moderate intensity indicators of moderate relative intensity (40-59% of heart rate reserve [%HRr], 64-76% of maximum heart rate [%HRmax] percentage, and a Borg scale rating of perceived exertion [RPE] 12-13). METHODS: Thirty-seven older adults (mean±SD; age=68.5±4.7 years, BMI=26.3±3.9 kg/m²) completed a progressive treadmill walking protocol that consisted of 5-minute bouts increasing by 0.5 mph from 0.5 to 6.0 mph. The protocol ended following the bout where the participant naturally selected to jog or run, > 75% HRmax, or reported a Borg scale RPE >13. Intensity indicators were analyzed using Receiver Operating Characteristic (ROC) curves. Optimal cadence thresholds associated with moderate intensity were determined using Youden’s index.

RESULTS: Four participants did not reach moderate intensity based on [%HRr], and three did not reach moderate intensity based on [%HRmax]. Moderate [%HRr] and [%HRmax] were both associated with moderate intensity cadence thresholds of 81 and 111 steps/min. [%HRr] had a sensitivity of 87%, specificity of 71%, and an area under the curve (AUC) of 0.76. [%HRmax] had a sensitivity of 75%, a specificity of 87% and an AUC of 0.75. Additionally, RPE was associated with a moderate intensity threshold of 104 steps/min, with 78% sensitivity, 80% specificity, and an AUC of 0.83. CONCLUSION: Cadence thresholds associated with relative indicators of moderate intensity were consistently higher (4-11 steps/min) than the commonly reported heuristic value of 100 steps/min, although still within an obtainable cadence for ambulatory, healthy older adults. Relative indicators provide an opportunity to individualize cadence-based intensity prescription.

There are countless benefits of exercising for older adults including a maintenance of bone density, muscle mass, and the preservation of muscular strength and endurance. Although older adults benefit from exercising it may be more convenient, more accessible, and less of a burden to exercise less times per week. PURPOSE: The purpose of this study is to quantify if there are any added benefits to exercising three days a week compared to two days a week. METHODS: Participants included community dwelling adults (N=36, M=74.3±7.9 years) who self-selected exercise frequency by joining a multi-component fitness class offered in their local community. Classes were held either two or three days per week depending on the location. The Functional Fitness Test and Short Physical Performance Battery were conducted two times 6 months apart at all locations. Results were analyzed using repeated measures ANOVA. RESULTS: A significant group-by-time interaction was observed for hand-grip strength, F(1, 18) = 7.92, p = .01, with the two days per week group improving by 13% and the three days per week group decreasing by 1.9%. Interactions were not significant for chair stands test, arm curl test, 8 Foot Up-and-Go, or Gait speed, p> .05. There was a significant time effect for the chair stand test [F(1, 15) = 7.54, p = .01], gait speed [F(1, 19) = 7.91, p = .01], and hand-grip strength [F(1, 18) = 4.61, p = .04] with all tests indicating improvements from the first to second test. Univariate effect sizes indicate a trend toward greater improvements in the 2 d/wk group when compared to the 3 d/wk group with the exception of the arm curl which favors 3 d/wk.

CONCLUSION: Although results are preliminary, this study indicates that handgrip strength was enhanced when participants were involved in a multi-component exercise program two days per week (13%). Chair stands test, arm curl test, 8 Foot Up-and-Go, and Gait speed increased regardless of the number of days per week of exercise. Notable limitations to the study are the number of males (N=6) compared to females (N=30) and participant’s self-selection of exercise frequency. Also, participants’ exercise was conducted at home, outside influences such as physical activity levels, health status, and history of disease. Future studies should confirm these results using an experimental design in a larger, more diverse sample.
Walking cadence is a gait parameter associated with reduced risk of mortality, cardiovascular events, and falling among older adults; but has not been reported among older Hispanics in Puerto Rico (PR). However, poor physical function, and low moderate to vigorous physical activity among older Puerto Rican adults in the USA and PR have been reported. PURPOSE: To evaluate the association between functional fitness and daytime walking cadence among Hispanic elders living in PR. METHODS: A group of 62 older adults (F=38, M=24; age=76.4 ± 8.4 yr), participants in two HOPE centers in PR, completed a battery of senior fitness tests (and wore an accelerometer for 7-consecutive days. Spearman correlation and linear regression analyses were conducted to test associations between mean daytime walking cadence (steps/min) and functional fitness. RESULTS: Mean steps/day = 841 ± 151, total daytime mean steps/min = 4 ± 2. Significant correlations were observed between walking cadence and cardiorespiratory fitness (6 min walk) (rho = 0.41, P=0.01), agility (foot up and go) (rho = -0.39, P=0.03), muscle endurance (sit-ups and biceps curl) (rho = 0.27, 0.29, P=0.03, 0.02, respectively), and body composition (waist to height ratio) (rho = -0.27, P=0.03). CONCLUSION: Supporting previous studies, walking cadence significantly correlated with most functional fitness parameters in our group of older Hispanic adults in PR, thus, suggesting that those with higher mean steps/min (uncensored mean cadence) have higher cardiorespiratory fitness, agility, muscle endurance, and lower waist to height ratio; all critical health parameters for this population.

Rheumatoid Arthritis (RA) is a chronic inflammatory disease commonly associated with physical inactivity and poor sleep quality (SQ). No previous studies have evaluated these associations among Hispanic women, and none have used objective assessment of physical activity (PA) and sedentary time (ST) in this population. PURPOSE: To evaluate associations between PA, ST, and SQ among Hispanic women with RA. METHODS: A group of 16 Hispanic women with RA (mean age=49.4±14.5yr, and BMI=26.9±5.3 kg/m²) wore an ActiGraph GT3X+ accelerometer attached to an elastic waist band in the right hip area for 7 consecutive days to determine PA and ST. Participants also completed the Pittsburgh Sleep Quality Index (PSQI). Correlation analyses were used to evaluate associations between PA, ST, and SQ components. RESULTS: Mean of total moderate to vigorous PA (MVPA) was 178.6 ± 52.7 min/week, and ST was 6.2 ± 1.9 hr/day. CONCLUSION: Different from other studies, physical inactivity and ST were not highly prevalent behaviors, but ST was an important determinant of sleep efficiency in our group of Hispanic women with RA. Regardless of PA classification, ST must be considered in any intervention aimed to improve sleep in this population.
Handgrip Strength as a Screening Assessment for Functional Limitations

Nathan W. Saunders, Alyssa K. Braun, Meghan E. Hess, Uriel Ibarra-Moreno, Megan D. Salvador. University of Mount Union, Alliance, OH.
Email: saundersn@mountunion.edu

There appears to be an undisputed strong relationship between isometric handgrip strength (HGS) and functional fitness test performance, ability to perform activities of daily living (ADLs), and mortality, but the extreme diversity in how HGS data are interpreted make it difficult to utilize the assessment in a meaningful way. PURPOSE: To simplify this interpretation by establishing a single and meaningful universal cutoff that would inform the test administrator whether or not additional functional fitness testing was warranted. It was hypothesized that subjects scoring above the HGS cutoff would exhibit fewer perceived and actual functional limitations. METHODS: Male (n = 24; Age = 62.3 ± 14.3 years) and female (n = 59; Age = 64.7 ± 13.0 years) subjects self-reported their perceived ability to complete the variety of ADLs included in the Composite Physical Function Scale (maximum score of 24 indicating no perceived functional limitations). They additionally completed a battery of functional fitness assessments, which included HGS, 30 s-Chair Stand, 8-Up and-Go, 10 h and 25 lb lift and carry, and 400 m Walk Test. A self-developed cell phone application was utilized to produce more outcomes, such as steady-state gait speed and stepping speed during the 400 m Walk Test. Independent samples t-tests were used to compare the perceived and functional fitness outcomes between subjects with grip strength ≤ 30 kg and those with grip strength ≥ 30 kg. Additionally, positive predictive value (PPV), and negative predictive value (NPV) were calculated to investigate the accuracy of a 30 kg HGS cutoff to identify subjects with perceived or actual functional limitations. RESULTS: Subjects with a HGS ≥ 30 kg scored significantly higher on the CPF Scale, compared with subjects with a HGS < 30 kg (23.9 ± 22.4 vs. 3.3, respectively). Likewise, Subjects with a HGS ≥ 30 kg performed significantly better on every functional fitness test outcome, compared with subjects with a HGS < 30 kg. The NPV (true negative) was excellent (≥ 90%) for all outcomes, while the PPV (true positive) was poor (< 50%) for all outcomes. CONCLUSIONS: A HGS ≥ 30 kg appears to be an appropriate cutoff to accurately rule out current functional limitations in males and females 40 years of age and older.

Relationship Between Functional Physical Condition And Age In Institutionalized Older Adults In Bogotá-colombia


Purpose
The quantification of functional physical condition (CFF) in the elderly is an important indicator to define the state of health, the level of dependency and the quality of life in functional physical condition this population. The objective of this study was to establish the relationship between and age in a group of elderly people residing in retirement home in the city of Bogotá.

Methodology
Cross-sectional descriptive observational study, which evaluated the functional physical condition (SFT) in 253 older adults (42.6% men and 57.3% women) institutionalized in the city of Bogotá. The CFF was evaluated through the senior fitness test, in the application the protocols proposed in the validation to Colombia were followed. The measure consisted of 6 physical tests: chair stand (repetitions), arm curl (repetitions), aerobic capacity in 2 minutes (repetitions), flexibility (cm); and 8 foot up and go (ms). A univariate descriptive analysis and a correlation analysis between age and physical condition variables were performed. An appreciative scale of the correlations was established as follows: weak for values ≤ 0.40; moderate, between 0.41 and 0.60; strong, between 0.61 and 0.80, and very strong, between 0.81 and 1.0.

Results
In all CFF tests, significant differences were found for all age ranges in both men and women (p < 0.01). The following correlations were identified between the CFF variables and age: chair stand (r = 0.850), arm curl (r = 0.928), trunk flexion (r = 0.928), back scratch (r = 0.862), 2-minute step (r = 0.914), 8 foot up and go (r = 0.877) in men. In the case of women, very strong correlations were observed in the aerobic capacity (r = 0.916), chair stand (r = 0.764), arm curl (r = 0.682), back scratch (r = 0.678), 8 foot up and go (r = 0.739) and moderate in trunk flexion (r = 0.458).

Conclusion
There is a linear relationship between age and performance in CFF tests.

Mobility limitations are linked with increased risk of disability and mortality among older adults with chronic disease. Physical activity (PA) has consistently been associated with the preservation of mobility and improvements in physical function in aging populations. Although accelerometry is accepted as the gold standard of objective PA measurement, knowledge of objectively-determined PA in free living conditions and its association with mobility limitations among older adults with chronic disease remains limited. PURPOSE: To examine the association of objectively-determined PA in free-living conditions, assessed using the LIFEORDER EX (LC) accelerometer, with select mobility outcomes. METHODS: Associations between objectively-determined PA and mobility performance (400 MWalk and Stair Climb tests) and mobility-related self-efficacy (MRSE) were examined from the baseline assessments of 3 prior lifestyle intervention trials in 156 older prostate cancer and knee osteoarthritis patients. Moderate-Vigorous (MVPA) and light (LPA) were measured using LC accelerometer in free-living conditions across 7 consecutive days. RESULTS: Results of partial correlation analyses controlling for age revealed that total weekly MVPA was significantly correlated with 400 MWalk (r = -0.36; p < 0.01), Stair Climb (r = -0.29; p < 0.05), and MRSE (r = -0.27; p < 0.01). LPA was also significantly correlated with 400 MWalk (r = -0.49; p < 0.01), Stair Climb (r = 0.40; p < 0.01) and MRSE (r = -0.38; p < 0.01). CONCLUSIONS: The present findings demonstrate that objectively-determined PA measured using the LC accelerometer are associated with mobility performance and MRSE in older adults with chronic disease. The results also provide evidence further supporting the validity of accelerometry as a measure of mobility limitations among older prostate cancer and knee osteoarthritis patients. Given the established complexity of objective PA assessment in aging populations, the present findings have implications for PA interventions in the preservation of mobility among older adults with chronic disease.
and FN BMD in both HiRIT and bD, all functional outcomes for HiRIT (all p≤0.05), and in LES, TUG, and STS for bD (all p≤0.05). There have been no adverse events.

CONCLUSION: Although preliminary, findings suggest that both novel bone-targeted exercise programs improved BMD and physical function in older men with osteopenia and osteoporosis. Data collection is ongoing.

CONTROLLING FOR AND MEASURING EXPLANATORY VARIABLES CAN BE DIFFICULT BUT VIRTUAL REALITY (VR) IS EMERGING AS A Viable MEANS FOR REPLICATING AUTHENTIC PHYSICAL ACTIVITY SETTINGS WITHIN THE LAB. PURPOSE: USING VR, WE DETERMINED IF YOUNG AND OLDER ADULTS DIFFER ON BEHAVIORAL RESPONSES OF REACTION TIME AND ACCURACY DURING STANDING, WALKING, AND FAST WALKING CONDITIONS THAT REQUIRE DUAL-TASK COMPLETION. METHODS: THIRTY-TWO YOUNG ADULTS (MEAN AGE = 21.03) AND THIRTY-FOUR OLDER ADULTS (MEAN AGE = 69.6) PERFORMED THREE EIGHT-MINUTE PHYSICAL ACTIVITY CONDITIONS: STANDING, WALKING, AND FAST WALKING. DURING THE CONDITIONS, 60 RED AND GREEN OBJECTS APPEARED AT RANDOM ON THE VR SCREEN TO REPLICATE A GO/NO GO COGNITIVE TASK. USING GLOVES THAT HAD KINEMATIC MOTION CAPTURE MARKERS, PARTICIPANTS WERE INSTRUCTED TO STRIKE THE GREEN OBJECTS. A MOTION CAPTURE SYSTEM CONNECTED TO THE TREADMILL RECORDED REACTION TIME AND ACCURACY ON CORRECT OBJECT STIMULI FOR ALL CONDITIONS. RESULTS: WE USED PAIRED SAMPLE T-TESTS TO CONFIRM THAT THE PHYSICAL ACTIVITY CONDITIONS INCREASED IN INTENSITY BY COMPARING HEART RATE MEASUREMENTS BETWEEN CONDITIONS. THERE WAS A SIGNIFICANT INCREASE IN HEART RATE (BPM) BETWEEN THE STANDING AND WALKING CONDITIONS (p<0.05) AND BETWEEN THE WALKING AND FAST WALKING CONDITIONS (p<0.05) FOR BOTH THE YOUNG AND OLDER ADULTS. T-TESTS DETERMINED THAT THERE WERE NO SIGNIFICANT DIFFERENCES IN ACCURACY BETWEEN THE YOUNG AND OLDER ADULTS DURING ANY OF THE THREE CONDITIONS (p>0.05). T-TESTS DETERMINED THAT YOUNG ADULTS HAD A SIGNIFICANTLY QUICKER REACTION TIME THAN OLDER ADULTS DURING ALL THREE CONDITIONS (p<0.05). CONCLUSIONS: SURPRISINGLY, OLDER ADULTS PERFORMED JUST AS ACCURATELY AS YOUNG ADULTS DURING DUAL-TASK COGNITIVE CONDITIONS CARRIED OUT IN A VR ENVIRONMENT. VR MAY BE AN APPROPRIATE INTERVENTION TO ENHANCE COGNITIVE STIMULATION TO ATTENUATE COGNITIVE DECLINE.

Several studies found that the reduction of capacity of concentration in older adults contributed to gait and mobility disturbances. The natural walking pattern was disrupted by diverting their attention to a secondary task, and the situation was even more serious among balance-impaired older adults who showed impairments when shifting their attention from task to task. However, there is limited information about the performance of attention and balance in old adults.

**Purpose:** To investigate the relationship between attention and balance in community-dwelling older adults.

**Method:** Thirty-three elderly (67±9±4.8 years) with no cognitive or neurological deficits (MMSE score: 28±4.1±3.3) volunteered attending the test. The balance ability was measured by Y-balance which included three parameters, right front side, right rear inner stride and right rear outer stride. The single and dual tasks were used to measure the attention of the subjects. The single task was face emotion recognition including more serious among balance-impaired older adults who showed deficits when more serious among balance-impaired older adults who showed impairments when shifting their attention from task to task. However, there is limited information about the performance of attention and balance in old adults.

**Results:** Some low-to-moderate correlations were found between attention and balance, which were summarized in the table below:
Exercise (MPK) has been found to increase agility and balance in elderly individuals.

Aging is associated with declines in vascular and muscular functions. It is crucial to reduce the negative effects of aging on vascular and muscular health by implementing appropriate lifestyle interventions, such as exercise training. Modified Parkour movements were progressed by increasing their complexity. Supine BP, AIx, and heart rate (HR), 30-second Chair Stand Test (CS30), and the Long Distance Corridor Walk (LDCW). The SPPB includes the time to complete 5 repeats of chair stands (5CS), balance testing (side-by-side stand, semi-tandem stand, and tandem stand), and an 8-foot walk. The Friedman test was used to examine differences in SPPB scores and one-way repeated measures analysis of variance was used to examine mean differences in scores for all other outcomes.

PURPOSE: To examine the effects of the GLBP on measures of body composition and physical function (PF) in overweight and obese (BMI ≥ 27) individuals with OA (N=15).

METHODS: This study used a single-group, quasi-experimental design with repeated measures. All participants received the GLBP and outcome variables were obtained at baseline, 3, 6, and 12 months. Lean mass (LM), fat mass (FM), and body fat percentage (BF%) were obtained via bioelectrical impedance. Total weight (WT), Body Mass Index (BMI), and waist circumference (WC) were also obtained. Measures of PF included the Short Physical Performance Battery (SPPB), grip strength (GS), 30-second chair stand test (CS30), and the Long Distance Corridor Walk (LDCW). The SPPB includes the time to complete 5 repeated chair stands (5CS), balance testing (side-by-side stand, semi-tandem stand, and tandem stand), and an 8-foot walk. The Friedman test was used to examine differences in SPPB scores and one-way repeated measures analysis of variance was used to examine mean differences in scores for all other outcomes.

RESULTS: Participants had a mean age of 70.20 ± 3.95 years and were primarily white (93%), female (80%) and college educated (67%). There was a significant effect of time for WT (F(4,44,20.775) = 6.591, p < 0.011), BMI (F(4,50,26.140) = 6.474, p< 0.010), and WC (F(4,48,46.986) = 4.826, p< 0.006). Bonferroni post hoc analyses indicated WT (p < 0.011), BMI (p < 0.002), and WC (p < 0.022) significantly improved from baseline to 3 months. There was also a significant effect of time for SCS (F(4,59) = 3.190, p< 0.033) and CS30 (F(4,59) = 6.956, p< 0.001). Post hoc analyses indicated CS30 scores significantly improved from baseline to 3 months and from baseline to 12 months (p< 0.007). There were no significant differences observed for any other outcome measure (p>0.05).

CONCLUSION: The GLBP may be effective at improving weight and physical function measures in people with OA, but more research is warranted.

PURPOSE: Falls are one of the leading cause of mortality and morbidity in older people and the risk of falling is exacerbated by impaired mental status due to dementia. However, whether persons with dementia benefit from fall prevention exercise training is unclear. This study aimed to evaluate the contribution of an exercise multicomponent training (MT) on cognition, balance, mobility and lower limbs muscle strength in the elderly with dementia as important risk factors for falling.

METHODS: Sixty-four elders (78.5 ±8.3 years) clinically diagnosed with dementia, were divided for convenience into two groups: Experimental Group (EG, n= 38) and Control Group (CG, n= 26). The EG participated in a 6-month supervised MT intervention (2 days/week, 60 min/session including aerobic, muscular resistance, flexibility, coordination and postural exercises). Cognitive function (MMSE), functional mobility (Time Up and Go -TUG -Test), balance and gait (POMA,Tinetti Index) and lower muscle strength (30-second Chair Stand) were assessed before and after 6 months of the experimental protocol.

RESULTS: A two-way ANOVA, with repeated measures, revealed significant group and time interactions on cognitive function, TUG and Tinetti Index, presenting the EGa significantly better performance over the time compared to the CG. However, no statistically significant main effect was founded on the lower muscle strength.

CONCLUSIONS: Our results suggest that a 6-month exercise multicomponent training can have a positive influence on the gait, balance, mobility and cognition, and therefore, seems to be an important strategy to reduce the risk of falling in dementia older adults.


Michael E. Rogers, FACSM, Pedro Gargallo2, Álvaro Juesas2, Eva Tamayo2, Sara Torkamaneh3, J.F. Guzmán3, J. Fernández-Garrido4, Guillermo Saez2, Nicole L. Rogers2, Juan C. Colado2, Wicha State University, Wichita, KS. 2University of Valencia, Valencia, Spain. 3University of Valencia, Valencia, Spain. 4Glasgow Caledonian University, Glasgow, United Kingdom. (No relevant relationships reported)

PURPOSE: To investigate the effects of 20-weeks of PT, MT, and TRT using variable resistance (elastic bands with loops) on isokinetic strength in older women (OW). METHODS: 136 sedentary OW (68.09 ± 4.78 yr) were randomized into PT (n=34), MT (n=34), TRT (n=34), and control groups (CG) (n=34). All exercise groups trained twice weekly for 20 weeks. PT performed 6 exercises, 3-4 sets of 10-12 repetitions, at a 4 rate of perceived exertion (RPE) in the first repetition and no more than 6 in the last. MT performed balance, muscular endurance (2 exercises, 3-4 sets of 15 repetitions at 7-9 RPE), aerobic, flexibility, and coordination exercises. The TRT performed 6 exercises, 3-4 sets of 6 repetitions at 7-9 RPE. Variables analyzed were static balance (Romberg), agility (Up & Go), gait speed (4m), muscle strength (30-s chair stand), and aerobic capacity (6-minute walk test). Trial 2 by group (4) repeated measures ANOVA was used to determine differences regarding time and groups. RESULTS: PT showed significant improvements (p<0.05; +56.8%) in static balance with significant differences between PT and CG in muscle strength (PT: +29.20%; MT: +21.14%; CG: -2.69%), being the group with greatest improvements in 6 repetitions at 7-9 RPE. Variables analyzed were static balance (Romberg), agility (Up & Go), gait speed (4m), muscle strength (30-s chair stand), and aerobic capacity (6-minute walk test). Trial 2 by group (4) repeated measures ANOVA was used to determine differences regarding time and groups. RESULTS: MT showed significant improvements (p<0.05; +56.8%) in static balance with significant differences between PT and CG in muscle strength (PT: +29.20%; MT: +21.14%; CG: -2.69%), being the group with greatest improvements in 6 repetitions at 7-9 RPE. Variables analyzed were static balance (Romberg), agility (Up & Go), gait speed (4m), muscle strength (30-s chair stand), and aerobic capacity (6-minute walk test). Trial 2 by group (4) repeated measures ANOVA was used to determine differences regarding time and groups. RESULTS: MT showed significant improvements (p<0.05; +56.8%) in static balance with significant differences between PT and CG in muscle strength (PT: +29.20%; MT: +21.14%; CG: -2.69%), being the group with greatest improvements in 6 repetitions at 7-9 RPE. Variables analyzed were static balance (Romberg), agility (Up & Go), gait speed (4m), muscle strength (30-s chair stand), and aerobic capacity (6-minute walk test).
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### 859

**Board #93**

**May 29 3:30 PM - 5:00 PM**

**Changes in Fitness and Fatness Levels in Qatari Schoolboys Over the Last Decade**

Piret C. Bourdon1, Christopher R. Brandner1, Andrew R. Douglas2, Mohammed Farooq3, Saleh Al Marri1, Esa Peltola1, Nigel T. Cable1. 1University of South Australia, Adelaide, Australia. 2Aspire Academy, Doha, Qatar. 3Aspetar - Orthopaedic and Sports Medicine Hospital, Doha, Qatar. 4University of Birmingham, Birmingham, United Kingdom. 5No relevant relationships reported

**PURPOSE:** This study examined changes in anthropometric and cardiorespiratory fitness (CRF) characteristics of 26,325 Grade 6 (Gr 6) schoolboys (11.0 -12.9 y) living in the State of Qatar between 2003-2016. **METHODS:** Anthropometric measures included standing height (cm), body mass (kg) and body mass index (BMI, kg/m2). A multistage shuttle run test (MSRT, laps) was used to assess CRF. Comparisons between Qatari and non-Qatari boys were also conducted. **RESULTS:** The results showed a trend for decreasing CRF (less MSRT laps) and increasing fitness (higher BMI) across the study period, irrespective of nationality. Qatari students generally performed worse on the MSRT test and were fatter than their non-Qatari peers. Also, the Qatari students displayed bigger decreases in MSRT (10 vs 4 laps) and their body mass (2.5 vs 0.7 kg) and BMI (1.3 vs 0.6 kg/m²) increased more over the study period than their non-Qatari peers. Furthermore, the percentage of Gr 6 schoolboys classified as overweight or obese increased over the study period for all nationalities, with Qatari boys showing a greater prevalence of overweight or obesity than the non-Qatari peers. For example, the percentage of Qatari boys classified as overweight or obese by Centers for Disease Control and Prevention (CDC) standards increased from 23.6% to 39.9% for the same periods. **CONCLUSIONS:** These data support the need to establish a mechanism for the prevention and treatment of obesity and the development of physical activity strategies in the State of Qatar.

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### 860

**Board #94**

**May 29 3:30 PM - 5:00 PM**

**Participation in Physical Activity is Associated with Sexual Activity in Older English Adults**

Lee Smith1, Sarah E. Jackson2. 1Anglia Ruskin University, Cambridge, United Kingdom. 2University College London, London, United Kingdom. 3No relevant relationships reported

**Purpose:** Physical activity (PA) is a potential modifiable correlate of the age-related decline in sexual function, but no studies have explicitly tested associations between PA and sexual activity. This study aimed to examine associations between PA, sedentary behaviour and sexual activity, problems and concerns in older adults.

**Methods:** A Cross-sectional observational population study. Data were from the English Longitudinal Study of Ageing, a nationally representative sample of older men and women living in England. A total of 7,038 older men and women aged ≥50 years were included. PA and TV viewing time were self-reported. Sexual behaviour and concerns were assessed by validated self-completion questionnaire and analyses were weighted for non-response. Covariates included age, partnership status, socio-economic status, limiting long-standing illness, smoking status, alcohol intake and depressive symptoms. Adjusted logistic regression were used to investigate associations between PA, sedentary behaviour and sexual activity, problems and concerns.

**Results:** The odds of reporting any sexual activity were increased among individuals who participated in moderate (OR=1.64, 95%CI:1.24-2.15 in men, OR=1.21, 95%CI:0.97-1.52 in women) or vigorous (OR=2.06, 95%CI:1.50-2.84 in men, OR=1.42, 95%CI:1.09-1.85 in women) PA at least once a week. Erectile difficulties were less common among men who were active (OR=0.58, 95%CI:0.44-0.77 for vigorous PA). Results linking sedentary behaviour with sexual activity and function were less consistent, although women who watched ≥6 hours of TV/day had lower odds of thinking about sex frequently (OR=0.69, 95%CI:0.50-0.96) or, if they did not live with a partner, being sexually active (OR=0.40, 95%CI:0.22-0.72).

**Conclusions:** Encouraging older adults to be more physically active could help to improve sexual relationships and, as a result, mental health and wellbeing.

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### 861

**Board #95**

**May 29 3:30 PM - 5:00 PM**

**Lower Aerobic Reserve is Associated with Poorer Physical Function in Community Dwelling Older Adults**

Nicolas D. Knuth1, Morgan Denny1, Jennifer A. Schrack2. 1Towson University, Towson, MD. 2Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. 3No relevant relationships reported

**CONCLUSIONS:** Reduced gait speed in older adults is a well-establish predictor of disability and mortality. Recent evidence indicates that this decline in gait speed is accompanied by an increase in the energetic cost of walking and a decrease in peak energy expenditure. However, the association between this loss of aerobic reserve (AR) and functional performance has not been explored. **PURPOSE:** To examine the relationship between AR and physical function in older men and women. **METHODS:** AR was calculated as the percentage of the energetic cost of slow walking relative to peak walking energy expenditure in 20 participants of the Longitudinal Aging Study at Towson (65% women, age 70:8 y). Slow walking energy expenditure was assessed as the average rate of oxygen consumption during the final 2 minutes of a 5 minute standardized treadmill walking test at 1.5 mph (0.67m/s) using indirect calorimetry. Peak walking energy expenditure was assessed as the average steady-state rate of oxygen consumption during 400 meters of fast-paced walking over a 20-meter course using a portable indirect calorimeter. Physical function (PF) was assessed using components of the expanded Short Physical Performance Battery (eSPPB) test consisting of time to complete 5 repeated chair stands, standing balance, and two measures of gait speed over 6 meters (normal walk and narrow walk). The association between AR and functional performance was modeled using linear regression models, adjusted for age and body mass index. **RESULTS:** In fully adjusted models, PF was negatively associated with AR (β = -0.014, p = 0.002), indicating that PF score improved 0.014 for each one-percentage higher AR. In further analyses of the individual components of PF, time to complete 5 chair stands (β = -0.006 chair stands per second, p = 0.02) and normal gait speed (β = -0.009 m/s, p < 0.005) were found to be negatively associated with AR, but there was no association with standing balance. **CONCLUSION:** Greater aerobic reserve was associated with higher physical function, specifically chair stand time and normal gait speed. These results suggest that maintaining AR is critical to preserving lower extremity strength and speed with aging. Interventions to improve mobility in older adults should aim to both increase peak capacity and reduce energetic costs to optimize potential benefits.

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**862**

**Board #96**

**May 29 3:30 PM - 5:00 PM**

**Detrimental Links Between Inflammation and Muscle Mass are Moderated by Physical Activity in Older Adults**

Andreas Nilsson, Janelle Tarum, Fawzi Kadi. Örebro University, Örebro, Sweden. 1Towson University, Towson, MD. 2Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. 3No relevant relationships reported

**While age-related elevations in systemic inflammation may contribute to the accelerated loss of skeletal muscle mass, previous findings have been based on a limited number of biomarkers. Moreover, whether links between inflammation and muscle mass are independent of protein intake and habitual physical activity (PA) remain unknown. **PURPOSE:** The aim of the study was to explore links between skeletal muscle mass and inflammatory biomarkers in older women with different metabolic risk status, while accounting for adherence to guidelines on protein intake and PA.**

**METHODS:** Skeletal muscle mass index (SMI) was assessed in 112 women (67±1.5 years) by bioelectrical impedance together with the equation of Janssen et al. (2002) to obtain muscle mass expressed in relation to body weight. Fasting blood samples were obtained following standardized protocols. Acute-phase proteins C-reactive protein (CRP) and fibrinogen were determined, together with the following inflammatory biomarkers: Adiponectin, Osteocalcin-M (OSM), Leukemia inhibitory factor-receptor (LIF-R), Interleukin-6 (IL-6), IL-8, IL-12, and IL-18. Protein intake and PA were determined during 6 days by food record and accelerometry, respectively. Classification of metabolic risk status was based on the metabolic syndrome. Multivariate regression models were used to explore links between SMI and inflammatory biomarkers while adjusting for adherence to PA and protein intake guidelines and metabolic risk status. **RESULTS:** Variation in SMI were inversely linked to levels of CRP (β-coefficient: -0.47; p< 0.05) and OSM (β-coefficient: -0.20 p< 0.05), where the OSM link was attenuated after further adjustment for PA. In contrast, positive links between SMI and adiponectin (0.19 p< 0.05) and LIF-R (0.24 p< 0.05) were observed, which both remained significant in fully adjusted models. Links to other biomarkers were not significant. **CONCLUSIONS:** Several inflammatory markers are linked to skeletal muscle mass in older adults, where detrimental or beneficial actions are indicated depending on the
bimarker. While adherence to PA guidelines moderates some of these links, others seem unaffected by either PA and protein intake or metabolic risk status. Further research is needed to elucidate mechanisms underlying these observations.

863 Board #97 May 29 2:00 PM - 3:30 PM The Relationship between Physical Activity and Physical Performance and Cognitive Abilities in the Chinese Elderly
Liu Ruidong, Chen Congming, Cao Chunmei. Tsinghua university, BEIJING, China.
Email: 76369088@qq.com
(No relevant relationships reported)

PURPOSE: Decreased physical and cognitive ability have become seriously problematic in aging. Studies seldom describe the relationship between physical activity (PA), physical performance and cognitive abilities, most of which by measuring only one or two specific abilities using questionnaires. The study was thus designed to examine the relationship between PA and physical performance and multiple cognitive abilities in the Chinese elderly.

METHODS: The design was a cross-sectional study. 148 people aged 65.15±7.79 were included from Guangxi Province in southern China. PA was measured by the Physical Activity Scale for the Elderly (PASE, Cronbach’s α=0.752; Test-retest reliability=0.980). Physical performance included coordination and lower limb strength, functional walking ability and the balance ability. Cognitive abilities were measured by computer-based tests, including simple reaction time and executive function (stroop task and shifting task). The association between PA and the outcomes were examined using correlation matrix and linear regression.

RESULTS: 1) The average time spent on physical activity was 1.8h/d; 2) High levels of PA significantly associated with better gait speed (B=0.67, p<0.05), 30-s chair-stand test (B=0.55, p<0.05) and reaction abilities (B=0.89, p<0.05); 3) The gait speed significantly correlated with the accuracy of stroop task (r = 0.23, p = 0.018) and shifting task (r = 0.21, p = 0.023), grip strength significantly correlated with the accuracy and the reaction time of the stroop task (r = 0.19, p = 0.04 & r = 0.19, p = 0.04). However, other physical performance outcomes had no significant correlation with the cognitive abilities.

CONCLUSIONS: More physically active residents scored higher on physical performance outcomes. Positive associations were found between physical performance, executive function and reaction ability.

864 Board #98 May 29 2:00 PM - 3:30 PM Cardiorespiratory Fitness and Body Mass Index with Gastroesophageal Reflux Disease in Older Adults
Joey M. Saavedra, Angelique Burellenthin, Duck-Chul Lee, FACSM. Iowa State University, Ames, IA. (Sponsor: Dr. DC-Lee, FACSM)
Email: joeysa@iastate.edu
(No relevant relationships reported)

Purpose: To examine the associations of cardiorespiratory fitness (CRF) and body mass index (BMI) with prevalence of Gastroesophageal Reflux Disease (GERD) in older adults.

Methods: This cross-sectional study included 566 older adults (57% women; 72 years old) who were without heart attack, stroke, or cancer in the past 5 years. CRF was assessed via a 400-meter walk test and the minutes to complete the test were divided into six-sex quartiles (fourths). Participants were categorized into normal weight (<25 kg/m²), overweight (25-29 kg/m²), and obese (≥30 kg/m²) BMI groups. GERD cases were identified via self-report on a medical history questionnaire. Logistic regression was used to calculate the odds ratios (ORs) and 95% confidence intervals (CIs) of GERD among CRF quartiles and BMI groups while adjusting for sex, age, smoking, heavy alcohol consumption, meeting walking guidelines based on ≥5,000 steps/day, and BMI (in CRF analyses) or CRF (in BMI analyses).

Results: 2) The 566 adults, there were 123 (22%) GERD cases. Compared with the first quartile of CRF (least fit), the ORs (95% CIs) of having GERD were 0.70 (0.40-1.22), 0.65 (0.37-1.16), and 0.46 (0.25-0.87) among those in the second, third, and fourth (fittest) quartiles of CRF, respectively, after adjusting for all confounders except BMI. However, these associations were not significant after adjusting for BMI. Compared with the normal weight group, the ORs (95% CIs) of having GERD were 2.67 (1.51-4.72) and 4.32 (2.30-8.09) among the overweight and obese groups, respectively, after adjusting for all confounders including CRF. In a joint analysis, compared with the unfit (first quartile of CRF) and obese, ORs (95% CIs) were 0.13 (0.03-0.48), 0.41 (0.17-0.96), 0.17 (0.08-0.36), 0.44 (0.23-0.83), and 0.53 (0.26-1.07) for the unfit-normal weight, unfit-overweight, fit-normal weight, fit-overweight, and fit-obese, respectively, after adjusting for all confounders.

Conclusions: Although both CRF and BMI appears to be associated with GERD in this sample of older adults, BMI was found to be more strongly associated with GERD independent of CRF. Among obese individuals, having high CRF may be associated with lower odds of GERD, but more research is warranted.

Supported by unrestricted research grant by BioSpace.

865 Board #99 May 29 2:00 PM - 3:30 PM Longitudinal Stability of Exercise Behavior Across Exercise Domains
Matthijs D. van der Zee, Denise van der Mee, Meike Bartels, Eco J.C. de Geus. Vrije Universiteit Amsterdam, Amsterdam, Netherlands.
Email: m.d.vander.zee@vu.nl
(No relevant relationships reported)

PURPOSE: Many previous studies that have assessed the tracking of leisure time exercise behavior focused on various parts of the life span, and have treated exercise behavior as a uniform construct. This study provides novel insight by assessing the longitudinal tracking of exercise in six different domains: (1,2) team-based versus solitary activities, (3,4) competitive versus non-competitive, and (5,6) externally paced versus internally paced activities across the life-span (8-80 years).

METHODS: From the Netherlands Twin Register (NTR) all subjects with longitudinal exercise data were selected (N = 43,889) and used to analyse the tracking of exercise behavior over time. With this dataset, we were able to examine tracking as a function of baseline age (8 to 80 years) and tracking duration (2 to 22 year follow-up), taking into account sex differences using generalized estimating equations.

RESULTS: Two-year tracking coefficients for total volume of exercise across age at baseline, ranging from .38 to .77 with a median of .57. Tracking coefficients tend to decrease as the distance to follow-up increases, down to a median of .38 for the 22-year tracking coefficients. The patterns of tracking were largely similar for solitary, competitive, non-competitive, externally and internally paced activities. With the exception of team-based activities, tracking was seen to increase as a function of baseline age.

CONCLUSIONS: We conclude that exercise is moderate to highly stable across the lifespan, especially in late adulthood the tracking of exercise is high. This stability reinforces the existing evidence that exercise habits may be hard to change, but simultaneously suggests that successful intervention can lead to life-long habits.

866 Board #100 May 29 2:00 PM - 3:30 PM Parasympathetic Nervous Regulation and Prevalence of Lifestyle-related Diseases in Japanese: Waseda’s Health Study
Masayuki Konishi1, Susumu S. Sawada, FACSM1, Ryoko Kawakami1, Kumpai Tanisawa2, Hiroki Tabata1, Nobuhiro Nakamura1, Hyeon-Ki Kim1, Tomoko Ito1, Mitsuru Higuchi, FACSM1, Katsuhiko Suzuki1, Suguru Torii1, Hiroki Tabata1, Steven N. Blair, FACSM1, Koichiro Oka1, Shizuo Sakamoto1. 1Waseda University, Saitama, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3Harvard Medical School, Boston, MA. 4University of South Carolina, Columbia, SC.
Email: m.konishi@aoni.waseda.jp
(No relevant relationships reported)

PURPOSE: Limited data are available on the relationship of parasympathetic nervous regulation with the prevalence of lifestyle-related diseases in Japanese men and women. We conducted a cross-sectional study to investigate the relationship between diving reflex (DR) and heart rate recovery after exercise (HRR) - markers of parasympathetic nervous regulation - with the prevalence of hypertension, diabetes, and dyslipidemia among Japanese men and women in WASEDA’S Health Study.

METHODS: WASEDA’S Health Study is a cohort study which was launched in 2014. We used data collected at baseline in this study. Participants were 193 Japanese men [median (IQR) age 57 (48-67) years] and 81 women [median (IQR) age 52 (44-58) years] who completed a medical examination, maximal exercise test, and diving reflex test. The participants were divided into tertiles based on DR indexes and HRR indexes. DR indexes were the peak value of the R-R interval during the test (R-Rmax), the relative difference between the baseline and peak response due to the test (R-Rchange), and the latency of DR (Latency). Also, HRR indexes were defined as the reduction in the heart rate from the rate at peak exercise to the rates 1, 2, and 3 minutes after the cessation of exercise (HRR1, HRR2, and HRR3). Odds ratios and 95% confidence intervals were calculated using logistic regression analysis. All statistical analyses were performed using IBM SPSS Statistics, version 25.0. A P-value <0.05 was considered statistically significant.
intervals for the prevalence of lifestyle-related diseases were obtained using logistic regression models while adjusting for sex, age, body mass index, physical activity, family history of lifestyle related diseases, cigarette smoking, and alcohol intake. RESULTS: 119 participants had hypertension, 17 had diabetes, and 125 had dyslipidemia. Using the lowest DR indexes and HRR indexes as reference, we calculated odds ratios and 95% confidence intervals for the outcomes if interests. We found statistically significant dose-response relationships between R-Rmax and diabetes (P for trend = 0.016) as well as R-Rchange and diabetes (P for trend = 0.010). There was also a statistically significant dose-response relationship between latency and dyslipidemia (P for trend = 0.011) and HRR3 and hypertension (P for trend = 0.047).

CONCLUSIONS: In cross-sectional analysis, the data suggest diving reflex may be related to the prevalence of lifestyle-related diseases, particularly diabetes.

**867 Board #101** May 29 2:00 PM - 3:30 PM
Impact Of Physical Activity Participation On Waist-to-hip Ratio: A Propensity Score Analysis
Zhigang Yang,1 Weimo Zhu, FACSM.1 FuDAn University, Shanghai, China. 2UIUC, Champaign, IL.

Email: yangzhigang@fudan.edu.cn

(No relevant relationships reported)

**Impact of Physical Activity Participation on Waist-to-Hip Ratio: A Propensity Score Analysis**

Zhigang Yang, Department of Physical Education, FuDan University, China; Weimo Zhu (FACSM), Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign

**PURPOSE:** To examine the impact of physical activity (PA) participation on college students’ WHR using the propensity score analysis.

**METHOD:** A total of 1,144 college students (Male = 53.8%) from a major Chinese university were recruited for the study and their waist circumference (WC) and hip circumferences (HC) were measured, and WHR were computed. In addition, their daily time spent on the internet (ITT), their PA participation frequency per week (PATE), time spent on PA per week (PATW) were collected through a survey. Using the propensity score analysis, in which sex, daily time spent on the internet (ITT), PATE (hr.), PAFW and PATW were used as the matching variables so that the impact of PA participation on WHR can be independently examined.

**RESULTS:** The descriptive statistics of key variables measures are summarized as below:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr.)</td>
<td>20.570</td>
</tr>
<tr>
<td>WC (cm)</td>
<td>74.22</td>
</tr>
<tr>
<td>HC (cm)</td>
<td>0.7600</td>
</tr>
<tr>
<td>WCIT (cm)</td>
<td>92.200</td>
</tr>
<tr>
<td>WHR</td>
<td>2.787</td>
</tr>
<tr>
<td>PAFW</td>
<td>2.312</td>
</tr>
<tr>
<td>PATE (hr.)</td>
<td>1.708</td>
</tr>
<tr>
<td>PATW (hr.)</td>
<td>3.735</td>
</tr>
</tbody>
</table>

Using the ACSM 3-time per week recommendation as a criterion, 439 of 703 college students were extracted as the high frequent PA participation (HPFA) group and the rest as the low frequent PA participation (LPFA) group, and their group difference in WHR was computed and compared:

| LPFA (M±SD) | 0.834±0.048 |
| HPFA (M±SD) | 0.758±0.056 |

Mean Difference 0.081
Effect size 0.642
p-value <0.001
t-value 24.347
Coefficients 0.779

After using the propensity-score matching, the impact of the frequency of PA participation became very significant (ES = .64 and p<0.001), which indicates regular PA participation is the key for college students’ weight control and management.
(PR 1.46 [95% CI 1.26; 1.70]), being divorced or widower (PR 1.75 [95% CI 1.21; 2.53]), being resuscitated (PR 1.31 [95% CI 1.09; 1.59]), and living in a rural environment (PR 0.80 [95% CI 0.66-0.97]) were independently associated with high levels (≥ 8 hrs per day) of self-reported SB. CONCLUSION: Cardiac patients present high levels of SB, and SB did not change after CR. Several patient characteristics (i.e. employment, marital status, resuscitation, cardiac anxiety and living environment) were significantly associated with SB duration, which provides insight in who is the most at risk for SB associated adverse outcomes. Our data suggest that tailored initiatives are needed to target high levels of SB among cardiac patients.

870 Board #104 May 29 2:00 PM - 3:30 PM Measured Vs. Self-reported Height, Weight And BMI: Relationships With Anthropometry, Fitness, And Physical Activity
Oliver W. Wilson, Christopher M. Bopp, Zack Papalia, Melissa Bopp, FACSM. The Pennsylvania State University, State College, PA. (Sponsor: Melissa Bopp, FACSM)
Email: oww2@psu.edu
(No relevant relationships reported)

Researchers, policy makers, and clinicians commonly use height and weight to determine BMI and classify weight status. Self-reported measures are utilized in a considerable portion of the scientific literature and national surveys, but often result in misreporting of height and weight, and consequentially underestimation of BMI and therefore potentially BMI category (weight status) misclassification. PURPOSE: To investigate the association between measured and self-reported height, weight, and BMI values, and whether discordance is associated with other anthropometric measures, fitness levels, and physical activity (PA) and sedentary behaviors (SB). METHODS: Data were collected from college students via: (1) a pre-consultation online questionnaire where participants self-reported sex, height, and weight, (2) an objective fitness assessment that assessed height, weight, body fat percentage, abdominal girth, predicted aerobic fitness, and muscular endurance; and, (3) a post-assessment electronic survey that assessed height, weight, BMI, and self-reported height, weight, and BMI values, and whether discordance is associated with other anthropometric measures, fitness levels, and physical activity (PA) and sedentary behaviors (SB). RESULTS: Measured and self-reported height and weight data were collected from 1,061 participants, 224 of whom also provided PA and SB data. Women significantly under-reported weight (p = .003, η² = .02), and both sexes over-reported height (p < .001, η² ≥ .07), resulting in a significant difference between BMIs calculated using self-reported and measured values (p < .001, η² ≥ .07) and misclassification of BMI category of ~15% of both sexes. Minimal differences were found in anthropometric, fitness, or PA between those who over and underreported their height, but significant differences were found based on reporting differences for weight (p ≤ .015) and BMI (p ≤ .015). CONCLUSIONS: Students were found to have a tendency to underreport weight and overreport height, resulting in BMI category misclassification. Findings suggest that those who underreport weight tend to be in poorer health, as indicated by lower aerobic fitness in and higher abdominal girth and body fat percentage in particular. With respect to PA, overreporters tended to report lower PA levels than under and accurate reporters. Further research is required to establish the link between underreporting weight and overreporting PA.

871 Board #105 May 29 2:00 PM - 3:30 PM Muscle Strength and Bone Strength Assessed with Osteo-sono Assessment Index Among Recreationally Athletic Japanese Women
Takahisa Ohta1, Junzo Nagashima2, Haruhito Aoki1, Takeshi Yoshihisa1, Yasunori Imagawa1, Nobuyoshi Ono2, Wataru Fukuda1, Reo Konagi2, Susumu S. Sawada, FACSM3, Hiroyuki Sasa1, Naokata Ishii1. 1The University of Tokyo, Tokyo, Japan. 2Yokohama Sports Medical Center, Yokohama, Japan. 3Waseda University, Saitama, Japan.
(No relevant relationships reported)

Low muscle strength is an independent risk factor for low bone strength, which is a well-established predictor of osteoporotic fracture. However, the association between muscle strength and bone strength remains unclear among recreationally athletic Asian women. PURPOSE: To investigate the association between muscle strength and bone strength among recreationally athletic Japanese women.
METHODS: This cross-sectional study was conducted in 2019 in 7091 recreationally athletic Japanese women [mean (standard deviation), age 50.3 ± 15.2 years] who had undergone medical checkup and various exercise tests voluntarily from 1998 to 2016 at a preventive medical center. Participants completed a maximal voluntary knee extension test, quantitative ultrasound (QUS), calcaneal measurements, a medical examination, and questionnaires on lifestyle. Muscle strength, expressed as Nm per body weight in kilogram (N/kg), was measured at 60 degrees in the knee with an isokinetic dynamometer. The osteo-sono assessment index (OSI) evaluated right calcaneus heel bone strength using a QUS measurement. Multiple linear regression analysis assessed independent association of muscle strength and OSI (≥106) after adjustment for age, systolic blood pressure, smoking, drinking, prevalence of diabetes, and body mass index.
RESULTS: Muscle strength had a positive association with OSI score after adjustment for potential confounding factors (β=0.17, 95% confidence interval; 0.15-0.19, p <0.001). Furthermore, age-stratified (≥50 years and under) analyses showed similar patterns of association.
CONCLUSIONS: Our results suggest a dose-response association between muscle strength and bone strength after adjustment for potential confounding factors. We need to further investigate longitudinal relationship between muscle strength and bone strength in a cohort study.

872 Board #106 May 29 2:00 PM - 3:30 PM Cardiorespiratory Fitness and Prevalence of Lifestyle-related Diseases In Japanese Men And Women: WASEDA’S Health Study
Susumu S. Sawada, FACSM1, Ryoko Kawakami2, Kumpi Tanisawa2, Hiroki Tabata1, Nobuhiro Nakamura1, Kim Hyon-Ki1, Masayuki Kominami1, Tomoko Ito1, Chiyoko Usui1, Taishi Midorikawa1, Mitsuru Higuchi, FACSM1, Katsuhiko Suzuki2, Suguru Torii1, Lee I-Min, FACSM4, Steven N. Blair, FACSM5, Isao Murakoa1, Kaori Ishii1, Koichiro Oka1, Shizuo Sakamoto1. 1Waseda University, Saitama, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3J. F. Oberlin University, Tokyo, Japan. 4Harvard Medical School, Boston, MA. 5University of North Carolina, Columbia, SC.
Email: yususumi@gmail.com
(No relevant relationships reported)

Many epidemiological studies report that there is an inverse relationship between cardiorespiratory fitness and the prevalence of lifestyle-related diseases. However, limited data are available on this relationship among Japanese men and women. PURPOSE: This cross-sectional study is to investigate the relationship between cardiorespiratory fitness and the prevalence of hypertension, diabetes, and dyslipidemia among Japanese men and women in WASEDA’S Health Study. METHODS: WASEDA’S Health Study is a cohort study which was launched in 2014. We used part of the baseline data collected for this study. Participants were 631 Japanese men (median [IQR] age 50 (45-57) years) and 306 women (median [IQR] age 50 (45-57) years) who completed a medical examination, and maximal exercise test at baseline. The participants were then divided into quartiles based on cardiorespiratory fitness. The prevalences of lifestyle-related diseases were based on self-reports from questionnaires, blood pressure, and/or blood test at the medical examination. Odds ratios and 95% confidence intervals for the prevalences of lifestyle-related diseases were obtained using logistic regression models while adjusting for sex, age, body mass index, physical activity, family history of lifestyle-related diseases, cigarette smoking, and alcohol intake. RESULTS: 366 participants had hypertension, 55 had diabetes, and 420 had dyslipidemia. Using the 1st quartile of cardiorespiratory fitness as reference, odds ratios and 95% confidence intervals for 2nd, 3rd, and 4th quartiles are shown in the table below.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Q1 (lowest)</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4 (highest)</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>366</td>
<td>1.00 (reference)</td>
<td>0.36 (0.22-0.66)</td>
<td>0.51 (0.30-0.85)</td>
<td>0.35 (0.19-0.62)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>55</td>
<td>1.00 (reference)</td>
<td>0.93 (0.44-1.93)</td>
<td>0.39 (0.15-1.00)</td>
<td>0.46 (0.16-1.32)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>420</td>
<td>1.00 (reference)</td>
<td>0.98 (0.65-1.48)</td>
<td>1.06 (0.69-1.64)</td>
<td>0.92 (0.56-1.51)</td>
</tr>
</tbody>
</table>

CONCLUSIONS: These results suggest that there is an inverse relationship between cardiorespiratory fitness and the prevalence of hypertension and diabetes, but not dyslipidemia, among Japanese men and women. We intend to continue prospective follow-up of participants, to obtain more robust findings with longitudinal analyses.
unclear, especially among Chinese children. This study aimed to investigate the association of active commuting with sport time and outdoor play time in Chinese schoolchildren.

METHODS: A total of 441 children (49.7% boys, mean age = 8.3 ± 0.9 years) in grades 1 to 3 from four primary schools in Beijing participated in this study. Information of children’s walking trips, daily sport time, and daily outdoor play time was reported by parents using the modified Chinese version of the children’s leisure activities study survey. Children were categorized as either active (≥ 6 walking trips per week) or passive commuters (< 6 walking trips per week) based on the parent-reported number of trips walking to and from school. Children reported their own sex, age, and exercise self-efficacy. Children’s body weight and height were measured by researchers to calculate body mass index (BMI). Differences of daily sport time and outdoor play time between active vs. passive commuters were examined by the analysis of covariance (ANCOVA) adjusting for children’s age, BMI, and exercise self-efficacy. ANCOVA were conducted separately for boys and girls.

RESULTS: 42.7% of boys and 40.3% of girls were classified as active commuters. In boys, no difference was found for daily sport time between active and passive commuters (60.2 ± 46.7 min/d vs. 55.4 ± 41.4 min/d, P = 0.266), whereas active commuters had more time of outdoor play than passive commuters (194.8 ± 122.4 min/d vs. 153.7 ± 122.3 min/d, P = 0.041). For girls, neither daily sport time (64.1 ± 37.7 min/d vs. 54.1 ± 43.9 min/d, P = 0.110) nor daily outdoor play time (146.3 ± 129.6 min/d vs. 178.5 ± 141.4 min/d, P = 0.156) differed between active and passive commuters.

CONCLUSIONS: Boys who actively commute to school have higher levels of outdoor play time. Promoting active commuting may increase levels of physical activity in Chinese schoolchildren.

**A Comparison of Obesity and Other CVD Risk Factors between Boys and Girls in Kuwait**

Abdulaziz K. Alfarhan1, Lorraine J. Weatherpoon2, Wei Li1, Karin A. Pfeiffer, FACSM3, Nabil K. Badawy1, Joseph J. Carlson1,2.1Michigan State University, East Lansing, MI. 2The Public Authority for Applied Education and Training, Kuwait, Kuwait.

**CONCLUSIONS:** Boys who actively commute to school have higher levels of outdoor play time. Promoting active commuting may increase levels of physical activity in Chinese schoolchildren.

**CONCLUSIONS:** The prevalence of childhood obesity in Kuwait, among the highest globally including the US, is higher in boys than girls. Cardiovascular disease (CVD) risk is hence a concern, but data are limited comparing other CVD risk factors between boys and girls.

**METHODS:** To compare the mean level and prevalence of CVD risk factors between 5th grade boys and girls in Kuwait. METHODS: A cross-sectional study of 367, 5th graders at 10.4 ± 0.4 years of age, (53% girls), from 16 schools in 6 Kuwaiti cities. Outcome variables and at-risk cut points included: Body mass index (BMI) to classify overweight (OW) or obese (OB) [WHO 2007], total cholesterol (TC ≥170 mg/dL), low-density lipoprotein (LDL ≥130 mg/dL), high-density lipoprotein (HDL <40 mg/dL), TC:HDLC (≥3.5), triglycerides (TG ≥100 mg/dL), resting systolic (SBP), and diastolic blood pressure (DBP) ≥90th centile. Trained research assistants took measures with a portable anthropometer, scale, Cardiocheck Plus analyzer, and BP via auscultation with manual cuff. Physical activity (PA) and screen time (ST) were self-reported. Data were analyzed using SAS version 9.4 (significance p < 0.05).

**RESULTS:** Mean ± at-risk for boys vs girls was: BMI Z score (1.32 ± 1.1 vs 1.29 ± 0.9, p = 0.04), OW (15.5% vs 27.1%, p < 0.007) and OB (41.1% vs 37.8%, p = 0.487). There were no significant differences in blood lipids except girls had higher TG (108.5 ± 58.6 vs 91.2 ± 42.7 mg/dL, p < 0.009). Girls vs boys had higher (non-significant) % at risk for TC (29% vs 23%, p = 0.28), low HDL-C (21% vs 12%; p = 0.06), TC:HDLC (29.5% vs 22%; p = 0.16), and TG (38% vs 30%; p = 0.19); and lower % at risk for LDL-C (3.2% vs 4.5%; p = 0.60). Girls also had significantly higher SBP (107.7 ± 12 vs 102.4 ± 11.5 mmHg; p < 0.001) and DBP (70.3 ± 9.6 vs 64.8 ± 8.7 mmHg; p < 0.001), and % at-risk for BP (10% vs 6%; p = 0.16), respectively. Boys mean PA (ds/week = 60 min; 3.37 ± 2.36 vs 2.47 ± 2.24; p = 0.001) and ST (hrs/d; 4.97 ± 2.56 vs 4.50 ± 2.77; p = 0.119) were higher than girls. Most girls and boys (>80%) did not meet PA or ST ≥2 hrs/d recommendations. CONCLUSION: Contrary to previous data Kuwaiti boys did not have significantly higher obesity prevalence vs girls. Girls had significantly higher OW % at risk; and mean TG, SBP, DBP, and lower PA levels. Intervention studies on Kuwaiti children are warranted to reduce CVD risk factors including improving PA and ST behaviors.
Purpose: To investigate whether or not CRF mediates the relationship between comorbidities with health-related quality of life (HRQoL) in a representative sample of Korean older adults. 

Methods: Data from a total of 7,350 Korean older adults aged ≥60 years (58% women) who participated in the 2008–2011 Korean National Health and Nutritional Examination Survey were used in this analysis. HRQoL was assessed with the EuroQol-5 dimensions (EQ-5D) index and EuroQol visual analogue scale (EQ-VAS). Comorbidity was defined as physician-diagnosed chronic conditions. CRF was estimated with a non-exercise regression equation derived from sex, age, body mass index, and self-reported physical activity. The SF-36 macro provided by Preacher and Hayes was used to test whether CRF mediated the relationship between comorbidity and HRQoL, at statistical significance of p<0.05. 

Results: The total effect of the presence of comorbidities on HRQoL was significant (path c: β=3.091, p<0.001). The presence of comorbidities was negatively related to eCRF in HRQoL model (path b: β=0.403, p<0.001). As illustrated in Fig.1, the effect of eCRF as a mediator on HRQoL was also significant (path b: β=1.574, p<0.001). The mediation analysis using the bootstrapping method (5,000 resamples) showed that eCRF mediated the relationship between the presence of comorbidities and HRQoL in Korean older adults (path a × b: β=-0.635, 95% CI=-0.746 ~ -0.524, Sobel test Z=11.029, p<0.001). In addition, a direct effect of the presence of comorbidities on HRQoL was also significant (path c: β=-2.456, p<0.001). 

Conclusions: The current findings suggest that CRF mediates the relationship between comorbidities and HRQoL in Korean older adults.

Supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048153 and NRF-2016R1A6A3A11932432).

880 Board #114  May 29 2:00 PM - 3:30 PM Co-existence Of Physical Activity And Sedentary Behavior Among Children And Adolescents In Shanghai, China

Yang Liu, Si-Tong Chen, Jin-Tao Hong, Yan Tang, Zhen-Bo Cao, Jie Zhuang, Zheng Zhu, Pei-Jie Chen. Shanghai University of Sport, Shanghai, China. (Sponsor: Mark Tremblay, FACSM)

Email: docliuyang@hotmail.com

(No relevant relationships reported)

There is limited evidence for the prevalence of the co-existence of meeting physical activity (PA) and sedentary behavior (SED) guidelines, and their correlates among children and adolescents.

Purpose: To investigate the prevalence of PA and SED guidelines, and their co-existence, and to examine the associations between PA or SED, or both with gender and age among children and adolescents in Shanghai, China.

Methods: Using a cross-sectional study design (conducted from September to December 2014), 50,090 children and adolescents aged 6-18 years old, 50.4% girls, were included in this study. A self-report questionnaire was used to measure participants’ socio-demographic characteristics, PA, and SED. Descriptive statistics were used to describe sample characteristics, the prevalence of meeting PA and SED guidelines, and their co-existence. A Generalized Linear Model was conducted to explore the associations between the prevalence of PA and SED, and their co-existence with gender and age separately.

Results: Of the children and adolescents studied, only 18.4% met the guidelines for PA, 25.5% met the guidelines for SED, and 5.7% met the guidelines for both. Boys and girls were examined separately.
were more physically active (aOR = 1.43, 95% CI: 1.36-1.50), and girls were less sedentary (aOR = 1.29, 95% CI: 1.24-1.34). The prevalence of PA, SED, or both all declined as age increased (p < 0.005).

CONCLUSIONS: Very few children and adolescents showed active lifestyles, and this was significantly related to age. Effective interventions aiming to promote PA and preventively to limit SED among children and adolescents should be implemented as early as possible.

Board #115 May 29 2:00 PM - 3:30 PM
Association Of Cardiovascular Health Trajectories And Cardiorespiratory Fitness: The Cardia Study
Brittany S. Pope1, Jonathan J. Ruiz-Ramírez1, Jacob L. Barber2, Abbi D. Lane-Cordova1, Donald M. Lloyd-Jones1, Mercedes Carnethon2, Cora E. Lewis3, Pamela J. Schreiner4, Michael P. Bantsch5, Stephen Sidney2, Mark A. Sarzynski1, FACSM.

1University of South Carolina, Columbia, SC. 2Northwestern University, Chicago, IL. 3University of Alabama at Birmingham, Birmingham, AL. 4University of Minnesota, Minneapolis, MN. 5Wake Forest University, Winston-Salem, NC. 6Kaiser Permanente Northern California, Oakland, CA.

Ideal cardiovascular health (CVH) is a composite metric of seven health factors and behaviors. How cardiorespiratory fitness (CRF) is related to CVH is unclear. Purpose: To identify associations of CVH trajectories throughout adulthood with CRF in late-middle age. Methods: CVH components were measured in Black and White adults [N=2723, aged 18-30 yrs. at baseline] in the CARDIA Study at seven in-person examinations over 20 years. Gradated treadmill tests at years 0 and 20 were used to measure CRF (minutes duration). CVH was determined by assigning each metric a score of 2 (ideal), 1 (intermediate), or 0 (poor) and summing the scores (range 0-14). Latent class modeling was used to identify subgroups of individuals with similar CVH trajectories from young adulthood to middle age. Multivariable logistic Poisson regression was used to assess the association between 20-year CVH trajectories and race- and sex-specific quartiles of CRF at year 20. Results: Five distinct CVH trajectories were identified: high (n=485), high-moderate (n=666), moderate (n=805), low-moderate (n=603), and low (n=164). Compared to the high trajectory group, odds ratios for low fitness (bottom quartile) at year 20 were 3.2 (95% CI: 1.9-5.2) for high-moderate, 6.6 (4.1-10.7) for moderate, 9.9 (6.1-16.4) for low-moderate, and 14.0 (8.2-24.0) for the low CVH trajectory groups after adjusting for race, sex, education, center, baseline CVH, and baseline CRF. Conclusion: Lower CVH trajectories throughout adulthood are associated with higher odds of low CRF in late-middle age.

Board #116 May 29 2:00 PM - 3:30 PM
A Prospective Cohort Study of Physical Fitness and Incident Glaucoma: The Niigata Wellness Study
Ryoko Kawakami1, Susumu S. Sawada2, FACSM3, Yuko Gando2, Haruki Momma1, Minoru Tashiro1, I-Min Lee3, FACSM4, Steven N. Blair2, FACSM5, Motohiko Miyachi2, Mitsuhiro Higuchi2, FACSM6, Kiminori Kato1, Hirohito Sone1, Waseda University, Tokyo, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3Tohoku University, Miyagi, Japan. 4Niigata Medical Association of Occupational Health, Niigata, Japan. 5Harvard Medical School, Boston, MA. 6University of South Carolina, Columbia, SC. 7Niigata University, Niigata, Japan. Email: r.kawakami@aoni.waseda.jp

There is limited evidence exploring the association between cardiorespiratory fitness and the incidence of glaucoma. However, associations between other components of fitness and incident glaucoma are still unknown.

Purpose: To investigate the association between muscular and performance fitness and the incidence of glaucoma among Japanese workers in the Niigata Wellness Study. Methods: Participants included 26,138 workers (18,129 men) [median (interquartile range) age 50 (44-56) years] free of glaucoma who underwent physical fitness tests in 2001. Muscular and performance fitness index was calculated using a summed z-score by sex and age from grip strength, vertical jump, single-leg balance and whole-body reaction time. The participants were summed z-score by sex and age from grip strength, vertical jump, single-leg balance and whole-body reaction time. The participants were followed for trends of meeting the PA or SED guidelines, or both in girls with increasing age (all p < 0.005).

CONCLUSIONS: Very few children and adolescents showed active lifestyles, and this was significantly related to age. Effective interventions aiming to promote PA and prevent sedentary behavior as early as possible.

Board #117 May 29 2:00 PM - 3:30 PM
Effects of Arterial Stiffness Between Objectively Measured Physical Activity and Domain-Specific Cognition in Older Adults
Leidyss Gutierrez-Martinez, Angelique Brellenthin, Duck-choo Lee, FACSM, Iowa State University, Ames, IA. (Sponsor: Duck-choo Lee, FACSM).

Email: leidyss@iastate.edu

(Purpose: To examine the effects of arterial stiffness (AS) on the associations between objectively measured physical activity (PA) and domain specific cognitive functioning in older adults. METHODS: This cross-sectional analysis included baseline data from 415 older adults enrolled in the Physical Activity and Aging Study (PAAS). Cognitive functioning was measured by working memory using Digit Span Test and selective attention and processing speed using computerized Stroop Test. PA over 7 days was measured with Omron accelerometer-based pedometers and time engaged in light-, moderate-, and vigorous-intensity PA with Fitbit Charge 2 wristbands. AS was derived from carotid-femoral pulse wave velocity (cPWV, ACor Sphygmocor XCEL). High AS was defined as cPWV >20 m/s, which is an established risk factor of cardiovascular diseases. Multivariable linear regression was used to model the associations between PA, AS, and each cognitive-domain score. RESULTS: Participants were a mean age of 72 (±6) years old and were well educated with 82% having a bachelor’s degree or higher. Participants were also considered healthy (Mean Score of Mini-Mental State Examination 29.2 [±1.29] out of 30). Participants with high AS (20.96%), n=87) accumulated fewer total steps per day (p=0.01), engaged in less light-intensity PA (p=0.01), and had worse precision on the Stroop test (p<0.01) compared to those with low AS. There were no significant group differences for other cognitive test scores. Light-intensity PA was associated with better performance on the digit span forward among those with high AS (p=0.01), but not those with low AS, after adjusting for age, sex, education, diabetes, hypertension, and current smoking status (p=0.01) from linear regression. However, no significant results were found in other PA variables regardless of AS status. CONCLUSIONS: These results suggest a possible association of increased light-intensity PA with better working memory, particularly among older adults with high AS who are at higher risk of developing cardiovascular diseases. Supported by unrestricted research grant by Biospace

Board #118 May 29 2:00 PM - 3:30 PM
Benefits of Behavior: Exercise Enhances Perception of Physical Function Independent of Improvement Among Diabetic Patients
Shahnam A. Behin1, Cynthia Villalobos1, Nathaniel J. Holmgren2, Alexis C. King1, J. Mark VanDussel1, Paul D. Vostl1, Courtney D. Jensen3, University of the Pacific, Stockton, CA. 4University of Illinois at Urbana-Champaign, Champaign, IL. 5St. Joseph’s Medical Center, Stockton, CA. Email: s.behin3@u.pacific.edu

(Purpose: To determine factors that affect perception of physical function in diabetic patients. METHODS: 38 men and women with diabetes completed a 10-week, 20-session exercise program that included both aerobic and resistance training components. At baseline and follow-up, we measured body fat percent (BF%), body mass index (BMI), and performance on...
six standard functional tests. Subjects also completed a self-report QOL questionnaire in which perception of physical function was assessed. Linear regressions tested the effect of functional performance (baseline capacity and 10-week change) on perception of function. RESULTS: Patients were 67.9±9.1 years of age, mean BMI was 31.5±6.1, and self-reported physical functioning ranged from 5.0 (very poor) to 100.0 (optimal); mean score was 54.7±25.8. At baseline, perception of physical functioning was not related to sex (p=0.731), age (p=0.405), BMI (p=0.610), or BFR (p=0.864). It was related to improved performances in six-mile walk (p<0.001), functional reach (p=0.046), timed up-and-go (p=0.080), chair stand (p=0.006), and sit-and-reach (p=0.024). At follow-up, perceptions of functioning improved by 13.8±24.5 points (25.7%: p<0.002) but there was no association with improvement in any anthropometric or functional tests: BMI (p=0.457), BFR (p=0.526), six-minute walk (p=0.131), functional reach (p=0.293), timed up-and-go (p=0.226), arm curl (p=0.966), chair stand (p=0.592), and sit-and-reach (p=0.441). CONCLUSION: 10 weeks of exercise improved perception of physical function by more than 25% in patients with diabetes. Improvement was unrelated to enhancement of any anthropometric or performance domain. Patients with diabetes seem to improve their perceptions via participation rather than progress. Thus, it may be important to incorporate the behavior of exercise into treatments, even if it fails to elicit physical improvement.

Sedentary behavior and physical inactivity have increased with advancements in technology. College students are high utilizers of computers and mobile devices, often for long periods with poor posture, putting them at risk for negative health consequences. PURPOSE: To evaluate the effects of sedentary behavior and physical activity participation on core strength, flexibility, and posture in college students. METHODS: College students (N=33; n=22 female, n=11 male) completed physical measures and questionnaires of sedentary behavior (SB) and physical activity (PA). Curl-up tests, sit and reach, and plumb line assessments indicated core strength, flexibility, and posture, respectively. Two-way ANOVAs were performed with participants categorized by their posture measures (rounded shoulders; RS, and forward head posture; FHP) on weekday and weekend SB, and PA per week. Associations were determined between SB, PA, core strength, flexibility, and body fat percentage by computing Pearson’s correlation coefficients. RESULTS: There were no significant differences in SB and PA between postural groups. However, participants with RS and FHP spent an hour more per day being sedentary on average than those with RS alone (RS & FHP: SB weekday, M=3.74 hrs ± 0.79, SB weekend, M=3.74 hrs ± 0.9; RS only: SB weekday, M=2.62 hrs ± 0.36, SB weekend, M= 2.77 hrs ± 0.48). SB was associated with decreased flexibility (SB weekday: r=−0.47, p<0.01; SB weekend: r=−0.48, p<0.01), while physical inactivity was associated with higher body fat percentage (r=0.36, p<0.04) and decreased core strength (r=0.51, p<0.01). Furthermore, college students who were sedentary during the week were also sedentary on the weekend (r=0.82, p<0.01). CONCLUSIONS: Sedentary behavior and physical inactivity were associated with negative changes in core strength, flexibility, posture, and body composition. Interventions targeting improvements in these behaviors among college students should include guidance on reducing screen time and limiting improper posture.

PURPOSE: Body mass index (BMI) and cardiorespiratory fitness (CRF; VO\textsubscript{2peak}) are significant predictors of cardiovascular health with high CRF being protective in the presence of high BMI. The current analysis aimed to determine relative contribution of overweight (OW) vs obese (OB) BMI while cross-stratifying with higher (HF) and lower (LF) CRF on blood lipids and glycemic markers. We hypothesized that an OW-HF group was more likely to have normal biomarkers compared to the OB-LF CRF group.

METHODS: Insufficiently-active participants (N=89, male=22, female=67, BMI range=25-50) underwent the following assessments with the following cut-points for normal/abnormal: fasting glucose (GLU, ≤100 mg/dL), insulin (≤10 μIU/mL), HOMA-IR (≤2.5), total-cholesterol (TC, ≤200 mg/dL), LDL-cholesterol (LDL-C, ≤130 mg/dL), HDL-cholesterol (HDL-C, male ≥40 mg/dL, female ≥50 mg/dL), triglycerides (TG, ≤150 mg/dL). BMI was calculated from measured height and weight and VO\textsubscript{2peak} was estimated using a modified Balke protocol. BMI was stratified by overweight/obese cut-offs; high/low fitness was stratified at ≥6-MET from VO\textsubscript{2peak}. Groups were: OW-HF (n=28), OW-LF (n=36), OB-HF (n=5), OB-LF (n=20). Odds ratios (OR) for having normal biomarker concentrations were reported using multiple logistic regressions (α = 0.05).

RESULTS: Participants biomarker concentrations were (mean±SD): GLU: 92.0±8.8 mg/dL, insulin: 14:1±8.4 μIU/mL, HOMA-IR: 3.3±2.2 AU, TC: 173.5±29.5 mg/dL, LDL-C: 119.6±29.0 mg/dL, HDL-C: 48.9±11.3 mg/dL, and TG: 109.1±47.5 mg/dL. Measured height and weight confirmed BMI (33.4 ± 5.9 kg/m\textsuperscript{2}). Estimated VO\textsubscript{2peak} was 25.3± 3.8 mL/kg/min. Compared to OB-LF, the OW-HF group was more likely to have normal HOMA-IR (OR 1.6; 95%CI = 1.04, 2.4; p = 0.03) and desirable HDL-C concentrations (OR 1.9; 95%CI = 1.2, 2.8; p = 0.001). No significant cross-stratified differences for HDL-C or HOMA-IR were observed. There were no significant differences for the other five biomarkers.

CONCLUSIONS: In this sample of insufficiently-active overweight and obese individuals, when cross-stratifying by CRF and BMI, a combination of OW and HF factors were related to normal HOMA-IR and HDL levels.
outcomes were presented in relative values (e.g., PA/waking hour). Linear mixed models were performed to determine the associations of nighttime sleep duration with PA, ST, and sedentary time using fixed effects of month and ambient temperature and random effects of individuals. RESULTS: The number of steps walked on each day was negatively associated with ambient temperature. RESULTS: Seventy children provided valid data of PA, ST, and sleep. On average, the children accumulated 50% of their hours of PA, ST, and sleep for 9.72 hours (SD 0.97) sleep. Sleep duration in the preceding night was positively associated with daytime PA (β = 0.007; 95% CI, 0.002 to 0.012; p = 0.011) and sit-to-stand transitions (β = 0.573; 95% CI, 0.336 to 0.810; p < 0.001), while was negatively associated with ST (β = -0.016; 95% CI, -0.028 to 0.004; p = 0.008) the following day. CONCLUSIONS: Longer nocturnal sleep duration was associated with more PA, frequent posture transitions, and less sitting time in the following day for preschool children. More work is needed to investigate how sleep parameters other than duration affect daytime activity behaviors. This study was supported by Health and Medical Research Fund Research Fellowship Scheme from Food and Health Bureau, the Government of the Hong Kong Special Administrative Region of the PRC (#02160127).

890
Board #124
May 29 2:00 PM - 3:30 PM
Diurnal and Circannual Variation in Body Temperature: Implications for Heat Illness Protocols
Nathaniel J. Holmgren1, J. Mark VanNess2, Lewis E. Jacobson3, Jonathan M. Saxe4, Courtney D. Jensen5. 1University of the Pacific, Stockton, CA; 2St. Vincent's Hospital, Indianapolis, IN; 3National Cancer Institute, Bethesda, MD. Email: n_holmgren@u.pacific.edu

As warm-season temperatures continue to rise, the incidence of heat illness is likely to increase. Although preventive protocols currently consider environmental risk factors, there may be reason to emphasize diurnal and seasonal effects. Data supporting seasonal fluctuation in body temperature are abundant in animals but limited in humans. PURPOSE: To examine circannual and diurnal patterns of body temperature in a patient population.

METHODS: We analyzed 2,184 men and women admitted to a major hospital in Indiana over 3 years. Demographic, anthropometric, and cardiometabolic variables were collected along with weight, height, age, gender, smoking status, and alcohol consumption. The National Centers for Environmental Information’s National Climate Report was used to generate month-by-month ambient temperature data; there were clearly defined cold (October through April) and warm (May through September) periods. All patients received oral temperatures. We used t-tests and ANOVAs to detect differences in body temperature by time conditions; we used linear regression to test the effect of chronological variables on body temperature, holding all measured confounders constant. RESULTS: Mean body temperature was 98.16 ± 0.73°F. The warmest period of the day was 6:00 to 10:00pm (98.27°F). The coldest period was 2:00 to 6:00am (98.05°F; p < 0.001). ANOVA revealed differences in body temperature by month (F = 5.255; p = 0.004) and by season (F = 3.656; p = 0.012). The strongest comparison was the cold vs. warm period (T = 3.835; p < 0.001). Patients admitted during the cold period (N = 1,139) had a temperature of 98.10 ± 0.81°F while patients admitted during the warm period (N = 1,045) had a temperature of 98.22 ± 0.63°F (p < 0.001). Lower temperatures were also found among patients ≥ 65 years (p < 0.001) and those with a positive blood alcohol test (p = 0.004). Holding all measured confounders constant, being admitted during the warmer months predicted an elevation in body temperature of 0.13°F (p < 0.001). CONCLUSION: These findings support diurnal and circannual variations in body temperature. There may be reason to emphasize these effects when designing and monitoring practice conditions. Athletes will likely require closer observation along with updated prevention protocols when practicing outdoors to minimize the risk of a heat-related event.

891
Board #125
May 29 2:00 PM - 3:30 PM
Compliance with Physical Activity Guidelines and Associations with Physical Literacy Among Future Physical Educators
Katherine E. Spring, Megan E. Holmes, Yonjoong Ryuh, Chih Chia Chen. 1Mississippi State University, Starkville, MS. 2St. Vincent’s Hospital, Indianapolis, IN. Email: katherine.spring@mississippistate.edu

Purpose: To examine the relationship between pre-professional physical educators meeting the U.S. Physical Activity Guidelines and steps per week and physical literacy. METHODS: Twenty-five physical education teacher education (PETE) undergraduate majors (19 males, 6 females, aged 19–24 years) participated in assessments of Physical Literacy using the Canadian Assessment of Physical Literacy and wore GTX3+ accelerometers on their waist for a week. Freedman 1998 cut-points were used for determining moderate-to-vigorous physical activity (MVPA). Descriptive statistics were calculated for all variables. Correlations were calculated to examine the relationships between measured MVPA, measured steps, Physical Literacy, self-reported PA and sedentary time, and physical competence. RESULTS: 16% were compliant with MVPA guidelines, 4% were compliant with both MVPA and 10,000 steps recommendations, 56% met MVPA but were considered low active steps, and 24% did not meet any recommendations. Participants’ physical literacy considered below that of a proficient 12-year-old. Significant relationships existed between self-reported PA and Physical Literacy (r = 0.40, p < 0.05), and MVPA and Physical Literacy (r = 0.42, p < 0.05); however, no other relationships existed. CONCLUSIONS: These findings suggest that while PETE students may meet the minimum guidelines for physical activity, more work needs to be done to address their Physical Literacy.
CONCLUSIONS: The results suggest that walking, unlike leisure-time physical activity, may not be generally associated with sunburn, except for the higher sunburn prevalence for men who walked for both leisure and transportation purposes. Research is needed into public health messages that encourage walking for physical activity and advise sun protection, with special attention to men.

Neighborhood walking environment is an environmental issue affecting human health-related behaviors in China and worldwide. Few studies so far have researched the relationship between neighborhood environment walkability and physical activity among freshmen in China.

PURPOSE: We examined the relationship between neighborhood environment walkability and physical activity. METHODS: Neighborhood environment was measured using the Neighborhood Environment Walkability Scale for Youth (NEWS-Y). Physical activity data by the Global Physical Activity Questionnaire (GPAQ) were collected. The data were analyzed by Stata14.0. RESULTS: We conducted a cross-sectional questionnaire study on 3,411 freshmen from Tsinghua University in Beijing, China. Of the total sample size, 2,318 were male (67.96%) and 1,093 were female (32.04%). One of seven environmental attributes were significantly related to moderate vigorous physical activity (MVPA) (MET-minutes/week): walking facilities (75.56 [5.36-145.76]; p=0.005). Two of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week) in neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008). One of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week) in neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008). One of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week): walking facilities (75.56 [5.36-145.76]; p=0.005). Two of seven environmental attributes were significantly related to moderate vigorous physical activity (MVPA) (MET-minutes/week): neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008). One of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week): walking facilities (75.56 [5.36-145.76]; p=0.005) and neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008). One of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week): walking facilities (75.56 [5.36-145.76]; p=0.005) and neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008).

RESULTS: The findings indicated that overall older adults spend in NSST and SST. Older males reported spending significant higher SST compared to their older female counterparts (4.5 vs. 3.1; P<.05). Those not making use of a mobility aid reported significant higher SST (10.2 vs. 9.3) and NSST (6.8 vs. 5.6) compared to those using a mobility aid (P<0.05). Older adults presenting with ≥3 chronic diseases reported significant higher SST (10.6 vs. 9.5) and NSST (6.9 vs. 5.5) compared to those with less than 3 chronic diseases (P<0.05). No differences were observed for TST, NSST and SST between older adults engaged and not engaged in a regular exercise. The findings further indicated that activities such as TV watching and reading comprise nearly 45% of participants’ TST and computer use accounted for about 12%. CONCLUSION: The findings indicated that older adults living in a RC spend a large number of hours in sedentary activities and that 65% of this time is spent in sedentary activities.

PURPOSE: To investigate the effect of daily (24-hour) activity behaviors (sleep, sedentary, light and moderate physical activity (LPA and MVPA)) on cardiometabolic risk among older women, using a compositional data analysis approach.

METHODS: Participants from the Healthy Women Study 2010-11 follow-up visit (N= 145, aged 73±1.7 years, white; 91.5%) wore an Actigraph GT3X accelerometer (hip) and an Actiwatch-2 (wrist) for 7 consecutive days, to objectively monitor physical activity and sleep. The estimated duration of sleep, sedentary, LPA, and MVPA, were averaged across valid wear days (≥4 days of ≥10 hours). For each participant a composite cardiometabolic risk score was calculated by transforming metabolic syndrome (MetS) components including waist circumference, blood pressure, fasting triglyceride, fasting high-density lipoprotein (HDL), and fast blood glucose into z-scores and summing z-scores to create a continuous MetS z-score. A 24-hour time composition of activity behaviors was derived and isometric log-ratio multivariable linear regression was used to predict MetS z-score. Additional 24-hour compositions were created where a fixed duration of time was reallocated from one activity behavior to another (e.g., sedentary to LPA), while time spent in the remaining activities was unchanged. Reallocation was defined as 15 minutes for sleep, sedentary, LPA and MVPA, and 5 minutes for MVPA. RESULTS: Participants had a mean MetS z-score (0.4±2.2). Mean daily time (minutes) spent in activity behaviors was 403, 749, 282, and 7; for sleep, sedentary, LPA and MVPA, respectively. The 24-hour composition was a statistically significant correlate of MetS z-score (P<0.001). Reallocation of 5 minutes from MVPA to sleep, sedentary, and LPA, increased the predicted MetS z-score by 1.07, 1.07, and 1.06, respectively. The predicted MetS z-score was reduced by 0.88, 0.91, and 0.85 when 15 minutes of sleep, sedentary, or LPA was replaced with MVPA. Reallocating 15 min of sedentary time to LPA reduced the predicted MetS z-score by 0.05. CONCLUSIONS: This cross-sectional study demonstrates the beneficial effect of MVPA on cardiometabolic risk among older women. The exchange of sedentary time for LPA may also reduce cardiometabolic risk in older women.
spend in SSST and 35% in SST. The findings further suggest that significant gender, mobility aid, and chronic disease variations exist in terms of TST, SSST and SST in this population. Supported by Dean’s Research Grant COE-NIU (2017-2018)

**897** Board #131
May 29 2:00 PM - 3:30 PM
**Geographical Effects In Familial Clustering Of Physical Activity, Adiposity And Metabolic Syndrome**

Raquel N. Chaves¹, Michele C. Souza², Thayse N. Gomes², Fernanda K. Santos³, Sara Pereira¹, Vincent P. Diego⁴, Adam Baxter-Jones⁵, José Maia⁶. ¹Federal University of Technology of Paraná, Curitiba, Brazil. ²Federal University of Santa Catarina, Florianópolis, Brazil. ³Federal University of Sergipe, Aracaju, Brazil. ⁴Federal University of Viçosa, Viçosa, Brazil. ⁵CIFID, Faculty of Sport, University of Porto, Porto, Portugal. ⁶University of Texas Rio Grande Valley, School of Medicine, South Texas Diabetes and Obesity Institute, Brownsville, TX.

Email: raquelmichele@live.com.pt

(No relevant relationships reported)

Metabolic syndrome (MetS) risk factors, adiposity and physical activity (PA) levels have a multifactorial aetiology, comprising genetic and non-genetic factors. Notwithstanding the consistent findings about their aetiology, biological and behavioural traits do not explain the total variation and the increase of metabolic disorders and physical inactivity over the past decade. Additionally, links may be identified between built and natural environments, namely PA environments, on adiposity, MetS and PA phenotypes, as well as how they may affect different behaviours, especially within families. PURPOSE: The purpose of this study was to estimate the magnitude of genetic and environmental factors on adiposity, MetS risk factors and PA levels, and to investigate the role of PA environments on these traits.

METHODS: The sample comprised 259 nuclear families (781 individuals) from a rural city of Portugal. All PA facilities’ locations and families’ home addresses were geocoded and Euclidian distances were calculated. Percentage of total body fat was estimated by bioelectrical impedance. Systolic and diastolic blood pressure, waist circumference, fasting glucose, triglycerides and total cholesterol were measured. PA was estimated by the Baecke questionnaire. Quantitative genetic models were used and computations performed with Mx AR software.

RESULTS: Genetic and shared environmental factors explained 22% and 38% of PA and body fat total variance, respectively. MetS risk factors were moderate-to-highlyheritable, ranging from 26% to 73%. Spatially structured data of PA environments had significant effects on MetS risk factors, adiposity and PA phenotypes (p<0.05), except for waist circumference, contributing to low adiposity levels (p=0.05), increases in PA (p=0.05), and being protective against the development of MetS risk factors (p=0.05).

CONCLUSIONS: Taken together, these results have important implications for the design of intervention programs, which need to consider the familial context and PA environments to promote physically active lifestyles and their positive effects on health.

**898** Board #132
May 29 2:00 PM - 3:30 PM
**Objectively-Measured PA and Sedentary Behavior Across The Lifespan Of Individuals With and Without Metabolic Syndrome**

Lunden C. Burton, Eduardo Bustamante, FACSM. University of Illinois at Chicago, Chicago, IL.

Email: lburto2@uic.edu

(No relevant relationships reported)

PURPOSE: To investigate whether PA and sedentary behavior (SB) differ across the lifespan of individuals with and without metabolic syndrome (MetS). Few studies investigating lifestyle behavior in this population have utilized objective measures of PA or included youth.

METHODS: Participants from NHANES 2003-2006 (ages 6-85) were divided into 5 age categories: Childhood (<12 years) (N=6,672), adolescence (13-19 years) (N=5,938), early adulthood (20-40 years) (N=5,537), middle adulthood (40-64 years) (N=5,176), and late adulthood (≥65) (N=3,730). Classification of MetS was based upon waist circumference (men>40", women>35"), triglycerides (>150 mg/dl), HDL cholesterol (men<40 mg/dl, women<50mg/dl), plasma glucose (>110 mg/dl or medicated), and blood pressure (≥130 mmHg or medicated). Status of 25OHD was defined as: severe/deficient ≤ 37.5 nmol/L, insufficient > 37.5 to < 50 nmol/L, and sufficient ≥ 50 nmol/L. Relative strength percentile was also highest for girls with sufficient 25OHD compared to the insufficient or severe/deficient groups, 51.8 (1.9), 45.6 (2.4), and 41.1 (3.3), respectively (p<0.05).

CONCLUSIONS: Youth with less than sufficient levels of 25OHD were consistently found to have lower relative handgrip strength and were more likely to have low strength values below the 25th percentile. These findings underscore the importance of vitamin D for muscular strength in youth and future prospective studies to elucidate the mechanisms would be of benefit.

**900** Board #134
May 29 2:00 PM - 3:30 PM
**Is Seasonal Affective Disorder A Symptom Of A Larger Collection Of Sedentary And Obesity-related Disorders?**

Stephanie Ta¹, Nathaniel J. Holmgren¹, J. Mark VanNess¹, Alexis C. King², Lewis E. Jacobson³, Jonathan M. Saxe⁴, Courtney D. Jensen⁵. ¹University of the Pacific, Stockton, CA. ²University of Illinois at Urbana-Champaign, Champaign, IL. ³St. Vincent Hospital, Indianapolis, IN.

Email: s_ta2@u.pacific.edu

(No relevant relationships reported)

Seasonal affective disorder (SAD) is a subtype of major depressive disorder (MDD) that occurs during cold and overcast months. Physical activity (PA) is known to counteract depressive symptoms; however, the relationship between seasonal changes in PA and MDD is largely unexplored. Physical inactivity and consequent weight gain may contribute to a host of cardiometabolic and cerebral complications, with SAD being one diagnostic feature. PURPOSE: To evaluate seasonal differences in MDD among obese and non-obese patients in conjunction with cardiovascular, metabolic, and cerebral diagnoses.

METHODS: We analyzed 2,306 consecutively-admitted patients at a Midwestern hospital over 3 years. Mean environmental temperature of the hospital’s city during each of the 36 months was computed. Patients were assessed for obesity, MDD, diabetes, hypertension, peripheral vascular disease, congestive heart failure, cerebrovascular accidents, and dementia. Logistic regressions tested the effects of season and temperature on all diagnoses. RESULTS: Patients were 51.2±12.4 years old, 16.3% were obese, 1.1% had MDD, 14.3% had diabetes, 36.8% had hypertension, 0.7% had peripheral vascular disease, 4.4% had congestive heart failure, 3.6% had a cerebrovascular accident, and 4.6% had dementia. Between March 1 and June 30, MDD incidence was 532.8% higher than it was during all other months (p<0.001). These were not the coldest months (mean temperature was 5.9°F higher during this
period; p<0.001), but it was the period of greatest obesity (33.3% higher incidence; p=0.003). Likewise, colder temperature was a poor predictor of MDD (p=0.465), but predicted elevated levels of psychosomatic incidence (p<0.001), fatigue (p=0.034), hypertension (p<0.001), congestive heart failure (p=0.013), peripheral vascular disease (p=0.058), cerebrovascular accidents (p=0.003), and dementia (p=0.001). CONCLUSION: MDD diagnosis was highest at the end of the cold season, when obesity was at its peak; in turn, the likelihood of numerous obesity-related diagnoses was increased. This suggests a possibility of seasonal incidence of depression is not exclusively caused by diminished exposure to sunlight. Perhaps a colder environment limits engagement in PA; in turn, SAD is one component of a larger picture, which includes dysfunction of numerous systems.

**Results**

Forty-five (15%) older adults had AJ. T-scores were higher in individuals with AJ compared with individuals without AJ in both men (-0.6 vs. 1.9) and women (-1.4 vs. 0.6) (both p<0.01) since most materials in AJ (e.g., metals) are considered as bone tissues by DXA. LF, EE, and EF were positively associated with BMD in men without AJ (all p<0.05), but not in men with AJ after adjusting for the possible confounders including BMI. There were no associations between MS variables and BMD in women, regardless of AJ status (all p>0.05). Compared with the lowest (weakest) third of LF, ORs (95% confidence intervals) of low BMD for the middle and upper thirds of LF were 0.40 (0.15-1.08) and 0.27 (0.09-0.85) among men without AJ after adjusting for the possible confounders without BMI. We found similar results in LE. However, no associations were observed after further adjustment for BMI, possibly due to the confounding effects of BMI on both MS and BMD.

**Conclusion**

Higher MS appears to be associated with higher BMD and lower odds of having low BMD in men without AJ, but not in men with AJ. These results indicate that AJ status should be considered in studies of muscular strength and bone health in older adults. Supported by unrestricted research grant by Biospace.

**Purpose**

Antifungal Joints (AJ) are prevalent in older adults, yet commonly ignored in bone related studies. We examined the effect of AJ on the association between muscular strength (MS) and whole-body mineral density (BMD) in older adults. Methods: This cross-sectional study included 303 older adults (58% women) 65 years old from the Physical Activity and Aging Study (PAAS). MS (peak torque at 60°/sec) was assessed by leg extension (LE), leg flexion (LF), elbow extension (EE), and elbow flexion (EF) on the dominant limbs using isokinetic dynamometry (Biodex). Whole-body BMD (t-score) was assessed by dual-energy X-ray absorptiometry (DXA). Low BMD was defined as t-score <-1. Standard AJ status was identified via medical history questionnaire. Linear and logistic regression were conducted in stratified samples of AJ status (yes/no) and sex including MS, age, hormone therapy (women only), smoking, cardiopulmonary fitness (400-meter walk test), physical activity, and body mass index (BMI). Odds ratios (ORs) of low BMD by sex-specific tertiles of MS were calculated in each stratum.

**Results**

Forty-five (15%) older adults had AJ. T-scores were higher in individuals with AJ compared with individuals without AJ in both men (0.6 vs. 1.9) and women (-1.2 vs. 0.6) (both p<0.01) since most materials in AJ (e.g., metals) are considered as bone tissues by DXA. LF, EE, and EF were positively associated with BMD in men without AJ (all p<0.05), but not in men with AJ after adjusting for the possible confounders including BMI. There were no associations between MS variables and BMD in women, regardless of AJ status (all p>0.05). Compared with the lowest (weakest) third of LF, ORs (95% confidence intervals) of low BMD for the middle and upper thirds of LF were 0.40 (0.15-1.08) and 0.27 (0.09-0.85) among men without AJ after adjusting for the possible confounders without BMI. We found similar results in LE. However, no associations were observed after further adjustment for BMI, possibly due to the confounding effects of BMI on both MS and BMD.

**Conclusion**

Higher MS appears to be associated with higher BMD and lower odds of having low BMD in men without AJ, but not in men with AJ. These results indicate that AJ status should be considered in studies of muscular strength and bone health in older adults. Supported by unrestricted research grant by Biospace.

**Purpose**

Green exercise may have psychological benefits. This study compared changes in anxiety, mood, directed-attention abilities, and stress after walking in green and suburban environments. Changes in Psychological State Measures After Green Versus Suburban Walking Exercise: A Pilot Crossover Study

**Methods**

A total of 44 participants were recruited from a convenience sample of community-dwelling adults living in Iowa City, Iowa. Participants were randomly assigned to one of two walking conditions: green walking or suburban walking. An outdoor green walking environment was created by combining walking in a 2.7-acre nature preserve with walking in a nearby neighborhood. The suburban walking environment included walking in a 1.5-acre neighborhood. Each walking condition included 60 minutes of walking three times per week for 3 weeks. Participants completed pre- and post-walk measures of anxiety, mood, directed-attention abilities, and stress. Pre- and post-walk measures were assessed using the State-Trait Anxiety Inventory, the Positive and Negative Affect Schedule, the Wide-Range Assessment of Memory and Learning, and the Stress Scale. Linear mixed models for repeated measures assessed pre- to post-walk changes between treatments. Baseline BDS scores were included as a covariate in the BDS outcome model to control for a learned effect.

**Results**

Pre-walk outcomes were similar between walking conditions. Results indicated that anxiety decreased after green walking and increased after suburban walking (-1.2 vs. 0.11 units, respectively; p<0.001). For mood, positive affect improved after green walking and decreased after suburban walking (1.26 vs. -0.32 units, respectively; p<0.001). For negative affect that decreased marginally after green and suburban walking (-0.59 vs. -0.04 units, respectively; p=0.06). Directed-attention abilities did not improve after green and suburban walking (-0.09 vs. -0.08 units, respectively; p>0.9). Stress levels were slightly but not significantly reduced after green and suburban walking (-0.91 vs. -0.69 units, respectively; p>0.5). There were no sequence effects. Finally, no carryover effects were observed - suggesting adequate washout between treatments.

**Conclusions**

Green exercise was effective in reducing anxiety and improving mood in this sample but not in improving stress and directed-attention. Future research should identify the optimal dose of green exercise for maximum psychological health gain.
Adolescence is often viewed as a critical window for the development of healthy behaviors which can prevent the development of metabolic risk factors and related comorbidities. Although there is evidence of the independent associations of physical activity with subject and contextual factors, few studies examined the joint longitudinal links of these factors. PURPOSE: We aim to model longitudinal changes in youth total physical activity (TPA) as a function of their biological maturation (BM), sex, weight status, socioeconomic status (SES), physical fitness (PF), sleep habits, fruits and vegetables consumption and built environment. METHODS: This is a mixed longitudinal study and the data comprised 3715 adolescents (3621 girls) divided into four age cohorts (10 to 12, 12 to 14, 14 to 16 and 16 to 18 years) measured annually for three consecutive years. TPA was estimated using the Baekke questionnaire; BM was indirectly assessed by the maturity offset; weight status was defined with cut-off points for age and sex defined by the International Obesity Task Force; SES was determined by the Portuguese schools’ social support system; PF was assessed with the Fitnessgram test battery; sleep habits, fruits and vegetables consumption and built environment information were obtained by questionnaire. Random effects mixed-models were used and computations done in SuperMix v1. RESULTS: GIRLS’ TPA at baseline (10 years) was 7.27 points (possible range: from 3 to 15), being boys significantly lower (p<0.01). No association was detected between BMI, PA, and ST. CONCLUSION: Although mean MPVA indicates compliance with current PA recommendation for children, lower values at 4th grade suggests a potential trend that must be addressed. No consensus yet exists regarding ST among children; however, the increase from 2nd to 3rd grade is another potential pattern to watch. Results also suggest that BM classification might not affect PA and ST behavior in these young children. Supported by UPRRP/DIE/FIP/FPI.

Fracture is a common source of morbidity and mortality in the elderly, approximately 10% of falls resulting in fractures. PURPOSE: To examine whether physical activity could reduce the risk of falls and fall-related fractures in the elderly. METHODS: This cross-sectional study included 390 older adults aged ≥65 years (mean age 72). Participants were free of diabetes and cardiovascular disease events that occurred within the past 2 years. CRF was assessed by time (minutes) to complete a 400-m walk test and MS by grip strength (Jamar Plus+ 12-064). Carotid-femoral pulse wave velocity (PWV) was used to assess AS (AcCor, Sphygmocor Xcel). High AS was defined as a PWV of 10 m/s or greater, as it has been established as a threshold for increased cardiovascular risk. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having high AS across sex-specific tertiles of CRF and MS. Further, CRF and MS were dichotomized into either weak or unfit (lower one-third), or strong or fit (upper two-thirds) in a joint analysis of CRF and MS with high AS. All logistic regression models included age, mean arterial pressure, body mass index, physical activity, smoking, heavy alcohol consumption (>14 drinks per week for male, >7 for female), and MS or CR for each other. Results: Sixty-three (16%) adults were identified as having high AS. Compared to the lowest CRF tertile (lowest 33%), ORs (95% CIs) of having high AS were 0.36 (0.16-0.81) and 0.51 (0.21-1.22), for middle and upper CRF, respectively, after adjusting for the possible confounders including MS. Compared to the lowest MS tertile (lowest 33%), ORs (95% CIs) of having high AS were 0.68 (0.33-1.39) and 0.31 (0.13-0.74), for middle and upper MS, respectively, after adjusting for the possible confounders including CRF. In the joint analysis, compared to the unfit and strong group, ORs (95% CIs) for high AS were 0.47 (0.16-0.81) for unfit and strong, 0.37 (0.13-1.04) for fit and weak, and 0.25 (0.12-0.60) for fit and strong. Conclusion: Higher levels of both CRF and MS were independently associated with reduced odds of having high AS in older adults. Future prospective studies could evaluate longitudinal associations of CRF and MS and estimation of age-related AS, which is an emerging risk factor for cardiovascular diseases. Supported by unrestricted research grant by Biospace.
of 100 participants, 54 (17 M, 37 F) had normal (<120/<80 mmHg) blood pressure (EBP, 120-129/<80 mmHg) or hypertension (Stage 1, 130-139/80-89 mmHg; Stage 2, ≥140/90 mmHg) than before. Prevalence of hypertension in the lower blood pressure (EBP, 120-129/<80 mmHg) or hypertension (Stage 1, 130-139/80-89 mmHg; Stage 2, ≥140/90 mmHg) was much higher than expected in this apparently healthy, physically-active college-aged group. It is a matter of debate if this group should be considered an important target for lifestyle modifications beyond physical activity, or if the new guidelines are applicable in this particular group.

### Table 1. Characteristics of subjects in baseline

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<th>PAL</th>
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</tr>
<tr>
<td>Bone density(T value)</td>
<td>M</td>
<td>-0.57(0.81)</td>
<td>-0.48(0.75)</td>
<td>-0.40(0.76)</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-1.28(0.79)</td>
<td>-1.15(0.74)</td>
<td>-1.02(0.76)</td>
<td></td>
</tr>
</tbody>
</table>

The RR of falls of "Moderate" decreased significantly compared with "Low" (RR=0.83, 95%CI=0.59-1.16). The RR of fall-related fractures of "Moderate" and "High" decreased significantly compared with "Low" (RR=0.58 and 0.69, 95%CI=0.26-1.2 and 0.37-1.27). (Figure 1)

#### Conclusions:
- Physical activity could increase the bone density; and the moderate PAL could decrease the RR of falls and fall-related fractures of the elderly. Though the high PAL could increase the RR of falls which might be explained by the increasing of outdoor activities, it could reduce the incidence of fall-related fractures.

#### Hypertension

Hypertension is an important risk factor for cardiovascular disease. Under the previous hypertension guidelines, 29% of adults in the US aged 18-60+ were hypertensive, with the highest prevalence (63%) in the 60+ age group. Prevalence in the 18-39 age group was the lowest at 7.5%. The newly revised American College of Cardiology/American Heart Association Hypertension Guidelines lowered the threshold for hypertension. Many more individuals are expected to be diagnosed with either elevated blood pressure (EBP, 120-129/<80 mmHg) or hypertension (Stage 1, 130-139/80-89 mmHg; Stage 2, ≥140/90 mmHg) than before. Prevalence of hypertension in the lower end of the young adult group, ages 18-25, is not well characterized, and how the new guidelines apply to this age group has not yet been studied.

### RESULTS

Under the recently-revised hypertension guidelines, the prevalence of elevated BP and Stage 1 and 2 hypertension was much higher than expected in this apparently healthy, physically-active college-aged group. It is a matter of debate if this group should be considered an important target for lifestyle modifications beyond physical activity, or if the new guidelines are applicable in this particular group.

#### Methodology

We hypothesized that hypertension would be <30% in this population.

#### Methods: Resting blood pressure (BP) was measured with a sphygmomanometer according to AHA guidelines in 100 participants (21±2 y, 53 females (F), 47 males (M)) after sitting for 10-15 min. Participants avoided caffeine and exercise for 4 h prior to measurement. All were physically active (athletes or recreationally active exercisers), and none were taking medications or supplements that directly affect resting BP. RESULTS: Of 100 participants, 54 (17 M, 37 F) had normal (<120/<80 mmHg) blood pressure. 25 (13 M, 12 F) had EBP (SBP: 123±4; DBP: 76±10 mmHg), and 21 were classified as either Stage 1 hypertension (n=13, 9 M, 4 F; SBP: 129±6, DBP: 81±13 mmHg) or Stage 2 hypertension (n=8: 7 M, 1 F; SBP: 144±3, DBP: 83±13 mmHg). CONCLUSIONS: Under the recently-revised hypertension guidelines, the prevalence of elevated BP and Stage 1 and 2 hypertension was much higher than expected in this apparently healthy, physically-active college-aged group. It is a matter of debate if this group should be considered an important target for lifestyle modifications beyond physical activity, or if the new guidelines are applicable in this particular group.

### Figure 1. Relationship between PAL and falls and falls and the fall-related fractures (The calculation of relative risk based on the ‘Low’ PAL group)

Reviews of physical inactivity (PIA) have not consistently identified systematic determinants influencing such behavior. Associations in subjective rather than objective measures may be important to consider when designing effective policy targeting PIA. PURPOSE: To analyze predictive variables that could influence PIA and how these variables may inform PIA-reducing policy. METHODS: Data from the 2014 Special Eurobarometer 412 (n = 27,919) were analyzed, including 40 separate variables and the International Physical Activity Questionnaire (IPAQ) for determining physical activity (PA) in MET-min per week. Variables included alternatives to car, places, reasons, and barriers to engaging in PA, memberships to clubs, and categorical responses regarding the extent of agreement with statements about the area, provision of activities, and local governance. A logistic regression model with a likelihood ratio statistic and a backward stepwise method was used to identify what variables contributed to PIA, which was defined as a “low” level based on IPAQ score. PIA was used as the dependent variable (0 = PA and 1 = PIA). Beta values (β) and standard errors (SE) are reported and Nagelkerke R square is indicated. A priori alpha level was set at 0.05. RESULTS: The model for detecting PIA (β = 2.023; p = 0.001; R^2 of Nagelkerke= 0.153) was able to identify 10.7% of the inactive and 96.9% of the active people (74.5% of the total sample). The variables contributing to the detection of PIA were (p = 0.01): having a disability or an illness (β = 0.521, SE = 0.052), not having friends to do sport with (β = 0.314, SE = 0.089), lacking motivation or interest (β = 0.190, SE = 0.073). Additionally, totally agreeing, tend to agree, and tend to disagree regarding the extent of local providers offering enough opportunities to be more active also contributed to the model (β = 0.302-433, SE = 0.04), and being afraid of the risk of an injury (β = 0.407, SE = 0.04), and being afraid of the risk of an injury (β = 0.407, SE = 0.04), and being afraid of the risk of an injury (β = 0.407, SE = 0.04), and being afraid of the risk of an injury (β = 0.407, SE = 0.04), and being afraid of the risk of an injury (β = 0.407, SE = 0.04). Moreover, people who were afraid of injury were more likely to be physically inactive. CONCLUSIONS: Overall, the model was effective for detecting PIA but not for PA. However, when PIA was detected, key subjective factors influencing PIA began to emerge. Greater insight into these subjective mediators will be helpful in drafting effective policy around active living, and therefore better correlates should be included in future public health surveillance efforts.

### Table 1. Characteristics of subjects in baseline
RESULTS: A total of 645 CVD deaths occurred over a mean follow-up period of 13.6 years (SD 7.4 years), for a total of 467,213 person-years of follow-up. Mean WC of the cohort was 94 cm (SD 11 cm). In a Cox proportional hazards model, including age, total cholesterol, HDL cholesterol, systolic blood pressure, current smoking status, and diabetes, WC was independently associated with CVD mortality (p < 0.001). The Harrell’s C-index without WC in the model was 0.834, and 0.837 upon addition of WC to the model. CONCLUSION: In this large population sample of men, WC was significantly associated with cardiovascular disease mortality after adjustment of cardiovascular risk factors. However, the addition of WC to these variables did not meaningfully improve our cardiovascular disease mortality prediction model.

912 Board #146
May 29 2:00 PM - 3:30 PM
The Prevalence of Depression Among Diabetic Patients is Associated with Hemoglobin
1University of California, Berkeley, Berkeley, CA. 2University of the Pacific, Stockton, CA. 3Saint Vincent Hospital, Indianapolis, IN.
(No relevant relationships reported)

More than 400 million adults have diabetes. Complications associated with diabetes poorly impact quality of life, including interactions between cardiovascular risk and depression. A diagnosis of diabetes associates with a three-fold increase in depression. The consequences of low Hb values on increased depression among healthy populations are well defined; however, isolating the relationship within a diabetic population requires further investigation. PURPOSE: To examine changes in depression, total fat mass and FM% in female track-and-field athletes transitioning to senior age, while maintaining or improving their high performance levels. METHODS: A total of 645 CVD deaths occurred over a mean follow-up period of 13.6 years (SD 7.4 years), for a total of 467,213 person-years of follow-up. Mean WC of the cohort was 94 cm (SD 11 cm). In a Cox proportional hazards model, including age, total cholesterol, HDL cholesterol, systolic blood pressure, current smoking status, and diabetes, WC was independently associated with CVD mortality (p < 0.001). The Harrell’s C-index without WC in the model was 0.834, and 0.837 upon addition of WC to the model. CONCLUSION: In this large population sample of men, WC was significantly associated with cardiovascular disease mortality after adjustment of cardiovascular risk factors. However, the addition of WC to these variables did not meaningfully improve our cardiovascular disease mortality prediction model.

913 Board #147
May 29 2:00 PM - 3:30 PM
Changes In Physiological Factors And Performance In Female Track-and-field Athletes Transitioning To Senior
Yuka Tsukahara1, Suguru Torii2, Fumihiro Yamawasa3, Jun Iwamoto4, Takehito Otsuka5, Hideyuki Goto6, Torao Kusakabe7, Hideo Matsumoto1, Takao Akama8.
1Keio University, Tokyo, Japan. 2Waseda University, Tokyo, Japan. 3Marubeni Clinic, Tokyo, Japan. 4Keijo Orthopaedic Hospital, Tatebayashi, Japan. 5Tokai Gakuen University, Nagoya, Japan. 6Shigakkan University, Obu, Japan. 7Kyoto Daini Reit-Cross Hospital, Kyoto, Japan.
Email: yuka.volia@gmail.com
(No relevant relationships reported)

Performance decline in female track-and-field (T&F) athletes transitioning to senior age has been indicated but there has not been any solutions of that yet. PURPOSE: To examine changes of physiological factors in female T&F athletes transitioning to senior and analyze their relationship to performance. METHOD: OF 142 top-level female T&F athletes recruited, we analyzed the data of 38 subjects who were sprinters and jumpers aged 17-18 in the season of 2016. We measured body composition with whole body mode dual-energy X-ray absorptiometry device in post-season of 2016 (Po-16) and 2017 (Po-17). Athletes’ performances were assessed by International Amateur Athletics Federation scoring system. Comparisons were made by a one-way analysis of covariance. RESULTS: Compared to performances in Po-16, 14 athletes (Group A) were able to maintain or improve in Po-17, while the other 24 (Group B) were not able to and the scores were significantly different between the two groups (FM% in Group B in all body parts, while they did not differ in Group A). In a Cox proportional hazards model, including age, total cholesterol, HDL cholesterol, systolic blood pressure, current smoking status, and diabetes, WC was independently associated with CVD mortality (p < 0.001). The Harrell’s C-index without WC in the model was 0.834, and 0.837 upon addition of WC to the model. CONCLUSION: In this large population sample of men, WC was significantly associated with cardiovascular disease mortality after adjustment of cardiovascular risk factors. However, the addition of WC to these variables did not meaningfully improve our cardiovascular disease mortality prediction model.

914 Board #148
May 29 2:00 PM - 3:30 PM
Arterial Compliance is Improved Following a Community-led 12-week Indigenous Wholistic Health and Wellness Program
Erin M. Shellington1, Shannon S.D. Bredin2, Kai L. Kaufman3, Henry Lai1, Jan Hare1, Moss Norman1, Paul ON1, Ryan Rhodes3, Darren E. Warburton4.
1University of British Columbia, Vancouver, BC, Canada. 2University Health Network, Toronto, ON, Canada. 3University of Victoria, Victoria, BC, Canada.
(No relevant relationships reported)

PURPOSE: Indigenous peoples are at a higher risk for many chronic diseases compared to the general population. Colonization and forced assimilation have led to marked changes in traditional roles and healthy lifestyle behaviors. The purpose of this study was to examine vascular health (arterial compliance) prior to and following an Indigenous led, and community-based 12-week lifestyle program representing Indigenous views of wholistic health and wellness.

METHODS: Indigenous adults were recruited to participate in a healthy lifestyle program through a community walk on National Indigenous Peoples Day (21/06/2018) in an Indigenous community. The program was a once weekly education session on healthy lifestyle behaviours (e.g., traditional diet), including sharing circles and a physical activity component (e.g., walk). Arterial compliance was assessed using applanation tonometry (HD1/PulseWave CR-2000) at pre- and post-intervention.

RESULTS: A total of 11 participants (1 male; Age = 47.3±10.7 yr, Height = 161.1±6.4 cm, and Weight = 82.3±18.3 kg) completed arterial compliance assessments. Large artery elasticity index was significantly improved over the program duration, t=-2.3, p=0.04 (pre:10.41±1.97; post:12.02±2.4 mL/mmHg x 10). There were no significant changes in resting systolic or diastolic blood pressure, pulse pressure, pulse rate, estimated cardiac output, cardiac index, systemic or total vascular resistance or small artery elasticity index following the program.

CONCLUSIONS: Arterial compliance, an important predictor of vascular health, is improved in Indigenous adults living in rural British Columbia following a 12-week program based on Indigenous worldviews. This data demonstrates health-related benefits of culturally appropriate programs. This project was funded by the Canadian Institutes of Health Research.

915 Board #149
May 29 3:30 PM - 5:00 PM
Effects of Combined Training on the Body Composition In Breast Cancer Survivors: A 1-y Follow-up
Thais R S Paulo1, Juliana Viezec2, Fabricio E. Rossi1, Ismael F. Freitas Junior3.
1Federal University of Rio Grande do Norte, UFRN, Natal, Brazil. 2Sao Paulo State University, Unesp, Presidente Prudente, Brazil. 3Federal University of Piaui, UFPI, Teresina, Brazil.
Email: thais.reis.silva@hotmail.com
(No relevant relationships reported)

Purpose: Exercise program can improve the side effects of cancer treatment, such as, decreased total fat mass and trunk fat mass, however, it is not known whether these positive outcomes acquired are maintained long-term after program interruption. Thus,
Effects Of Chemotherapy On Muscle Performance In Women With Breast Cancer

Vitor Alves Marques1, Rafael Ribeiro Alves1, Thyânã Coelho Guimarães1, Weder Alves Silva1, Claudio Barbosa de Lira1, Mario Hebling Campos1, João Ferreira Júnior2, Paulo Viana Gentil1, Carlos Alexandre Vieira1, 1University Federal of Goiás, Goiânia, Brazil. 2Federal Institute of Minas Gerais - Rio das Pombas, Brazil.

Email: vitor_alvesmarques@hotmail.com

(No relevant relationships reported)

PURPOSE: To compare muscle performance on breast cancer women (BCW) during the treatment chemotherapy with apparently healthy women (CNT).

METHODS: 19 BCW (52.2 ± 13.11yrs, 1.60 ± 0.07m, 66.8 ± 12.33kg, 27.6 ± 3.8kg/m²) undergoing chemotherapy (between the third and fourth cycle of chemotherapy: AC+T - Doxorubicin + Cyclophosphamide - Paclitaxel) and 18 CNT (55.8 ± 8.37yrs, 1.60 ± 0.06m, 69.0 ± 11.49kg, 28.3 ± 3.1kg/m²) without breast cancer, performed 2 sets of 4 unilateral isokinetic knee extension repetitions at 60°/s (Biodex system III, Inc., Shirley, NY, USA). The rest interval between sets was 2 minutes. All subjects were not involved in exercise programs that included resistance exercise. The normality of the data was performed by the Shapiro-Wilk test and the Student t test was conducted when a significant interaction was observed.

RESULTS: There were a significant group × time interaction for total fat mass (Pre= 30.7±7.7 vs Post=28.6±7.8 vs Follow-up= 30.3±8.1 kg, F= 4.864, p=0.012) and percentage of fat mass (Pre= 45.4±5.1 vs Post=43.2±5.8 vs Follow-up= 45.7±5.4 %, F= 6.808, p=0.002). The Bonferroni’s Post hoc test showed a decreasing for fat mass only in the EG after 9 months of training but there was a regain over 1 year follow-up. There were no statistically significant interaction for lean mass, trunk fat and bone mineral density (p>0.05).

CONCLUSIONS: This study demonstrated the potential benefits of combined training (resistance plus aerobic) to decreased total and percentage of fat mass in breast cancer survivors undergoing aromatase inhibitor therapy, however, after training interruption there was a regain of body fat. Therefore, our results emphasize that is important to maintain an exercise training program over a prolonged period for this population.

CONCLUSION: These results support the implementation of a brief prehabilitative exercise intervention and display the multidimensional effects of exercise on function, as well as psychological health parameters.
PURPOSE: This pilot study aims to determine the feasibility and acceptability of a remotely-delivered eHealth intervention that links physical activity and charity-based incentives to motivate young adult cancer survivors to initiate and maintain physical activity (PA). METHODS: Inactive cancer survivors (diagnosed between age 18-39y) were recruited through hospital support groups and online forums across the western United States. Screening and informed consent were done online; activity was measured via activPAL for 7-days at baseline and again at 12-weeks. Participants were randomized into either a PA only or Physical Activity+Charity Incentive group. Participants in the PA only group received a Fitbit One, personalized step goals, and weekly behavioral change content via email. PA+Incentive participants received the PA intervention plus donations to a cancer charity of their choice if daily step goals were attained. The primary aim was to evaluate feasibility and acceptability and the primary outcome was 12-week-between-group changes in steps per day as measured by the activPAL. RESULTS: Seventy-six participants were screened of those, 54 (75%) were eligible and provided informed consent and 51 (94%) completed the baseline assessments and were randomized. Those randomized were 88% female, 54% with prior breast cancer, 56.9% Non-Hispanic White; and had a mean age of 36.8 years. Of those eligible to date to complete the 12-wk measure (N=47), retention was high for the PA only (22/25) and 21.71 ± 2.13 cm (p = 0.01), and post (16.57 ± 2.22 cm, p = 0.01). Five participants (23%) reported they were “satisfied or very satisfied” with the overall intervention experience. There was some evidence that the PA + Incentive group was more satisfied with the overall experience as a study subject compared to the PA only group (45% vs 30% reporting “very satisfied”). This also holds true for the level of contact with staff (27% vs 15%) and content of emails (23% vs 10%). Some participants (23%) wanted more contact with study staff or other participants. CONCLUSIONS: These preliminary findings show that a mail-based intervention among young adult cancer survivors is feasible and acceptable to participants. The next step will be to evaluate if there was a significant change in daily steps as a result of the intervention. Support by Frost Fund and Cal Poly RSCA.

Higher Perceived Breast Cancer Risk is Associated with Less Aerobic Physical Activity in Women

Shreya Desai1, Keana Asadifar, Umaima Memon, Daphne C. Hernandez, Lorraine R. Reitzel, Rosenda Murillo. The University of Houston, Houston, TX.

Email: sdesai11@uh.edu

(No relevant relationships reported)

PURPOSE: To examine the association between perceived breast cancer risk and aerobic physical activity among women.

METHODS: We used cross-sectional data on women aged ≥18 years who participated in the 2015 National Health Interview Survey (n=17,967). Participants were asked to report whether they perceived themselves at less than average risk (ref), average risk, or higher than average risk for breast cancer. Aerobic physical activity was measured based on self-reported minutes of moderate-to-vigorous aerobic physical activity engaged in per week, then categorized into none (ref), some activity, and meeting the aerobic activity recommendation. Multinomial logistic regression models were fit, accounting for the complex survey design, to estimate associations between perceived risk of breast cancer with aerobic physical activity. Models were adjusted for age, education, race/ethnicity, and insurance.

RESULTS: In adjusted models compared with women who perceived themselves at low risk for breast cancer, those perceiving themselves at higher than average risk had a lower likelihood of engaging in aerobic physical activity (PA). Since greater aerobic physical activity can reduce the risk of breast cancer, future studies should also use longitudinal designs to determine if increasing physical activity decreases perceived breast cancer risk. Results suggest a possible role for health promotion interventions linking perceived breast cancer risk with physical activity. Supported by NIH R20CA221697-02, P20CA221696-02, and P20CA221697-01S1.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®
Purpose: Anti-cancer treatment causes numerous cancer related symptoms (CRS) which may influence quality of life (QOL). The purpose of this analysis was to determine the relationship between having CRS and the magnitude of the change in QOL in cancer patients participating three to four months in various exercise classes at a university cancer center.

Methods: Data of 779 patients who participated between 2012 and 2017 in exercise classes at the National Center for Tumor Diseases (NCT) Heidelberg, Germany, were examined. Baseline characteristics assessed were anthropometric data, cancer diagnosis, peak power output (PPO) and, maximum peak oxygen uptake (VO₂peak) in a cycle ergometer test as well as CRS by a self-developed anamnesis questionnaire. QOL was assessed at the start of the exercise program (t0) and after three to four months (t1) using the European Organisation for Research and Treatment of Cancer Questionnaire (EORTC QLQ-C30, subscale global health status/QOL). CRS included fatigue, lymphedema, peripheral neuropathy, weight loss, pain, restricted mobility, and negative emotions (anxiety, depression). A multiple regression analyses was performed to determine the relationship between CRS and the change of QOL (ΔQOL) from t0 to t1.

Results: Participants’ (71% female, 29% male, n=779) mean age was 56±12 years (16-88 years, n=772), and body-mass-index was 25±5 kg/m² (15-57 kg/m², n=755). Most frequent diagnoses were breast cancer (44%), colorectal cancer (7%), and gynecologic tumor diseases (6%) (n=779). PPO averaged 1,750±600 W/kg (0.3-3.5 W/kg, n=273) and VO₂peak averaged 25±5 ml/min/kg (6-47 ml/min/kg, n=273).

ΔQOL was 1.75±16.02 (-50.0-5.0, n=105). Multiple regression analysis revealed that CRS explained 16% of the variance in ΔQOL (R²=0.158, F(7,97)=2.606, p<0.05) (p=0.272, n=105). Restricted mobility (β=0.233, p<0.05) and weight loss (β=0.216, p<0.05) explained 16% of the variance in ΔQOL (R²=.158, F(7,97)=2.606, p<0.05).

Conclusion: Overall, QOL increased through exercise participation. Results indicated that participants who reported to have restricted mobility and weight loss at baseline compared to the control groups. No adverse events were reported during the exercise intervention. CONCLUSION: Exercise therapy during GCT showed improvements in PA and QOL. Exercise with various cancer types seems safe during GCT. Further research is needed to evaluate effects of supervised exercise interventions on cardiorespiratory fitness, type, frequency and training intensity.

Purpose: Prescription compliance in breast cancer survivors is needed to evaluate effect of supervised exercise interventions on cardiorespiratory fitness, type, frequency and training intensity. However, little research has been conducted to that end. This study investigated breast cancer survivors’ ExRs compliance during a personal training (PT) or group-based exercise (GBE) intervention.

METHODS: Women (N=26) with stage II breast cancer who had completed chemotherapy and/or radiation treatment within the previous year were randomly assigned to PT or GBE for 8 weeks. All participants received supervised exercise twice per week for 60 minutes a session. Participants were compliant to aerobic ExRs if they completed 20-30 minutes at 50-80% of heart rate reserve. Participants were compliant to upper and lower body resistance ExRs if they completed 2-3 sets of 8 repetitions within 50-80% of 1RM for chest and leg press. Compliance to aerobic, upper, and lower resistance ExRs was coded dichotomously (yes/no) for each session, then summed and divided by the number of sessions attended to calculate percent compliance. Independent t-tests examined differences in ExRs compliance between PT and GBE. Results are reported as mean±SD.

RESULTS: Participants were aged 52.8±5 years, and 13.4±1.5 months post diagnosis. Of the N=24 who completed the intervention, exercise session attendance was 15.8±0.5 (99%) in PT, and 13.4±1.0 (82%) in GBE out of 16 possible sessions (p=0.000). Compliance for aerobic ExRs was 77.2±0.17% in PT, and 70.6±0.17% in GBE (p=0.41). Compliance for upper body resistance ExRs was 76.0±0.37% in PT and 82.6±0.29% in GBE (p=0.597). Compliance for lower body resistance exercise was 80.2±0.23% in PT and 87.9±0.21% in GBE (p=0.40).

CONCLUSION: Exercise session attendance was higher in PT. Overall ExRs compliance was >70% for aerobic, >80% for resistance, and similar in PT and GBE. With growing support for establishing exercise programs for cancer survivors, it is important to determine sustainable and scalable delivery modalities. GBE may be more resource conscientious than PT, and this study suggests GBE can achieve comparable ExRs compliance to PT. Future exercise intervention studies in breast cancer survivors should examine how ExRs compliance affects health and/or fitness outcomes.
between perceived risk of colorectal cancer (ref= less than average risk) with activity (ref= none). All models were adjusted for age, sex, education, race/ethnicity, and insurance.

RESULTS: After adjusting for covariates, compared with individuals who perceived themselves at less than average risk, those who perceived themselves at higher than average risk for colorectal cancer had 22% higher odds of engaging in some activity and 60% higher odds of meeting the aerobic activity guideline (Odds Ratio [OR]: 1.22, 95% Confidence Interval [CI]: 1.01-1.46; OR = 1.61, 95% CI 1.37-1.86, respectively). In addition, those who perceived themselves at average risk for colorectal cancer had 25% higher odds of meeting the guideline (OR 1.25, 95% CI 1.07-1.47).

CONCLUSIONS: These findings suggest that perceived colorectal cancer risk may contribute to aerobic activity levels among adults. Although causal relations could not be established from these data, aerobic activity is known to aid in colorectal cancer prevention; therefore, those who are aerobically active may be able to accurately perceive their risk relative to those who are inactive. Future studies should use longitudinal designs to examine mechanisms that underlie this link.

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926 Board #160 May 29 3:30 PM - 5:00 PM
The Effect of Familiarization on the Reliability of Isokinetic Assessment in Breast Cancer Survivors
Filipe Dinato de Lima1, Sandro Nobre Chaves1, Lucas Ugliara1, Andrew Correa Tomé1, Tomás Santanna Sarandy1, Natália Leite Colombelli2, Claudio L. Battaglini, FACSM3, Martim Bottaro1. 1University of Brasilia, Brasilia, Brazil. 2University of Chapel Hill, Brasilia, Brazil. 3University of North Carolina at Chapel Hill, Brasilia, Brazil. (Sponsor: Claudio L. Battaglini, FACSM)
Email: fdinatolima@gmail.com

Muscle function plays an important role in quality of life of breast cancer survivors (BCS). Hence, several interventions have been proposed to improve muscle function during and after treatment. Thus, the assessment of muscular strength is essential for understanding the performance capacity of a BCS. Isokinetic dynamometer has been considered a gold standard method for assessing muscle strength in different populations. However, many internal and external factors in the isokinetic testing procedures can have an undesirable effect on the test results on BCS. PURPOSE: To assess the number of familiarization sessions required to test knee extensors strength and to state isokinetic dynamometer test-retest reliability to assess muscle function in BCS.

METHODS: Eleven breast cancer survivors (48.00 ± 6.25 years, 71.91 ± 11.55 kg, 1.61 ± 0.06 m) performed three isokinetic knee extension tests, separated by, at least, 72 hours. The isokinetic tests were composed by one warm-up set of 10 submaximal knee extensions at 120%, followed by two sets of four maximal knee extensions at 60%. All volunteers rested two minutes between sets. Muscle strength was determined as the greatest peak torque (PT) of each session. PT achieved in each session were compared between one-way ANOVA and Bonferroni adjustment. Significant test and intra-rater correlation coefficients (ICC3.1) between non-different measures were calculated to determine test-retest reliability. RESULTS: Peak torque on the second session (119.18 ± 30.83 N.m) was significantly greater than first session (105.66 ± 30.21 N.m, p = 0.002). However, there was no difference between second and third sessions (121.30 ± 30.21 N.m, p = 0.885). Significant test and ICC, between second and third sessions were 3.08 and 0.97, respectively (95% ICC confidence interval: 0.92 to 0.99).

CONCLUSIONS: Isokinetic dynamometer is a reliable device to assess muscle function on BCS. However, to assess knee extension strength on the isokinetic dynamometer, BCS require one familiarization session.

927 Board #161 May 29 3:30 PM - 5:00 PM
Effects of a Smartphone Based Exercise Intervention on Quality of Life in Breast Cancer Survivors
Margaret F. Bedillion, Emily B. Artsell, Gwendolyn A. Thomas. Syracuse University, Syracuse, NY.
Email: mbedillion@syr.edu
(No relevant relationships reported)

A physically inactive lifestyle in breast cancer survivors elevates risk for recurrence, morbidity, and co-occurring chronic diseases. Exercise interventions, particularly those that combine both aerobic and resistance exercise, can help mitigate these risks and serve as an important pathway for promoting health and quality of life in breast cancer survivors. However, barriers to exercise may prevent adherence to recommended levels of activity. Smartphone based exercise programs may promote improvements in quality of life via a method that is both scalable and widely feasible for breast cancer survivors.

PURPOSE: To determine the effects of a smartphone based aerobic and resistance exercise intervention on quality of life in breast cancer survivors.

METHODS: 34 women (age = 57.5 ± 6.7 y) 6.7 years since diagnosis (YSD) were recruited through Army of Women, a national non-profit breast cancer organization, to complete a 6-week intervention remotely. They were provided with a Fitbit and a mobile application that provided prompts to complete aerobic and resistance exercise. Additionally, written and video instructions were provided for each resistance exercise workout on the app. Surveys on depression and quality of Life (Center for Epidemiologic Studies Depression, Short Form Health Survey, and Functional Assessment of Cancer Therapy - Breast Cancer) were completed pre and post the 6-week intervention. RESULTS: Regression analyses examined effects of aerobic and resistance exercise completed during the intervention on quality of life, controlling for YSD, race, stage, and BMI. Only resistance exercise was significantly associated with improvements in depression (β = -0.431, t=-2.79, p < 0.01), social functioning as measured by the SF-36 (β = -0.378, t=-2.25, p = 0.03) and social well-being as measured by the FACT-B (β = -0.361, t=-1.95, p=0.06). CONCLUSIONS: These findings demonstrate the unique effects of a brief resistance exercise program delivered via a mobile application in improving quality of life in breast cancer survivors. Mobile application based exercise interventions offer significant scalability and improved feasibility for breast cancer survivors who may have limited access to a supervised exercise program.

928 Board #162 May 29 3:30 PM - 5:00 PM
The Long-term Effects Of A Physical Activity Behaviour Change Intervention On Cancer Survivors’ Levels Of Depression, Fatigue And Mental Well-being
Mairead Cantwell1, Briona Furlong1, Catherine Woods1, Noel McCaffrey1, Lisa Loughney1, Fiona Skelly1, Andrew McCarren1, Niall Moyna1. 1Dublin City University, Dublin, Ireland.
1University of Limerick, Limerick, Ireland. (Sponsor: Dr. Mairéad Coenoy4@mail.dcu.ie)
(No relevant relationships reported)

PURPOSE: Exercise is known to increase cancer survivors’ cardiorespiratory fitness and strength, assist in the management of treatment related side effects and reduce the risk of cancer recurrence and mortality. The aim of this study was to determine the long-term effects of the MedEx IMPACT (Improve Physical Activity after Cancer Treatment) trial, a patient centred, evidenced-based and theoretically informed physical activity behaviour change intervention, on cancer survivors’ long-term levels of depression, fatigue and mental well-being (MWB).

METHODS: Adults with an established diagnosis of cancer, who had completed their adjunctive therapy, were referred to a community-based exercise rehabilitation programme (CBERP) for survivors of cancer known as ‘MedEx Move On’. Participants in the control group (CG) and intervention group (IG) attended two 60-min supervised exercise classes each week for 12 weeks. In addition, participants in the IG also received: i) a home-based exercise programme, ii) 4 PA information sessions and iii) a 1:1 exercise consultation. At baseline, programme completion (week 12) and 3-month follow-up, depression, fatigue and MWB were measured using the Patient Health Questionnaire (PHQ-8), Functional Assessment of Chronic Illness Therapy-Fatigue Scale (FACT-Fatigue) and the short Warwick-Edinburgh mental well-being scale (SWEMWBS), respectively.

RESULTS: One hundred and ninety-one survivors of cancer were recruited (CG, n= 87; IG, n=104; mean age 56 ± 10 yrs, 73% female). Cancer diagnoses were breast (60%), colorectal (16%), prostate (13%) and other (11%). On average, participants attended 66% of the supervised exercise classes (CG= 67±22%; IG=65±27%). 97 participants (51%) completed the trial. Depression, fatigue and MWB significantly improved in both groups from baseline to week 12, and 3 month follow-up (p<0.001).

There were no statistically significant differences between the CG and IG.

CONCLUSIONS: Participation in a 12-week CBERP has a positive long-term effect on cancer survivors’ levels of depression, fatigue and MWB. The inclusion of additional behaviour change strategies to the supervised exercise classes did not augment the benefits achieved.

929 Board #163 May 29 3:30 PM - 5:00 PM
Cancer Survivorship Fitness Program: College and Community Connect
Email: johaire@ithaca.edu
(No relevant relationships reported)

Evidence confirms that exercise has positive effects on physical functioning (PF) and quality of life (QOL) in cancer survivors after treatment. Long term medical complications may impact exercise ability and precautions need to be taken to ensure safety. Exercise scientists (ES) and physical therapists (PT) are ideal providers suited to prescribe exercise in this population. An educational clinic where ES and PT students work together may be a beneficial environment to provide fitness support to cancer survivors.

S188 Vol. 49 No. 5 Supplement
PURPOSE: To examine the effects of an interdisciplinary 8-week supervised exercise program in post-treatment cancer survivors on a college campus, hypothesizing that participants would improve in QOL and PF.

METHODS: Nine participants with various types of cancer, stages II-III, within 3 years of treatment were included in this pilot-study. QOL was measured using the Short Form-36 (SF-36). PF was measured using grip strength, 30 second sit to stand (30s STS), single limb stance, 6 minute walk test (6MWT), and sit and reach flexibility test. Measurements were taken at baseline and at the end of the 8 week program. Participants worked with ES and PT students at the campus fitness facility on an individualized program created by the pair with faculty oversight. Participants were encouraged to meet American College of Sports Medicine guidelines for cardiorespiratory endurance, muscular fitness, and flexibility. Results were analyzed using descriptive statistics.

RESULTS: Seven participants completed the study. The greatest gains in PF were demonstrated in the 6MWT, flexibility, 30s STS, and grip strength. Overall, 86% of participants improved in the majority of PF tests. QOL improved in 71% of participants for physical function but only in 43% of participants for general health subscales.

CONCLUSIONS: This is the first known study design to combine an interdisciplinary approach (ES and PT) to exercise care for cancer survivors in an academic setting. This supportive and collaborative environment allowed for an individualized program and participant monitoring from both disciplines. Furthermore, it permitted learning opportunities for students and fitness opportunities for cancer survivors to enhance the continuum of care.

Cancer treatments including surgery, chemotherapy, radiation, and hormone suppressant therapy have greatly improved the survival of breast cancer patients. Although these treatments have been successful in reducing breast cancer mortality, they are accompanied by long-term side effects that include accelerated losses in muscle mass and gains in fat mass. These changes lead to losses in strength and physical function. While resistance training programs have been shown to attenuate these negative changes in body composition, strength, and physical function, there is a lack of research examining the effects of resistance training combined with high impact training or a low impact yoga program to maintain or improve these measures.

PURPOSE: To examine the effects of functional impact training (FIT) and yoga (YY) on body composition, strength, and physical function in breast cancer survivors (BCS).

METHODS: Forty-four BCS (60.3 ± 8.3 yrs) were assigned to a 24-week FIT (resistance+high impact exercises) or YY intervention (stretching+relaxation) 2x/wk. Pre- and post-body composition measurements were assessed via dual energy X-ray absorptiometry. Upper body strength was measured by a one-repetition maximum chest press test. Lower body strength was assessed by Biodex isokinetic knee extension and flexion at 60, 120 and 180°. The Continuous Scale-Physical Functional Performance (CS-PFP) test assessed physical function. Data were analyzed using a repeated measures analysis of variance. Significance was accepted at p<0.05.

RESULTS: Body composition did not change. FIT improved upper body strength (73 ± 18 to 83 ± 22 kg) compared to YY (60 ± 15 to 59 ± 16 kg). Main time effects occurred for lower body strength with a mean extension and flexion improvement of 13% and 16%, respectively. A main time effect occurred for CS-PFP (68.53 ± 12.87 to 73.66 ± 12.62 U). CONCLUSION: Our findings suggest that FIT and YY are beneficial for strength and physical function in BCS. FIT may be a high impact alternative to traditional weight training for BCS while YY may be a viable option for BCS who require a program of lower intensity. Supported by: ACSM Doctoral Student Grant; NSCA Graduate Student Research Grant.

Cancer survivors are less active than the general population. Previous research has examined predictors of physical activity among cancer survivors; however, few studies have focused on adolescent and young adult (AYA) survivors.

Purpose: To examine cross-sectional relationships between demographic, psychosocial, disease-related characteristics, and measures of physical activity (steps, MVPA, and sedentary time) among AYA cancer survivors.

Methods: Eligible participants were diagnosed with cancer between 18-39y, >6 months post-treatment, and engaged in <60 min/wk of exercise. Participants were an activPAL monitor for 7-days to obtain estimates of physical activity and sedentary time. Participants self-reported their health history (e.g., cancer type and treatment), demographics, psychosocial correlates (e.g., self-efficacy), and symptoms (e.g., fatigue). We used Pearson correlations to assess bivariate relationships. For variables with significant correlations, we used linear regression models to assess the relationship between activity variables, demographics, and psychosocial factors.

Results: Fifty-four participants were eligible and provided informed consent; of those, 51 completed the baseline assessments and 48 had valid baseline data. Fatigue was significantly correlated with steps per day (R = 0.39), percent of MVPA (R = 0.38), and percent of time sedentary (R = 0.40). There were no other significant correlations between psychosocial variables and steps, MVPA, or sedentary time. After adjusting for age and gender, breast cancer survivors had significantly higher steps per day than other cancer types (1,651 steps), more minutes of MVPA (157 minutes), and less sedentary time (8.4%, p<0.05). The relationship between higher levels of fatigue, less physical activity, and more sedentary time remained significant after adjusting for age, gender, and cancer type (p<0.05).

Conclusions: Preliminary results indicate a significant relationship between higher levels of fatigue, more sitting time, and less daily physical activity. Future research is needed to determine if increasing physical activity will reduce fatigue in AYA cancer survivors. Supported by Frost Fund and Cal Poly RSCA Grant.
A wealth of evidence suggests exercise as a complementary therapy for breast cancer (BC), by reducing the expression of oncogenes and atrophy genes, inducing antioxidant defense pathways and helping combat chronic inflammation. However, exercise appears not to be adequately incorporated in the therapeutic strategy of cancer.

**METHODS**: One hundred and forty women were recruited, 76 women with BC under chemotherapy or radiotherapy (age: 53.3 ± 8.7 years, height: 1.62 m, mass: 69.0 kg, BMI: 25.3 kg/m²). Levels of PA were self-estimated with the International Physical Activity Questionnaire (IPAQ) and with the SF-36 Health Survey questionnaire.

**RESULTS**: BC patients estimated their QoL, 15.30% of them assessed it as excellent, 60% as very good, 23.07% as average and 1.50% as poor. Similarly, 10.30%, 55.17%, 29.30% and 5.00% of the individuals participated in moderate-intensity PA and 98.40% of them engaged in high-intensity PA, however they estimated their QoL as very good. PA levels of moderate-intensity were similar in the two groups, indicating that BC patients were willing to exercise but refrained from doing more intense activities, possibly because of their cancer-related fatigue. Moreover, patients subjected to both therapies exhibited lower rates of PA, potentially due to the overall burden of the therapeutic intervention.

**CONCLUSIONS**: Our findings revealed that BC patients didn’t engage in high-intensity PA, however they estimated their QoL as very good. PA levels of moderate-intensity were similar in the two groups, indicating that BC patients were willing to exercise but refrained from doing more intense activities, possibly because of their cancer-related fatigue. Moreover, patients subjected to both therapies exhibited lower rates of PA, potentially due to the overall burden of the therapeutic intervention.
and categorized into meeting physical activity guidelines (aerobic only; strength only; combined; and neither). Assessment was conducted at baseline, post-intervention, and 12-month follow-up.

**RESULTS:** Of 301 patients, 284 (94.4%) and 263 (87.4%) completed body composition and self-reported physical activity assessment at 12-month follow-up, respectively. There were no significant effects of the randomized interventions on body weight, lean body mass, body fat mass, and percent body fat at 12-month follow-up; and no significant changes within each group. Meeting the combined physical activity guideline at 1-year follow-up was significantly associated with higher lean body mass compared to meeting neither guideline (-0.9 kg; p = 0.017). Moreover, meeting the aerobic guideline only was significantly associated with a lower body fat percent compared to meeting the combined guideline (-1.3%; p = 0.049) and with a higher lean body mass compared to meeting neither guideline (-0.8 kg; p = 0.037).

**CONCLUSIONS:** Combined or higher doses of aerobic exercise during breast cancer chemotherapy was not superior to a standard dose of aerobic exercise for body composition outcomes at 1-year follow-up. Meeting the combined or aerobic guidelines during follow-up, however, was associated with higher lean body mass and lower percent body fat, respectively which can have implications for breast cancer outcomes.

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**937 Board #171 May 29 3:30 PM - 5:00 PM**

**A Modified Participatory Action Research Process To Enhance Utilization Of A Co-located Exercise Oncology Clinic**

Mary A. Kennedy¹, Robert U. Newton¹, Sara Bayes², Dennis R. Taaffe, FACSM¹, Nigel Spry³, Nicolas H. Hart¹, Michael Davis⁴, Daniel A. Galvão, FACSM⁴. *Edith Cowan University, Joondalup, Australia. 1GenesisCare, Joondalup, Australia. 2GenesisCare, Wembley, Australia. (Sponsor: Daniel Galvão, FACSM)*

Email: m.kennedy@ecu.edu.au

(No relevant relationships reported)

Exercise offers great potential as an adjunct therapy to reverse treatment-related side-effects and increase quality and quantity of life in people with cancer. Regardless, most patients do not exercise during treatment and it is often overlooked by clinicians as an important component of cancer care. Innovative implementation strategies are needed to overcome these barriers. A 5+ year partnership between the Exercise Medicine Research Institute at Edith Cowan University (ECU) and GenesisCare has demonstrated that co-locating an exercise clinic within a cancer treatment facility is a feasible solution, yet referrals and program uptake have been suboptimal.

**PURPOSE:** To investigate the barriers and facilitators to program referral and uptake and provide recommendations to optimize program utilization.

**METHODS:** A variation of participatory action research methodology was employed to understand the factors impacting exercise program referral and uptake, and to design solutions to improve both. A stakeholder advisory group (SAG) was convened to guide the process. Key stakeholders were identified as SAG members and a comprehensive mixed methods approach was used to gain feedback from all program users. Utilization and financial data were collected via clinic records.

**RESULTS:** This 6-month process successfully engaged key partner organizations and individuals, and led to the development of an implementation-ready program model. Multiple barriers and facilitators within and across the domains of the social-ecological model were revealed and accounted for in the model’s development. Logistics (e.g., finances, hours of operation, referral pathways), programming options, and issues around clear communication within the system were targeted as major areas for improvement. Leadership’s commitment to change and strong belief in the value and potential of the program were key to success.

**CONCLUSION:** The successful operation of a co-located exercise and cancer treatment facility requires leadership buy-in supported by a robust implementation plan that considers all domains of the social-ecological model. Stakeholders should be engaged throughout the process, using their input to create a clear vision that can be effectively communicated to all program users.

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**938 Board #172 May 29 3:30 PM - 5:00 PM**

**Feasibility And Adherence For Exercise During All Chemotherapy: EnACT**

Kelsey G. Taylor, Erica A. Schleicher, Melanie Potiaumpai, Jessica Moyer, Natasha Burse, Kathryn Schmitz, FACSM. *Penn State Hershey College of Medicine, Hershey, PA. (Sponsor: Kathryn Schmitz, FACSM)*

Email: ktaylor@phs.psu.edu

(No relevant relationships reported)

Several national and international agencies recommend exercise following a cancer diagnosis. Current research suggests that exercise is safe and effective during adjuvant therapy and has been shown to improve fatigue, pain, physical function, symptoms management, quality of life, depression and anxiety. Despite the evidence in favor of exercising during chemotherapy, the acceptability and feasibility of an exercise intervention among cancer patients receiving chemotherapy remains unknown.

**PURPOSE:** To determine if an individualized exercise intervention is accepted by cancer patients receiving chemotherapy and is feasible for them to complete.

**METHODS:** One hundred sixty-eight patients diagnosed with cancer actively receiving chemotherapy were recruited for an outpatient exercise intervention. Participants were prescribed an individualized home-based exercise program that included resistance, aerobic, flexibility and balance exercises. Exercise equipment included resistance bands, and adjustable dumbbells. Participants were in the study either the length of their chemotherapy regimen or for six months, whichever came first. An exercise physiologist followed up with participants during their regularly scheduled infusions to document the progress of their exercises and make any necessary adjustments to the exercise prescription. **RESULTS:** Seventy-four participants (47F, 27M; 58.2 ±11.9 years) completed the entirety of the exercise intervention. Feasibility was defined as completing one tier of prescribed exercises and adherence was defined as the number of completed exercise sessions divided by the number of prescribed sessions. Overall 86.5% of participants reached the feasibility threshold. Patients with non-metastatic cancer had higher feasibility at 89.4% compared to patients who with metastatic cancer at 81.5%. The adherence rate for aerobic, balance and flexibility training was 75%, while the resistance training adherence rate was 60%. Adherence rates were higher in the metastatic group, 76%, compared to the non-metastatic group, 70%.

**CONCLUSION:** An exercise intervention for cancer patients receiving chemotherapy is feasible and the adherence rates are comparable to and even higher than those seen in previous exercise studies done with cancer patients.

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**939 Board #173 May 29 3:30 PM - 5:00 PM**

**Moving Medicine: Development Of An Exercise Oncology Tool For Clinical Practice**

Rebecca Robinson¹, Kush Joshi², Hamish Reid³, Natasha Jones³, Mike Loosemore⁴, Katy Hornby⁴, Florence Newton⁴. *Faculty of Sports and Exercise Medicine, Sheffield, United Kingdom. Faculty of Sports and Exercise Medicine, London, United Kingdom. (Sponsor: Kathryn Schmitz, FACSM)*

Email: rjrobinson@doctors.org.uk

(No relevant relationships reported)

The Moving Medicine Cancer resource translates exercise oncology evidence into a tool for everyday practice in healthcare. It was created by the Faculty of Sport and Exercise Medicine in partnership with Public Health England and Sport England.

**PURPOSE** Evidence that Physical Activity (PA) can mitigate cancer-related fatigue, deconditioning and late effects, positively impacting physical function, quality of life and survivorship continues to grow. However most people living with cancer do not attain recommended PA levels and under 10% of HCPs provide PA advice. The Moving Medicine digital resource is designed to overcome barriers and integrate PA into everyday practice in healthcare.

**METHOD** Created in a knowledge-into-action framework, Moving Medicine Cancer is one of 9 themes promoting PA in non-communicable disease. Development comprised two phases:

1. Knowledge creation

   A literature search yielding 34000 papers found 500 relevant for inclusion. Evidence was graded and divided into pre, during and post treatment. An expert multidisciplinary panel was recruited for consultation. An iterative process refined and prioritized evidence into clinical context.

2. Action cycle

   Delphi study and COM-B framework analysis drove action cycle creation. This enabled end-user driven design.

**RESULTS** The online tool is a time-based framework with practical information reflecting clinical priorities and accessible embedded evidence. It presents infographics with a conversational guide to support patient-focused consultation using behavioural change techniques. Moving Medicine was developed in collaboration with over 25 medical organisations and charities. Its launch in October 2018 by the UK Health Secretary received positive feedback. Formal evaluation will follow the initial delivery phase.

**CONCLUSION** This novel resource harnesses current knowledge to facilitate quality conversations about PA across cancer care. As exercise oncology evolves, the Cancer Moving Medicine tool has capacity to develop precision PA prescription for the growing population of people living with and after cancer. Its developers welcome future collaboration with the international Exercise Oncology community to optimise health and wellbeing for patients. Moving Medicine is open access and free to use at www.movingmedicine.ac.uk.
Nearly half of all cancer patients undergo chemotherapy. Many patients experience chemotherapy-related side effects, including decreased quality of life. The American College of Sports Medicine recommends exercise following a cancer diagnosis and current research suggests that exercise is safe during chemotherapy and can be used as a complementary strategy to manage symptoms. PURPOSE: To examine whether an individualized exercise program delivered during chemotherapy can improve chemotherapy-related symptoms. METHODS: One hundred sixty-eight patients diagnosed with cancer actively receiving chemotherapy were recruited for a home-based exercise intervention. Participants were prescribed an individualized exercise program focusing on resistance, aerobic, flexibility, and balance training. Participants were in the study for the length of their chemotherapy regimen or up to six months, whichever came first. At baseline and completion of the study participants were asked to complete the following questionnaires: Brief Pain Index (BPI), European Organization for Research and Treatment of Cancer- Quality of Life (EORTC QLQ-C30). Participants-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE), and Fatigue Symptom Inventory (FSI). RESULTS: An interim analysis included seventy-four participants (47F, 27M; 58.2 ± 11.9 years). A Paired-Sample T-test analysis showed a significant increase in social functioning (MD= .48, SD= .27, p= .03) and a significant decrease in fatigue in regards to relations with others (MD= -.38, SD= 2.80, p= .01). Additionally, severity of headaches (MD= .31, SD= 60, p= .05) and frequency of nausea (MD= .47, SD= 1.54, p= .02) significantly decreased with exercise. Severity of neuropathy significantly increased (MD= .47, SD= 2.14, p= .005), however, it did not significantly interfere with activities of daily living. Severity of pain and overall fatigue did not significantly change with exercise. CONCLUSION: These preliminary findings show that an individualized exercise program can improve some chemotherapy related symptoms and may help manage others.

CONCLUSIONS: Long-term endurance exercise decreased the hepatic tumor incidence and improved the mitochondrial function. But high-intensity interval exercise increased the lactate production.
The incidence of nasopharyngeal carcinoma (NPC) in endemic areas is high. The long-term chemotherapy and radiotherapy cause bodily dysfunction and low quality of life (QoL) in NPC survivors. Complementary therapy especially mind-body exercise such as Taichi-Qigong becomes an option for NPC survivors to improve the QoL.

**Purpose:** To examine the effects of 10 weeks Taichi-Qigong training and health education lectures on QoL of NPC survivors. **Methods:** Thirty eligible participants were recruited and randomly assigned into either intervention or control group. 14 NPC survivors (n=7 for intervention group; n=7 for control group completed pre-post assessment of QoL, satisfactory. The intervention group practiced the active, low-intensity 18-form Taichi-Qigong exercise for at least 3 times a week for 10 weeks plus three health education seminars during the 10-weeks intervention period. The control group engaged in the health education seminars only over the period. The control group engaged in the health education seminars only over the period. QoL was assessed by Functional assessment of cancer therapy - General (FACT-G) which included four subscales: physical well-being (PWB), social well-being (SWB), emotional well-being (EWB) and functional well-being (FWB).

**Results:** Significant differences were found on subscales of EWB (p=0.011), and the effects of Taichi-Qigong on SWB is marginally significant (p=0.056). **Conclusion:** The results of this study provide preliminary data to support that Taichi-Qigong exercise, as a complementary therapy, may contribute to positive effects for NPC survivors in terms of improved QoL outcomes.
comorbidity and mortality. However, community-based exercise programs can be a powerful tool for improving other physiological outcomes related to cardiovascular health and physical fitness. Supported by funding from Breast Cancer Research Foundation of New York.

Breast cancer survivors (BCS) who underwent chemotherapy treatment have increased risk of cardiovascular disease (CVD). Chemotherapy contributes to increased arterial stiffness. Acute aerobic exercise has been demonstrated to be effective in improving arterial stiffness in healthy individuals, however, it is unknown if BCS have a similar response to aerobic exercise. **METHODS:** Seven BCS (48 ± 4 yrs; 26.0 ± 2.8 kg/m²) and seven female controls (43 ± 9 yrs; 22.7 ± 3.5 kg/m²) completed a 30-min bout of aerobic cycling exercise at 65% of their maximal aerobic capacity. Central arterial stiffness was evaluated by pulse wave velocity (PWV) via applanation tonometry at baseline, 5 and 30-min post-exercise. Hemodynamic variables [cardiac output (Q), heart rate (HR), and mean arterial blood pressure (MAP)] were acquired with an automated ambulatory blood pressure monitor. Carotid arterial stiffness was determined using ultrasonography [β-stiffness index, pressure-strain elasticity modulus (Ep) and arterial compliance (AC)]. **RESULTS:** See Table. Both groups had similar increases in AC at 30-min compared to 5 min post-exercise (p=0.05). HR increased in both groups post exercise (p=0.05); however, BCS had an overall higher HR compared to the control group (p<0.05). There were no differences in β-stiffness, Ep and AC responses following exercise between the groups. **CONCLUSIONS:** The results suggest that BCS have similar arterial stiffness responses compared to a healthy control group. Interestingly, PWV decreased (approached significance), while AC decreased following exercise, showing a differential response between the aorta and carotid artery, suggesting more investigation in this area.

<table>
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<th>30-min</th>
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<td>Control</td>
<td>6.8 ± 1.6</td>
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<td>β-stiffness index</td>
<td>BCS</td>
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<td>7.3 ± 3.4</td>
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<td>Ep (kPa)</td>
<td>BCS</td>
<td>74 ± 33</td>
<td>87 ± 32</td>
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<tr>
<td>Control</td>
<td>62 ± 14</td>
<td>72 ± 25</td>
<td>63 ± 18</td>
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<tr>
<td>AC (mmHg/L/min)</td>
<td>BCS</td>
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<td>BCS</td>
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**Board #184 May 29 3:30 PM - 5:00 PM**

**Acute Effect of Aerobic Exercise on Arterial Stiffness in Breast Cancer Survivors: Preliminary Results**

Georgios Grigoriadis1, Brooks A. Hibner2, Elizabeth C. Schroeder1, Alexander J. Rosenberg2, Garet Griffith3, Amanda V. Sardelli1, Dana C. Danciu1, Bo Fernhall, FACSM4, Tracy Baynard, FACSM4.1University of Illinois at Chicago, Chicago, IL. 2University of North Texas Health Science Center, Fort Worth, TX. 3Northwestern University, Chicago, IL. 4University of Campinas, São Paulo, Brazil. (Sponsor: Tracy Baynard, FACSM)

(No relevant relationships reported)

**Purpose:** To determine if female cancer patients who underwent taxane-based chemotherapies impact on VO2 and or balance versus non-taxane based chemotherapies in female cancer survivors. **Methods:** Twenty-six females (Avg. 58.11 years 29-72), enrolled in a cancer rehabilitation program underwent a treadmill assessment of VO2 and four measures of balance (TUG, 4stage, sitto stand, 6MWT). **Results:** No differences were found in measures of balance or VO2 between those who received taxane based chemotherapies vs. non-taxane based chemotherapies (p>0.05). Significant increases in HR (r=0.71, p=0.000) and Dyspnea (r=5.96, p=0.000) occurred with significant correlations between pre-exercise (r=0.605, p=0.001) and post-exercise (r=7.29, p=0.001) Dyspnea and RPE. Trends in associations between TUG and 6MWT (p=0.073), 4stage and VO2 (p=0.057), 6MWT and 4stage (p=0.08) were also observed. Significant positive correlation between 6MWT and VO2 (r=0.487, p=0.012) and a negative correlation between %change in Dyspnea and VO2 (r= -0.474, p=0.014) were found. A negative correlation between pre-exercise HR and 6MWT speed (r=-0.441, p=0.027) and strong positive correlation between 6MWT distance and 6MWT Speed (r=0.968, p=0.000). 6MWT distance moderately predicted VO2 (r=0.487, F=7.461 p=0.012). **Conclusion:** The data does not support the hypothesis that taxane based chemotherapies affect VO2 values, or measures of balance. However, trends suggest a larger population might detect an association among the balance measures and VO2 and therefore perhaps detect a difference. Expected changes and associations between RPE and Dyspnea were found, with lower scores likely associated with higher fitness as evidenced by negative correlation between %change in Dyspnea, 6MWT speed and pre-exercise HR and 6MWT speed and distance.

**Board #185 May 29 3:30 PM - 5:00 PM**

**The Effect Of Doxorubicin On Myocardial Extracellular Matrix Degradation**

Wisam O. Najdawi1, Eric C. Bredahl2, Joan Eckerson, FACSM2, Jacob Siedlik2, Kristen Dresscher2. 1Creighton University, Omaha, NE. 2Creighton School of Medicine, Omaha, NE. (Sponsor: Joan Eckerson, FACSM)

Email: WisamNajdawi@creighton.edu

(No relevant relationships reported)

**Do Taxane Based Chemotherapies Impair Improvements in VO2 in Female Cancer Survivors**

Stephen Lo Russo1, Henry Piascik1, Karen Wonders, FACSM2. 1Saint Francis University, Loretto, PA. 2Maple Tree Cancer Alliance, Dayton, OH.

Email: sloruss01@sfu.edu

(No relevant relationships reported)

**Purpose:** To determine if female cancer patients who underwent taxane-based chemotherapies benefited from exercise as compared to those who received non-taxane based treatments. **Methods:** Retrospectively, 101 females (57.88 ± 11.59), with female cancers (Breast (79), ovarian (10), endometrial (4), uterine (2), and cervical (1)) enrolled in a cancer rehabilitation program underwent a variety of fitness assessments, but only measures of VO2 are reported here. Each subject was provided an individualized mixed home (2 days) and facility based (1 day) 12 week exercise intervention. **Results:** A strong positive correlation between VO21-VO22 (r=0.802, p<0.000), a low to moderate negative correlation between VO21-age (r= -0.365, p=0.000), a low negative correlation between VO22-age (r= -0.215, p=0.036) were found. A significant change from VO21 to VO22 (t=5.372, p=0.000) was determined. While there were no differences between Taxane and Non-Taxane measures of VO2, there was a trend in percent change in VO2 (F=3.306 p=0.073). There were also no differences in any measure of VO2 between taxane and non-taxane treatments by cancer type. Regression analysis indicated only age (r=2.775 p=0.007) predicted percent change in VO2 values and VO21 values (r=3.306, p=0.001), while age and cancer type predicted VO22 values (r=2.117, p=0.037; r=-2.217, p=0.029 respectively). **Conclusion:** The data does not support the hypothesis that taxane based chemotherapies result in lower VO2 values, as both age and cancer type had greater overall effects on VO2. Additionally, significant improvements in VO2 after the 12-week exercise intervention, regardless of treatment type, age, or cancer type supports the effectiveness of exercise-based cancer rehabilitation program to improve VO2 in a female cancer population.
cardiac tissue from animals treated with DOX relative to the control (p < 0.0068).
There was no significant difference in expression of MMP-2 (p = 0.8757) or TIMP-
2 (p = 0.2266) between groups. CONCLUSION: These findings suggest that treatment with DOX significantly reduced the expression of MMP-9, contradicting our hypothesis. A potential explanation for these findings is that there is an intermediate factor affecting MMP-9 expression. Future studies should profile all components of MMP/TIMP signaling during DOX treatment.

Exercise and competition function as stress factors and may result in dysregulation in the neuroendocrine and cardiovascular systems. PURPOSE: The intent of the study was to evaluate neuroendocrine and cardiovascular response using salivary cortisol and heart rate/blood pressure respectively in junior track and field athletes across a season. METHOD: Fifty-One Jamaican junior level track and field athletes (26 females, 25 males) participated in the study. Data was collected throughout the athletic season over two main periods: (1) a preparation period and (2) a competition period which was further subdivided into two stages: development game stage and major game stage. Athletes delivered a saliva sample prior to bedtime (8 pm - 10 pm) during each phase of the season. Resting blood pressure and heart rate were monitored throughout the season. Data collected during the preparation and competition periods were compared using Friedman’s test and Wilcoxon signed-rank test. RESULTS: There were significant changes in salivary cortisol across the season p < 0.05. The concentration of cortisol increased during the development game stage (42%), then further increased in the major game stage (53%). With regard to cardiovascular response, there were significant differences in heart rate across the season p < 0.05. However, there was no significant change in blood pressure across the season in the athletes. CONCLUSION: Overall, there was an increase in cortisol across the season. This could possibly be due to the accumulation of stress factors over the competitive season which might be due to improper training regimens. Resting heart rate and blood pressure may not be good indicators of stress in athletes.

PURPOSE: Aerobic exercise is recommended for blood pressure control rather than resistance exercise. However, resistance exercise is gaining prominence, particularly isometric exercise. The purpose was to compare the cardioregulatory responses to whole body isometric (IT) and isometric (IM) resistance exercises.

METHODS: 8 normotensive males (21 ± 2 years) completed one familiarisation session, then an IM and IT session in a counter-balanced order, each separated by at least 72 hours. 10-repetition maximum (10-RM) for each exercise was determined in two main periods: (1) a preparation period and (2) a competition period which was further subdivided into two stages: development game stage and major game stage. Athletes delivered a saliva sample prior to bedtime (8 pm - 10 pm) during each phase of the season. Resting blood pressure and heart rate were monitored throughout the season. Data collected during the preparation and competition periods were compared using Friedman’s test and Wilcoxon signed-rank test. RESULTS: There were significant changes in salivary cortisol across the season p < 0.05. The concentration of cortisol increased during the development game stage (42%), then further increased in the major game stage (53%). With regard to cardiovascular response, there were significant differences in heart rate across the season p < 0.05. However, there was no significant change in blood pressure across the season in the athletes. CONCLUSION: Overall, there was an increase in cortisol across the season. This could possibly be due to the accumulation of stress factors over the competitive season which might be due to improper training regimens. Resting heart rate and blood pressure may not be good indicators of stress in athletes.

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measures, blood acid-base, muscle oxygenation and heart rate (HR) were determined. Exercise values and recovery intervals from 3rd to final repetition were compared between T1 and T2 intensity using two-way repeated measures ANOVA. **RESULTS**. Subjects reached 9:1 intervals during T1 (350±40 W) compared to 5:2 during T2 (390±40 W) due to fatigue. VO₂ increased from 3.3±0.34 to T1 and 3.8±0.53 L/min in T2 (P<0.006). Pulmonary ventilation (VT) increased from 77±13 in T1 to 117±27 L/min in T2 (P<0.04). HR increased from 171±12 beats per minute (bpm) in T1 to 178±9 bpm in T2 (P<0.03). Although, blood lactate concentration (LA) increased and blood pH values decreased considerably during T2, they were similar to values at exhaustion in T1 test. None of the muscle oxygenation variables: oxyhemoglobin (HbO₂), deoxyhemoglobin (Hb) and total hemoglobin (HbT) changed significantly. **CONCLUSION**. The results of our study revealed that changes in blood acidosis and muscle oxygenation during tests were the limiting factors and not the VO₂ uptake.

The average American consumes far more soda than is recommended. Consuming high amounts of sodium may augment blood pressure (BP) responses to physical exercise and stress. Exaggerated responses to exercise in sodium-sensitive individuals may be an early symptom of some cardiovascular diseases like hypertension. **PURPOSE**. This study was designed to determine the extent to which postexercise autonomic control, as assessed by heart rate variability (HRV), depends on exercise volume remains unclear in hypertensive individuals. We included 14 normotensives [age: 40.7±2.8 yr; body mass index (BMI): 25.7±0.9 kg/m²] and 10 hypertensive men [age: 39.2±2.3 yr; BMI: 29.3±1.0 kg/m²; 24-h ambulatory systolic/diastolic BP (SBP/DBP): 120.6±1.6 / 73.9±1.2 mmHg]. **METHODS**. The recovery pattern of cardiac autonomic control to acute aerobic exercise (AE) was established as effective for lowering blood pressure (BP), little is known about the alterations in aortic BP after exercise. To investigate the acute pulse wave reflection responses after moderate AE with different volumes in normotensive (NT) and hypertensive (HT) men. **METHODS**: We included 14 normotensives [age: 40.7±2.8 yr; body mass index (BMI): 25.7±0.9 kg/m²; maximal oxygen uptake (VO₂ max): 3.3±1.8 mL·kg⁻¹·min⁻¹; 24-h ambulatory systolic/diastolic BP (SBP/DBP): 120±6.1/73±1.2 mmHg] and 10 hypertensive men [age: 39.2±2.3 yr; BMI: 29.3±1.0 kg/m²; VO₂ max: 26.7±0.8 mL·kg⁻¹·min⁻¹; 24-h ambulatory SBP/DBP: 139±3.6/86±4.1 mmHg]. Participants undertook a maximal cardiopulmonary exercise test, a non-exercise control session (CTL), and two cycling bouts at 50%VO₂ max. In an randomized order. Aortic systolic blood pressure (SBP), aortic pulse pressure (PPa), augmentation pressure, and augmentation index were determined using applanation tonometry 10 min before, and 30- and 70-min after CTL and the two exercise bouts (Sphygmocor v7). **RESULTS**: In NT, AE50%-150%cycled decreased SBP in comparison with CTL, until 30 min of recovery [CTL: &91;5.7±3.3 mmHg; AE50%-150c: &91;5.0±2.8 mmHg (p<0.05)]. However, in HT men, only AE50%-300cattenuated the SBP increase observed in the CTL. [CTL: &91;9.0±1.9 mmHg (p<0.001); AE50%-300c, &91;4.9±2.3 mmHg (p<0.07)]. In addition, NT men showed a decrease in PPa after all AE bouts, without differences between conditions. In the HT group, both AE bouts attenuated the PPa increase observed in CTL. (CTL: &91;4.3±0.1 mmHg (p<0.05); AE50%-150c, &91;4.8±0.9 mmHg (p=0.01); AE50%-300c, &91;2.6±3.9 mmHg (p=0.18)]. Lastly, only AE50%-150c was able to reduce pulse wave reflection until 30 min of recovery in NT men. **CONCLUSION**: In NT, lower AE volume was able to reduce pulse wave reflection and central BP until 30 min of recovery. However, only the greater AE volume attenuated the increase in central aortic BP and PPa, with no difference in pulse wave reflection after any experimental protocol in the HT group. **PURPOSE**: The purpose of this study was to compare peak oxygen uptake (VO₂peak) measured in a underwater swim test (UWST) and during a maximal aerobic capacity test on a cycle ergometer (Velotron Pro, Seattle, WA, USA). **METHODS**: Highly trained artistic swimmers (n=14, 14.9±1.9 years) completed a synchronised swimming specific test (275W UWST) in 25m pool an incremental exercise test to volitional fatigue (15 W every 30 sec) on a cycle ergometer to determine VO₂max. The UWST and maximal aerobic capacity testing occurred on consecutive days. The 275W UWST comprised 50m freestyle followed by 25m underwater breast stroke three times, with an additional 50m freestyle. During the UWST participants wore water-resistant HR monitors (Polar OH1) and had expired gases collected (Cosmed K4 b’) in the 20 sec immediately upon completion of the UWST to determine VO₂peak. During the cycle test, HR (Polar Electro, Kempele, Finland), prolonged HRV analysis [i.e. low-frequency band (LF), high-frequency band (HF), and sympatho-vagal balance (LF/HF ratio) each 21-h under ambulatory conditions using a three-channel Holter (CardioLight, Cardios Ltda, Brazil). Marginal models were used to compare HRV changes between trials. **RESULTS**: Significant differences for rMSSD 30s were only detected between CTL vs. AE150 [Δ -38.3 ms (P<0.001)] and CTL vs. AE300 [Δ -40.0 (P<0.001)]. Within the subsequent 21-h of recovery, no significant differences were observed among CTL, AE150 and AE300 for LF, HF and HF/HR ratio. **CONCLUSIONS**: These findings suggest that exercise volume is not a major determinant of exercise prescription when considering the recovery pattern of cardiac autonomic control in hypertensive men, at least when AE is performed at moderate-intensity.
Heart rate variability (HRV), blood pressure variability (BPV) and baroreceptor sensitivity (BRS) provides insight into cardiovascular regulation in different physiological settings. Pre-menopausal females have been shown to exhibit a cardioprotective autonomic profile compared to males following maximal exercise, but it is unknown if there are sex differences in autonomic recovery following submaximal aerobic exercise.

METHODS: Forty-three (males n=22, age =22 ± 1 yrs, BMI = 25.9 ± 0.7 kg/m²; females n=21, age = 22 ± 1 yrs, BMI = 23.7 ± 0.5 kg/m²) healthy, normotensive participants completed a 45-min moderate intensity aerobic exercise session. Beat-to-beat BP was recorded using finger photoplethysmography for 5 min prior to exercise (REST), at 30 min (P30), 60 min (P60) and 90 min (P90) following exercise. Frequency domain measurements of HRV and BRV were calculated. The low frequency power of BPV (BPV_LF) was used as an estimation of sympathetic vasomotor tone and the ratio of low- (LF) and high-frequency (HF) bands in HRV (LF/HF) has been used to quantify the degree of sympathovagal balance. BRS was estimated by the alpha coefficient method (Alpha_LF). Repeated measures analysis of variance (ANOVA) (2 x 4; sex x time-point) was performed.

RESULTS: Data were presented in Table 1 as mean ± standard error.

CONCLUSION: Forty-five min of submaximal aerobic exercise results in sustained disturbance of cardiovascular homeostasis as manifested by elevated sympathovagal balance and increased cardiovascular baroreceptor sensitivity 90 min after exercise. In addition, young, healthy women exhibited lower sympathetic tone at rest and during recovery from aerobic exercise compared to age-matched males.
Blood flow restriction (BFR) training has been increasingly incorporated into a more common activity of daily exercise (e.g., yoga). However, BFR may increase blood pressure and myocardial oxygen demand by augmenting vascular resistance. Yoga is characterized by systolic blood pressure (SBP)/diastolic blood pressure (DBP)/mean arterial pressure (MAP) levels of 110/70-80/60 mmHg, which is far lower than the 180/100 mmHg commonly induced by BFR training. The potential cardiovascular changes arising from the combination of yoga and BFR are unknown. However, there is preliminary evidence that yoga can increase heart rate and systolic blood pressure, which may be counteracted by the concomitant increase in parasympathetic activity. This raises the concern of exaggerated cardiovascular responses when yoga is performed with BFR. **Purpose:** To determine the impact of a combination of yoga and BFR on cardiovascular responses. **Methods:** Twenty young healthy participants (M=10; F=10) performed 20 yoga poses with and without BFR bands placed on both legs. Heart rate, blood pressure, and heart rate were measured using finger photoplethysmography during the yoga exercise. Blood lactate concentration, flow-mediated dilation (endothelium-dependent vasodilation), and cardiac vascular index (arterial stiffness) were measured before and after the yoga exercise. **Results:** At baseline, there were no significant differences in any of the variables between the BFR and non-BFR conditions. Systolic and diastolic blood pressure and heart rate increased significantly in response to the various yoga poses (p<0.01). However, there were no significant differences between the BFR and non-BFR conditions. In general, hemodynamic responses were more pronounced during more difficult yoga postures (e.g., Crescent Lunge, Half Moon, Chair Pose, and Downward Facing Dog). Rate-pressure products increased significantly during yoga exercises with no differences between the two conditions. Rating of perceived exertion (RPE) was not different between the conditions. Blood lactate concentration was significantly greater after performing yoga with BFR bands (p=0.007). Cardiac vascular index decreased similarly after yoga exercise in both conditions while flow-mediated dilation remained unchanged. **Conclusion:** The use of blood flow restriction bands in combination with systemic isometric exercise like yoga did not result in marked hemodynamic and pressor responses.

Increased blood pressure (BP) and autonomic dysfunction are independent risk factors for cardiovascular disease. Heart rate variability (HRV) is used as a measure of cardiac autonomic function in many research settings, including the evaluation of the autonomic control during and after physical activity. A prolonged sympathetic predominance and a slow parasympathetic reactivation contribute to a delayed BP and heart rate (HR) recovery after exercise which is thought to be associated with increased risk of acute cardiac events. Therefore, understanding the impact of various exercise modalities on the post-exercise autonomic modulation of HR and BP would allow for appropriate exercise prescription in susceptible populations. Battling ropes exercise (BRE) has become an extremely popular training modality for improving both anaerobic and aerobic fitness. However, the HRV and BP responses induced by an acute BRE bout are currently unknown. **Purpose:** To evaluate the effects of an acute session of BRE on HRV and BP responses in healthy young males. **Methods:** Eight young healthy males [age (23±1 years)] completed a BRE or a no-exercise control trial in a randomized order. During the BRE trial, participants completed ten-30s sets of battling ropes waves followed by 1 min of rest. Low-frequency power (LF), high-frequency power (HF), the LF to HF ratio (LF/HF), HR, and BP were collected in the supine position at baseline, 3, 10 and 30 min after each trial. LF and HF were normalized to total power resulting in nLF, nHF and nLF/nHF. **Results:** There were significant group-by-time interactions (P<0.05) for nLF (sympathetic activity), nHF (vagal tone), nLF/nHF (sympathovagal balance), HR, systolic and diastolic BP. There were significant increases (P<0.05) in nLF, nLF/nHF, and HR as well as significant decreases (P<0.01) in nHF, systolic (~6mmHg) and diastolic (~4mmHg) BP for 30 min after BRE compared to no changes after control. **Conclusions:** Our findings indicate that BRE increases sympathovagal balance following an acute BRE bout. This is concurrent with a sustained hypotensive effect in young healthy males. Further research is warranted to evaluate the potential clinical application of BRE in populations that might benefit from post-exercise hypotension.
The recording of heart rate variability (HRV) is a strategy for the rapid and non-invasive evaluation of the Autonomic Nervous System (ANS) activity. Previous studies have shown a rapid activation of the parasympathetic nervous system at the end of a physical effort and the association of this with the likelihood of developing cardiovascular disease. PURPOSE: Establish the relationship between recovery heart rate (RHR) after exercise and HRV at rest in apparently healthy men and women.

METHODS: Quantitative, cross-sectional, exploratory research conducted in 50 subjects (25 men and 25 women) of 19 ± 2.34 years. Subjects were monitored by continuous electrocardiographic reading all throughout the different activities. The HRV was evaluated at rest for 5 minutes, using time, frequency and non-linear analyzes, cardiac vagal index (CVI) was calculated using Log10 (SD1/SD2). Subsequently, a physical test of 6 minutes on the bike was performed between 50 and 60% of the maximum reserve heart rate. In the end, the RHR was evaluated every 10 seconds during the first minute. Subsequently, the relationship between HRV and RHR was analyzed using the Pearson correlation coefficient (r). RESULTS: In all population, mean RHR at rest and RHR had an inverse effect, finding the following correlations: 10s (r = -0.35 p = 0.01), 20s (r = -0.37 p = 0.007), 40s (r = -0.40 p = 0.004) and 60s (r = -0.53 p = 0.000). Additionally, in women exist a direct correlation between RHR and CVI were more significant in the following correlations: 40s (r = -0.41 p = 0.044), 50s (r = 0.52 p = 0.008) and 60s (r = 0.59 p = 0.002); however, in men this correlation was not significant.

CONCLUSIONS: When performing stress tests in apparently healthy people, the decrease of the HR after exercise could be used to evaluate the activity of the ANS, specifically the activation of parasympathetic system demonstrated by the significant correlations between RHR and HR at rest, as well as the correlation between RHR and CVI. Therefore, the activity in the first minute after ceasing the exercise shows that the evaluation of the parasympathetic nervous system could be implemented in the early diagnosis and prognosis of chronic diseases including cardiovascular disease.

Since nicotine-bearing cigarette smoking can induce acute cardiac autonomic imbalance, it may cause to persist sympathetic excitatory, and delay vagal reactivation during post-exercise recovery. However, the effect of cigarette smoking on cardiac autonomic nervous system is still uncertain; especially the difference between e-cigarettes and conventional cigarette smoking on autonomic balance after aerobic exercise.

METHODS: Apparently healthy male smokers (n=40, 23.03±3.10 yrs) were participated in a randomized crossover study where 3 experimental sessions (non-smoking condition, NS; e-cigarette smoking, ES; conventional cigarette smoking, CS) were applied after 30 min single bout treadmill running at 60% HR reserve. Immediately after exercise, heart rate variability (HRV) was monitored for 5 minutes, using time, frequency and non-linear analyzes. RESULTS: As results of HRV analysis, parasympathetic activity indices (RMSSD, pNN50, HF and SD1) were significantly decreased in both CS and ES compared to NS (p<0.001, respectively). In particular, those parasympathetic indices at CS were significantly decreased at CS while smoking and post-exercise recovery (p<0.001, respectively) whereas there was no significances at ES. In contrast, sympathetic activity index (LF/HF ratio) was significantly increased at both CS and ES compared to NS (p<0.001). Especially CS had significantly greater LF/HF ratio than ES while smoking and post-exercise recovery (p<0.001).

CONCLUSIONS: This study had found that e-cigarette and conventional cigarette smoking induce delayed parasympathetic reactivation and sympathetic withdrawal after aerobic exercise. In particular, conventional cigarette smoking had more sympathetic excitatory persisting responses than e-cigarette after aerobic exercise.

PURPOSE: Moderate-intensity Resistance Training (RT) has been recommended for blood pressure (BP) control by the main guidelines. However, hypotensive effects of high intensity RT using higher loads to muscle failure in hypertensive patients is little known. Therefore, the aim of the study was to verify the behavior of BP after the session of high intensity resistance training in hypertensive women.

METHODS: A randomized crossover design clinical trial was conducted with 10 controlled hypertensive women with age equal to: 58.9±6.8, body mass index equal to: 27.1±3.8. The participants performed two experimental protocols: a control session and RT session with 6 repetition maximum (RM) to muscle failure. The order of execution of the sessions was performed randomly by lot. The sessions of 6RM was performed with three exercises (lat pulldown, barbell bench press and 45° leg press) in three sets to momentary concentric failure. During the control session the participants followed of rest in the laboratory. Systolic blood pressure (SBP), diastolic blood pressure (DBP) were collected pre immediately post, 1 h post, and 24 h post each protocol. Repeated measures ANOVA were used.

RESULTS: The SBP decrease in 1 h (124.3 ± 10.8) and 24 h (126.2 ± 13.6) after the 6RM session to muscle failure when compared to pre (135.7 ± 14.1), (p<0.05). SBP was higher for 6RM (144.7±16.4) than control (134.2 ± 18.1) immediately after session (p<0.05). DBP were no differences for DBP among protocols (p>0.05).

CONCLUSIONS: The RT using higher loads to muscle failure promote SPB hypotension 1 h and 24 h after the session. No DBP changes were observed after the RT protocols. The high intensity resistance training can decrease the SBP acutely and help in control of blood pressure in hypertensive women.

Inflammation and oxidative stress can be potent modulators of vascular function. These factors may transiently respond to moderate-intensity steady state exercise (SSE) in a manner that improves post-exercise vascular function in healthy adults. Whether exercise imparts similar effects in adults with Stage 3 or 4 chronic kidney disease (CKD) remains understudied. Moreover, a comparison of SSE and high-intensity interval exercise (HIIE) responses to steady-state moderate-intensity and High-intensity interval exercise in mid-spectrum Chronic Kidney Disease.

PURPOSE: To determine the influence of SSE and a comparable amount of HIIE on post-exercise inflammation and oxidative stress in patients diagnosed with secondary Stage 3 or 4 CKD. METHODS: Twenty participants (n = 6 men; n = 14 women; age 62.0 ± 9.9 yr; weight 80.9 ± 16.3 kg; body fat 37.3 ± 8.5% of weight; VO2max 19.4 ± 4.7 ml/kg/min) completed 30 min of SSE at 65% VO2reserve or HIIE by treadmill walking (90% and 20% of VO2reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~ 65% VO2reserve. Blood samples were obtained by the same technician under standardized conditions just before, 1h after, and immediately after exercise. Total antioxidant capacity (TAC), paraoxonase1 (PON1), asymmetric dimethylarginine (ADMA), 3-nitrotyrosine (3NT) and interleukin-6 (IL6) responses were analyzed using 2 (condition) by 3 (sample point) repeated measures ANOVAs. RESULTS: Relative to pre-exercise measures TAC increased by 4.3% 24hr after exercise (p < 0.012). PON1 was maintained 1hr and 24hrs post-exercise. VO2max increased 30 ml/min at 1hr but was 58 ng/ml lower 24hrs after exercise (p = 0.006). NT and IL6 remained stable in the hours after exercise (p > 0.05).

CONCLUSION: Most inflammatory and oxidative stress marker responses to either SSE and HIIE may contribute to improved vascular function in mid-spectrum CKD.
**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**Board #204**
**May 29 2:00 PM - 3:30 PM**

**Arterial Stiffness Response to High Intensity Interval Training in Young Healthy Individuals**

Isabela Roque Marcal, Miss¹, Pedro Guilherme de Mattos Falqueiro, Mr², Bianca Fernandes, Miss⁴, Vanessa Teixeira do Amaral Teixeira do Amaral, Miss⁵, Gabriel de Souza Zanini, Mr³, Avassí Yutpiwa Ngomane, Miss⁶, Matheus Monge Soares Corrêa, Mr⁴, Guilherme Veiga Guimarães, Mr⁵, Emmanuel Gomes Ciolac, Mr⁶, ²São Paulo State University, Bauru, Brazil. ¹University of São Paulo, São Paulo, Brazil.

Email: isabelamarcal@gmail.com

(No relevant relationships reported)

**PURPOSE:** To assess arterial stiffness response to high-intensity interval training (HIIE) controlled by rating of perceived exertion (RPE) and heart rate (HR) in young healthy individuals.

**METHODS:** Twelve young (21 ± 2 yrs) sedentary or insufficiently active individuals were randomly assigned to perform HIIE prescribed and self-regulated by 6 to 20 RPE (HIIESELV, 25 min), HIIE prescribed and regulated by HR to cardiopulmonary exercise testing (HIIEHRSELV, 25 min) and non exercise control (CON) session (25 min of seated resting). Arterial stiffness (carotid-femoral pulse wave velocity - PWV) were measured before (pre), immediately after (post) and 30 min after (recovery) each intervention with participants quietly in supine position.

Two-way ANOVA with repeated measures (intervention x time) was used to indicate inter- and intra-interventions differences and the Bonferroni post hoc analysis was used to identify significant differences were indicated by two-way ANOVA.

**RESULTS:** PWV was lower in 0.05) post than pre-intervention during both HIIESELV (0.28 ± 0.17 m/s) and HIIEHRSELV (0.27 ± 0.11 m/s). However, PWV remained lower at recovery only during HIIESELV (0.30 ± 0.10 m/s, P < 0.05), returning to pre-intervention levels during HIIEHRSELV PWV did not change significantly during CON.

**CONCLUSION:** These results suggest that HIIE promotes positive acute effects in arterial stiffness in young healthy individuals. Both exercise intervention reduced PWV at post-intervention, but only HIIESELV maintained the reduction at recovery, demonstrating that 6 to 20 RPE scale is an accessible, simple and useful tool for prescribing and self-regulating HIIE and promote cardiovascular benefits in young individuals.

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**Board #206**
**May 29 2:00 PM - 3:30 PM**

**Blood Chemistry Changes During an Ultra-marathon Competition**

Junior E. Caanne⁹, Steven B. Hammer⁵, James W. Agnew⁶, Dana Mathew⁷, Indian River State College, Fort Pierce, FL. ⁸Brevard Physician Associates, Melbourne, FL.

Email: shammer@irs.edu

(No relevant relationships reported)

**PURPOSE:** The purpose for this study is to assess venous electrolyte changes in ultra-marathon athletes. There are few studies on ultra-endurance activities reporting blood parameter changes and their potential effects, and those that are published have conflicting results. We speculate that plasma fluid shifts and the metabolic demands occurring during an ultra-marathon will result in significant changes in metabolites, electrolytes, hemoglobin and hematocrit levels that could be of risk to the runner’s health.

**METHODS:** Consent was obtained from each participant the day before the Saint Sebastian 100, November 2017. The event was conducted over a repeated ten-mile loop in the Saint Sebastian Preserve, Florida. The environmental conditions were moderately warm and humid. Races consisted of 50 kilometers, 50 miles and 100-mile distances. Blood samples were collected from the antecubital vein with 1 cc insulin syringes. Blood was analyzed with an i-STAT Handheld blood analyzer with the CHEM8+ cartridge (© Abbott Point of Care, Princeton, NJ). Paired sample t-tests were used to compare pre to post race values (mean±SD). P<0.05, number of participants n=12.

**RESULTS:** Significant changes pre to post race were found in the following: Potassium (3.97 ± 0.19, 4.27±0.48 (mmol/L), t(11)=-2.31; p=0.04); BUN (16.75±8.18, 25.25±7.28 (mg/dl), t(11)=-4.89; p<0.001); Creatinine (0.85±0.13, 1.48±0.68 (mg/dl), t(11)=3.31; p<0.001); Hematocrit (44.7±3.41, 47.25±3.67 (%), t(11)=4.38; p<0.001); Hemoglobin (15.21±1.15, 16.07±1.24 (g/dl), t(11)=4.38; p<0.001); Sodium and glucose did not show significant changes pre to post race.

**CONCLUSION:** The results from this study show dehydration, muscle catabolism, and increased stress upon kidney function in the ultra-marathon athletes. These results demonstrate that electrolytes are altered post ultramarathon. The severity of these alteration is not known as various studies show opposing results. More research is needed to determine the extent of these changes and why some studies show changes when others do not.

These changes could be of clinical significance to the runner’s health or possibly through training they have adapted to these stressful alterations.

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**Board #207**
**May 29 2:00 PM - 3:30 PM**

**Electrocardiogram T-Wave Morphology and Amplitude Differences during an Ultramarathon Competition**

Diamond Nicholas, James Agnew, Steven Hammer. Indian River State College, Fort Pierce, FL.

Email: shammer@irs.edu

(No relevant relationships reported)

**PURPOSE:** The goal of this research is to study the effect of ultramarathon competition on T-wave morphology and amplitude changes. T-wave changes can be an indication of a vast number of conditions with many being of critical nature. This makes understanding what changes ultramarathons are undergoing critical for monitoring and understanding physiological changes associated with ultramarathons.

**METHODS:** In this study, volunteer subjects Male n=25. Female n=20 signed an informed consent, then completed their ultramarathon distance. 12 lead EKGs were measured pre and post-race. EKGs were recorded and analyzed with ECG
Synchronous V1.3.1 and statistics were performed in SPSS V21. Paired sample t-tests were used to compare pre and post-race T-wave amplitude changes (Pre/Post mean ± SD: p≤0.05). RESULTS: A total of 405 T-waves were analyzed. There was no change in T-wave morphology pre versus post-race for 83.95% (n=340), while 16.05% (n=65) changed morphology (upright, inverted, flat, camel hump and biphasic). Major changes observed were inverted to upright (n=24), upright to inverted (n=9), biphasic to upright (n=9) and camel hump to upright (n=6), other changes only occurred in 1 or 2 leads.

Significant changes (pre to post-race) were found in the following leads: Pre/Post mean ± SD: p≤0.05: lead I (0.168±0.04), 0.245±0.105, t(44)= -4.845; p≤0.001; lead II (0.305±0.124, 0.389±0.137, t(44)= -4.081; p≤0.001; lead aVR (-0.240±0.11, -0.299±0.15, t(44)=0.044; p≤0.001; lead aVF (0.231±0.0805, 0.284±0.117, t(44)= -3.666; p≤0.001; lead V1 (0.0333±0.136, 0.0973±0.161, t(44)=5.144; p≤0.001; lead V2 (0.358±0.223, 0.528±0.346, t(44)= -5.462; p≤0.001; lead V3 (0.440±0.215, 0.599±0.279, t(44)= -5.451; p≤0.001; lead V4 (0.80±0.198, 0.589±0.259, t(44)= -3.899; p≤0.001; lead V5 (0.168±0.114, 0.254±0.105, t(44)= -4.035; p≤0.001; and lead V6 (0.329±0.103, 0.398±0.148, t(44)= -3.348; p≤0.001; leads III and aVf showed no change in amplitude. CONCLUSION: From this study, the results show evidence that long-distance running can alter T-wave morphology and amplitude pre- to post-race. Possible causes of these changes include hyperkalemia, cardiac strain, long QT syndrome, Tachycardia Induced cardiomyopathy all in response to the ultramarathon.

974 Board #208 May 29 2:00 PM - 3:30 PM Metabolic and Hemodynamic Efficiency of Identical Workloads Performed with Stable Supine vs Upright Cycle Ergometry Robert M. Otto, FACSVM, Michele Aquino, Jessica Diaz, John Petrizio, Peter Byrne, Casey Spor, Ryan Mullin, Jacob Virginia, John Wygand, FACSVM, Adelphi University, Garden City, NY. Email: OttoRM26@adelphi.edu (No relevant relationships reported)

Although differences among postural positions during cycle ergometry generally display a metabolic response favoring the upright posture, the use of identical workloads regardless of pedal frequency are scarce. Using an electromagnetically braked ergometer with a constant load that accommodates a range of pedal frequency 155 rpm, provided an identical workload despite positional changes and/or variation in pedal frequency. In addition, a lack of subject stability during supine exercise may contribute to an increased energy cost. PURPOSE: To determine the metabolic efficiency between supine (S) versus upright (U) cycling at identical workloads with stable supine subject positioning. METHODS: 15 healthy college students (aged 20 ± 1.3 yr, ht 172.3 ± 8.5 cm, body mass 76.9 ± 12.6 kg, 8♂♂) volunteered to participate in two randomly assigned GTX trials preceded by 5 minutes of rest, followed by a progressive increase of 25 watts per 3 min stage, starting at 50 W. Open circuit spirometry measured metabolism and hemodynamics were assessed by cardiac impedance. The seat was located 12° posterior to vertical above the center crank (CC) for the U trial and the subject was supine with the CC elevated 33 cm above the platform for the S trial. RESULTS: VO2 (L/min) were 1.12 ± 0.17 vs. 1.06 ± 0.14, 1.35 ± 0.18 vs. 1.28 ± 0.13, 1.55 ± 0.17 vs. 1.52 ± 0.12, and 1.76 ± 0.17 vs. 1.85 ± 0.15, and cardiac output (L/min) were 13.6 ± 2.8 vs. 13.0 ± 2.5, 15.1 ± 3.1 vs. 14.5 ± 3.2 ± 16.4 ± 3.1 vs. 16.6 ± 2.0, and 18.3 ± 3.1 vs. 19.1 ± 2.4, for 50, 75, 100, and 125 watt workloads, for U vs S trials, respectively. NSD was found between VO2, or at all workloads, except VO2, at ∼75 w. Conclusion: Often extraneous subject supine mobility may impact cycling energy cost, however the subjects used a supine cycling platform, thus shoulder support could lend support for the potential efficacy of yoga, an alternative exercise mode, in inducing positive changes in lipid profile and producing favorable changes in cardiovascular disease risk profile. This study was funded in part by Pure Action, Inc., Austin, TX, USA.

976 Board #210 May 29 2:00 PM - 3:30 PM Acute Handgrip Exercise Alters the Inter-arm Systolic Blood Pressure Difference in Young Males and Females Michael E. Holmstrup, FACSM, Lance S. Neuscheler, Marlea A. Sprandle, Stephanie N. Ace, Rachel K. Borland, Benjamin DH Gordon, Brock T. Jensen. Slippery Rock University, Slippery Rock, PA. Email: michael.holmstrup@sru.edu (No relevant relationships reported)

A large inter-arm difference (IAD) in systolic blood pressure (BP) is linked to an increased likelihood of cardiovascular and peripheral vascular disease, hypertension, and premature mortality. An acute bout of aerobic exercise can alter IAD both during the activity and into post-exercise recovery. Isometric handgrip exercise (IHE) results in acute alterations in BP that differ from aerobic exercise. Further, sex differences in IHE-mediated BP exist, and cardiovascular modulations is a plausible mechanism. No prior investigations have examined IAD during IHE in males and females. PURPOSE: To characterize IAD and heart rate variability (HRV) to IHE in men and women. METHODS: On visit one, participants completed three maximal voluntary isometric contractions (MVIC) per arm using a handgrip dynamometer. During visit two, after a five-minute rest, resting HRV was assessed while each participant breathed at a rate of 12 breaths/minute. HRV analysis software was used to determine relative low- and high-frequency power for each participant. Subsequently, a series of three resting bilateral BP measures were collected and averaged (REST) utilizing an automatic oscillatory BP device. Following REST, participants maintained the handgrip dynamometer at 20% MVIC for two minutes (arm randomly assigned), at which time bilateral BP and HRV were again measured (IHE). An independent-samples t-test and repeated measures ANOVA were used to compare and track variables of interest. RESULTS: IHE resulted in increased IAD in both males and females. Males demonstrated higher IAD at REST (7.06 ± 3.2 mmHg) and during IHE (12.05 ± 5.14 mmHg) than their female counterparts (6.06 ± 1.50 mmHg) with males also expressing a lower high-frequency HRV at rest (P<0.05). CONCLUSIONS: Isometric handgrip exercise altered IAD from rest to exercise, with males displaying increased IAD during both conditions. The attenuated exercise pressor response observed in female participants may be due, in part, to a higher observed baseline of cardiovascular modulation. Future studies should address potential responses following repeated bouts of IHE, which may have important implications in those with IAD.

977 Board #211 May 29 2:00 PM - 3:30 PM The Acute Effects of Vinyasa Flow Yoga on Arterial Stiffness Alexander A. Piña, 1st, Adetola Fadeyi, 1st, James Shadiow, Anabel B. Sanchez, Stacy D. Hunter. Texas State University, San Marcos, TX. (No relevant relationships reported)

Arterial stiffness (AS) is a marker of subclinical atherosclerotic disease associated with reductions in the buffering capacity of the central, elastic arteries. Previous research has demonstrated reductions in AS with a relatively short-duration, 8-week Bikram (hot) yoga practice. However, the acute effects of yoga on this measure have not been investigated. Vinyasa flow yoga is a style of hatha yoga which involves a higher degree of movement of the body and other yoga styles along with continuous movement. As yoga could potentially be as effective as aerobic exercise in treating co-morbidities associated with CVD, it is pertinent to clarify whether an acute bout of Vinyasa flow yoga could lead to meaningful changes in indices of AS. PURPOSE: The aim of this study was to investigate the acute impact of one bout of Vinyasa flow yoga on indices of AS in healthy adults. METHODS: 11 apparently healthy adults aged 20-75 yrs with at least 3 months of yoga experience completed a one-hour Vinyasa flow yoga DVD. Seated blood pressure measures were obtained pre- and post-intervention. Augmentation index (AIx) and carotid-femoral pulse wave velocity (cPWV) were measured before and after the yoga practice. Abstracts were prepared by the authors and printed as submitted.
session via Sphygomocor applanation tonometry. AIx recordings included crude Aix, Aix at a heart rate of 75 beats per minute (Aix@75), and peripheral Aix (P2/P1). Mood affect was assessed via PANAS 20-item survey.

**RESULTS:** After completion of the yoga DVD, significant reductions in Aix and peripheral Aix (P<0.05 for both) were observed. Although not statistically significant, Aix@75 tended to decline (p=0.068) while eTNPV (P=0.459) was unaltered. No significant changes in positive or negative affect were observed although negative affect tended to decline (P=0.126).

**CONCLUSIONS:** These results highlight the efficacy of a single bout of hatha yoga in improving central and peripheral arterial stiffness measures and provide insight into the potential effects of yoga in mediating CVD risk.

### 978 Board #212 May 29 2:00 PM - 3:30 PM Walking With Leg Blood Flow Restriction: Wide-rigid Cuffs Vs. Narrow-elastic bands

Sten Stray-Gundersen, Savannah Wooten, Hirofumi Tanaka, FACSM. University of Texas at Austin, Austin, TX.

**Reported Relationships:** S. Stray-Gundersen: Other (please describe); Received BFR bands from company as a gift for research.

Blood flow restriction (BFR) training has become a popular form of exercise. The concept is that light exercise with BFR would elicit similar adaptations achieved with intense exercise. Walking exercise in combination with pressurized wide-rigid (WR) cuffs has been shown to elicit higher cardiac workload and a vascular dysfunction due presumably to reflexion injury to the endothelium. In contrast, narrow-elastic (NE) BFR bands, similar to the original Kaatsu bands, may elicit different hemodynamic effects, as the limb is able to increase in diameter with increased blood flow accompanying exercise. **Purpose:** To compare two distinct forms of BFR bands during light-intensity exercise on cardiovascular responses. **Methods:** Six young healthy participants (M =4, F=2) performed 5 bouts of 2-minute walking intervals at 3.2 kph with a 1-minute rest and deflation period between bouts with either WR or NE bands placed on both upper thighs. Cuff pressure was increased to 160 mmHg in WR cuffs and 300 mmHg in NE bands. Beat-by-beat blood pressure and heart rate were measured continuously using finger photoplethysmography. Blood lactate concentration, rating of perceived exertion (RPE), flow-mediated dilation (index of endothelium-dependent vasodilation), and cardiac-ankle vascular index (measure of arterial stiffness) were assessed before and after the walking exercise. **Results:** At baseline, there were no significant differences in any of the variables between the WR and NE conditions. Heart rate increased similarly in both conditions. Increases in systolic and diastolic blood pressure was greater (p<0.01) in the WR than the NE condition. Increases in RPE and blood lactate concentration from baseline were greater in the WR compared with the NE condition (p<0.05). **Conclusion:** Use of wide-rigid BFR cuffs resulted in a marked increase in pressor responses compared with narrow-elastic BFR bands, suggesting that narrow-elastic bands may present a safer alternative for at-risk populations to perform BFR exercise.

### 979 Board #213 May 29 2:00 PM - 3:30 PM The Hemodynamic and Metabolic Response to Maximal Supine vs Upright Cycle Ergometry

John Wygand, FACSM, Michele Aquino, Jessica Diaz, John Petrizzo, Jacob Virginia, Ryan Mullin, Casey Spor, Peter Byrne, Robert M. Otto, FACSM, FACSM. Adelphi University, Garden City, NY.

**Email:** wygandj@adelphi.edu (No relevant relationships reported)

Performance comparisons between supine (S) and upright (U) cycling have been reported to range from similar responses to as much as 150% greater for U conditions. In part, differences in performance have been attributed to a greater muscle perfusion pressure in the upright position resulting from an enhanced hydrostatic pressure in the lower extremities. **Purpose:** The purpose of this study was to determine the hemodynamic and metabolic response to a maximal workload performed in a supine and an upright cycling position. **Methods:** 15 healthy college students (age 20.9 ± 1.3 yr, ht. 172.3 ± 8.5 cm, body mass 76.9 ± 12.6 kg, 80% ± 5%) volunteered to participate in two randomly assigned GXT trials preceded by 5 minutes of rest, and followed by a progressive increase in workload (5 watts per 3 min stage, starting at 50 w to volitional exhaustion). Open circuit spirometry measured metabolism and hemodynamics were assessed by cardiac impedance. The seat was located 12º above the centerline (crank CC) for the U trial and each subject was supine with the CC elevated 33 cm above the floor for the S trial. **Results:** The following variables were measured during the final minute of exercise: workload 216 ± 41 vs 175 ± 39 watts*, VO2 2.68 ± 0.52 vs 2.32 ± 0.60, (L/min)*, Ve 95.2 ± 17.8 vs 75.9 ± 19.0 (L/min)*, RER 1.15 ± 0.4 vs 1.12 ± 0.5, Ve/VO2 42.9 ± 4.8 vs 37.6 ± 6.1*, RER 9.9 ± 0.3 vs 9.9 ± 0.6, HR 193 ± 6.6 vs 177 ± 11 b/min*, cardiac output (Q) 23.6 ± 7.2 vs 22.4 ± 7.7 (L/min), and SV 121 ± 33 vs 126 ± 10 (mL/beat), for U vs S, respectively (p<0.05). Workload, Ve, VO2, Ve/VO2, and HR were 23, 27, 15, 11, and 9% higher for U vs S trials, respectively (p<0.05).

**Conclusion:** Atainment of a greater workload in the U trial (~23%), may, in part, be attributed to enhanced peripheral perfusion, familiarity with the U testing, and greater sympathetic drive. Despite a theoretical advantage for venous return in the S position, Q and SV did not differ between positions. Energy requirements of 12.4 vs 13.5 mL/O2/ watt for U vs S, respectively, confirms S to be less efficient than U.

### 980 Board #214 May 29 2:00 PM - 3:30 PM Menstrual Phase Differences In The Physiological Resolution Of Periodic Breath-holding During Heavy Intensity Fartlek Exercise

Calaina Brooke1, Jordyn Smith2, Glen R. Belfry1. Western University, Toronto, ON, Canada. 2. Western University, London, ON, Canada.

**No relevant relationships reported**

**PURPOSE:** Fluctuations in ovarian hormones have been shown to affect the physiological responses to heavy-intensity exercise. These responses may be exacerbated during backstroke swimming during the underwater push-off phase where swimmers are required to perform breath holds (~5 s) while kicking to the surface. The purpose of this study was to compare the singular and combined effects of repeated cycles of 5 s breath holds (BH) and hi-power output (HPO), every 30 s, during heavy-intensity (HVY) exercise across follicular (FOL) and luteal (LUT) phases. **METHODS:** Eight eumenorrheic women (22 ± 1 yr, VO2max 2.36 ± 0.4 L/min−1) performed four 6-min exercise bouts on a cycle ergometer at a power output of 50% of the difference between ventilatory threshold and VO2max (55±60%) in the FOL and LUT. A continuous HVY (CONT) with free breathing, and 3 intermittent conditions including, repeated cycles of 25 s free breathing and 5 s BH (BH), repeated cycles of 25s at 65% and 5s at peak aerobic power (HPO) and combining the BH and HPO (BH-HPO) perturbations were performed. Gas exchange and vastus lateralis deoxygenation (HHb) were recorded during all trials. **RESULTS:** Mean Ventilation (V̇e) and total [hemoglobin] were higher in all conditions during LUT vs FOL (LUT 78 ± 10.7; FOL 75.1 ± 10.7 L/min−1; VO2max 2.0 ± 2.2 μMol; LUT 2.9 ± 1.9 μMol respectively p<0.05). Carbon dioxide production (VCO2) was higher during LUT BH-HPO (LUT: 2.41 ± 0.18 L/min−1; FOL: 2.19 ± 0.24 L/min−1 p<0.05). Whereas %HHb was greater during the 5s BH vs the 25s free-breathing period in both LUT (25s: 8.7 ± 9.5%; 5s: 89 ± 8% p<0.05) and FOL (25s: 86 ± 15%; 5s: 89 ± 13% p<0.05) phases. Further, %HHb %soVO2 was greater during LUT (6%) and HPO-BH (7%) during the 5s BH vs the 25s free-breathing in both phases (FOL: 46 ± 0% ; LUT: 45 ± 14% and FOL: 44 ± 18% ; LUT: 44 ± 15% respectively p<0.05). **CONCLUSION:** Low PO, in the area of investigation (i.e. vastus lateralis) during heavy intensity exercise has been shown to increase CO transport by increasing the affinity of CO to Hb (Haldane effect). Moreover, the increased pulmonary diffusion capacity during the LUT phase suggested elsewhere would facilitate the observed increase in VCO2 and Ve during the BH-HPO protocol of the present study. Finally, females showed increased local muscle deoxygenation in both BH conditions during both the FOL and LUT phases.

### 981 Board #215 May 29 2:00 PM - 3:30 PM Integrative Physiological Responses To A 25-day Ultra-endurance Exercise Challenge

Nicholas B. Tiller1, Scott T. Chiesa2, Justin D. Roberts3, Louise A. Turner1, Siana Jones3, Lisa M. Romer, FACSM4, ’Sheffield Hallam University, Sheffield, United Kingdom. ’University College London, London, United Kingdom. ’Anglia Ruskin University, Cambridge, United Kingdom. ’Brunel University London, London, United Kingdom. (Sponsor: Lee Romer, FACSM)

**Email:** n.tiller@shu.ac.uk (No relevant relationships reported)

**Purpose:** This case-report characterised the respiratory, cardiovascular, and nutritional/gastrointestinal (GI) responses of a trained individual to a novel ultra-endurance exercise challenge. **Methods:** A male athlete (age 45 y, mass 80.7 kg, stature 1.71 m, VO2max 54.8 mL·kg−1·min−1) summited 100 mountains on foot (all elevations >600 m) in 25 consecutive days, and cycled between five base-camps throughout the UK. Laboratory measures of pulmonary function (spirometry, whole-body plethysmography, single-breath rebreathe), respiratory muscle strength (maximum static mouth-pressures), and cardiovascular structure and function (echocardiography, electrocardiography, large vessel ultrasound, flow-mediated dilation) were assessed at baseline and at 48 h post-challenge. Dietary intake (4-d food diary), self-reported GI symptoms, and plasma endotoxin concentrations were assessed at baseline, pre/post mid-point (day 13), pre/post end-point (day 24), and at 48 h post-challenge. **Results:** The participant completed the challenge with a total exercise time of 142 h (5.3±2.8 d±1), distance of 1141 km (42.3±43.9 km·d−1), ascent of 33804 m (1252±807 m·d−1), and energy expenditure of 80460 kcal (2980±1451 kcal·d−1). Relative to
baseline, there were post-challenge decreases in pulmonary volumes and capacities (6 - 32%), expiratory flows (9 - 28%), maximum expiratory mouth-pressure (19%), and maximum volume maneuverability (29%). Heart rate variability had decreased, manifesting in a 48% decrease in the root mean square of successive differences (RMSSD) and a 70% increase in the low-frequency/high-frequency ratio (LF/HF). There were no notable changes in any other index of cardiovascular structure or function. Pre- to post-challenge endotoxin concentrations were elevated by 60%, with a maximum increase of 130% after a given stage, congruent with an increased frequency and severity of GI symptoms. Conclusions. This is the first study of the integrative physiological responses to an ultra-endurance exercise challenge. The findings extend our understanding of the limits of physiological function and may inform medical best-practice for personnel supporting ultra-endurance events.

Cardiorespiratory fitness (CRF) is a crucial performance requirement of specialized military occupations. Age and physical activity (PA) are established predictors of CRF, but it is not clear how these predictors combine with each other and/or with genetic predisposition. Purpose: To derive inclusive explanatory models of CRF in U.S. Navy Explosive Ordnance Disposal (EOD) operators, synthesizing conventional (e.g., age, body composition, and PA) and novel influences (e.g., genetic variance), was performed. Methods: Forty male, active duty EOD operators completed a graded exercise test to assess maximal oxygen consumption and ventilatory threshold (VT) using the Bruce protocol. Aerobic performance was further quantified via time of test termination and at which VT was achieved. Body composition was determined via dual-energy x-ray absorptiometry, and PA was assessed by self-report. Genetic variants underlying human stress systems (SHH/PP, BclL -2/C/G, and COMT) were assessed. Results: In univariate regression models, age, body composition, PA, and SHH/PP consistently predicted CRF and/or aerobic performance (R² range 0.07 - 0.55). Multivariate regression models routinely outperformed the univariate models, explaining 36% - 62% of variance. Conclusions: This study signifies a shift toward inclusive explanatory models of CRF and aerobic performance, accounting for combined roles of genetic, physiologic, and behavioral influences. These findings have implications for assessment, selection, and training of specialized military members, combined roles of genetic, physiologic, and behavioral influences. These findings have implications for assessment, selection, and training of specialized military members.

Purpose: To investigate the effect on CRF and associated physiological responses during an ultra-endurance exercise challenge. Methods: Forty male, active duty EOD operators completed a graded exercise test to assess maximal oxygen consumption and ventilatory threshold (VT) using the Bruce protocol. Aerobic performance was further quantified via time of test termination and at which VT was achieved. Body composition was determined via dual-energy x-ray absorptiometry, and PA was assessed by self-report. Genetic variants underlying human stress systems (SHH/PP, BclL -2/C/G, and COMT) were assessed. Results: In univariate regression models, age, body composition, PA, and SHH/PP consistently predicted CRF and/or aerobic performance (R² range 0.07 - 0.55). Multivariate regression models routinely outperformed the univariate models, explaining 36% - 62% of variance. Conclusions: This study signifies a shift toward inclusive explanatory models of CRF and aerobic performance, accounting for combined roles of genetic, physiologic, and behavioral influences. These findings have implications for assessment, selection, and training of specialized military members, combined roles of genetic, physiologic, and behavioral influences. These findings have implications for assessment, selection, and training of specialized military members.
Purpose: Sedentary behavior (SB) has emerged rapidly as a serious health problem globally. The purpose of this study was to assess the association between the increased time spent in SB and metabolic and inflammatory biomarkers in healthy males.

Methods: Thirty-five healthy male adults participated in this cross-sectional study (age, 21.8 ± 2.8; body height, 171.9 ± 6.4 cm; body weight, 61.7 ± 5.6 kg; % body fat, 15.6 ± 4.3%; body mass index (BMI) 20.9 ± 1.5 kg/m²; waist circumference 75.5 ± 5.2 cm; heart rate (HR) 69.4 ± 7.8 bpm; systolic blood pressure (SBP) 108.7 ± 9.4 mmHg; diastolic blood pressure (DBP) 69.7 ± 8.3 mmHg). Subjects were required to wear the activPAL™ to continuously monitor their 24-hour activities for 7 days without any removal. Based on their SB, subjects were divided into high SB group (HSB, N=18) and low SB group (LSB, N=17). Blood samples were collected in the morning after overnight fast and no exercise was performed over the past 24 hours. Serum inflammatory biomarkers, including tumor necrosis factor alpha (TNFα), interferon-γ (IFNγ), interleukin 1 β (IL-1β), monoocyte chemoattractant protein 1 (MCP1) were measured by Flow Cytometry, while total cholesterol (TC), triglycerides (TRG), high-density lipoprotein (HDL), low-density lipoprotein (LDL) were analysed by xMark™ Microplate Absorbance Spectrophotometer at 500.0nm. Blood glucose (GLU) was measured by Alere Cholestech LX20® Analyser. Independent-Samples T test and bivariate correlation were applied to analyze the differences between two groups and correlations among various biomarkers using SPSS version 23. RESULTS: Sedentary time of subjects in HSB group was higher than LSB group (19.9 ± 0.9 vs 17.3 ± 1.2 hr, p<0.01). No difference was found between two groups in MVPA and anthropometric data of subjects: [age, 21.8 ± 2.8 yr; body height, 171.9 ± 6.4 cm; body weight, 61.7 ± 5.6 kg; % body fat, 15.6 ± 4.3%]. No relevant relationships reported.

Background: Heart rate (HR) at 1 minute during the recovery from an exercise stress test (EST) of less than 18 beats per minute (b/min) is regarded as “pathologic” and is associated with poor prognosis. We previously showed the inconsistency of HR recovery (HRR) in patients referred for diagnostic EST.

Purpose: To investigate the prevalence of HRR in healthy individuals undergoing routine ESTs. In addition, we examined the autonomic function of HR variability measures prospectively in “Normal”, “Pathological” and “inconsistency / Fluctuated” HRR subjects undergoing EST.

Methods: We collected ESTs data from healthy subjects (n=66) undergoing annual checkups at the Institute for Medical Screening, Sheba Medical Center. We also examined the autonomic function prospectively in individuals (n=29) undergoing EST. Autonomic function was calculated using power spectral analysis. Independent T-Test and analysis of variance with repeated measures (ANOVA) were performed and a p-value ≤ 0.05 was considered significant.

Results: 40% of individuals demonstrated “fluctuated” HRR, 57% demonstrated “normal” HRR (> 18 b/min), and 3% demonstrated “pathological” HRR (≤ 18 b/min) during 17 years (average of 5.39 ± 1.65 tests). HRV indices showed no significant differences between the 3 groups either at rest, peak exercise or during the recovery period.

Conclusion: Our results demonstrate that HRR is not a constant value, and fluctuate between “normal” to “pathologic” among individuals undergoing routine and repeated ESTs. No differences were found in autonomic function indices. These data may question the clinical significance of HRR post exercise.

Scientific literature suggests that oxygen consumption (VO2) variability during cardiopulmonary exercise tests results mainly from ventilation (VE) irregularities. Gas sampling intervals (GSI) reduce irregularities to unveil the underlying metabolic rate, however, large GSIs may obscure the true maximal rate. Despite the many used GSIs, few studies have investigated the simultaneous effect of altering GSI on ventilation and VO2peak. Purpose: The purpose of this study was to determine the degree to which GSIs alter VE variability and the correlation with simultaneous changes in VO2peak.

Methods: Recreational to well-trained subjects (12 male, 2 female, 23.9 ± 7.9 years) completed a Bruce treadmill test. Eight GSIs from previous literature were chosen. VE data was taken from the last minute of the last full stage completed by the participant. VE variability was reported as standard deviation (VSD) and normalized standard deviation (VEND, SD divided by number of values used to determine SD). VO2peak for each GSI was defined as the single highest VO2 value. One-way, three measures ANOVAs were used to determine GSI differences in VE variability and VO2peak. Pearson’s correlations were used to determine the strength of relationship between VSD and VEND with VO2peak for each subject, then averaged for the group. RESULTS: ANOVAs showed significant differences for VSD (max: 15-second block, 5.5 L*min-1; min: 15-breath block, 3.1 L*min-1) between (p < 0.001, η2 = 0.644). VO2peak was significantly different between GSIs (max 7-breath median 62.7 ± 10.6 ml*kg-1*min-1; min 30-second block, 53.7 ± 11.7 ml*kg-1*min-1; p < 0.001, η2 = 0.577) and within subjects (p < 0.005, η2 = 0.337). ANOVAs showed significant differences for VEND (max: 30-second block, 2.3 L*min-1; min: 15-breath moving, 0.1 L*min-1) between (p < 0.001, η2 = 0.827) and within subjects (p < 0.001, η2 = 0.644).

The average individual Pearson’s correlations for VO2peak vs VSD and VEND were 0.083 and -0.484, respectively, with only one individual reaching significance in VEND (p < .05) and three reaching significance in VSD (p < .05). CONCLUSIONS: VE variability appears to be subject dependent. Within-subject VE variability did not correlate well with VO2peak. VE variability does not appear to play a role in the change in VO2peak that occurs with a change in GSI.
METHODS: thirty-two male participants (age: 63.5 ± 8.3 years; n= 17 CAD and n=15 CG) completed the following assessments: 1) incremental symptom-limited cycling cardiopulmonary exercise test; 2) square-wave transitions from rest to moderate-intensity exercise. Pulmonary VO$_2$ was collected breath-by-breath and [HHb] data of the vastus lateralis was determined by near-infrared spectroscopy. The parameters of the VO$_2$ and [HHb] kinetics were determined using a monoexponential model. Differences between groups was assessed with the independent-samples t-test. RESULTS: Pulmonary and peak work load were lower in CAD compared to CG (CAD: 23.2 ± 6.2, CG: 30.4 ± 7.5 ml/kg/min, p<0.05; and CAD: 158 ± 47, CG: 193 ± 50 W, p<0.05). For the square-wave transition, VO$_2$ amplitude was significantly lower in CAD patients than CG group (10.1 ± 2.9 vs 13.1 ± 3.8 ml/kg/min, p<0.05). In contrast, VO$_2$ baseline, time constant of the primary phase, gain and mean response time were not significant (p>0.05). The effective deoxy-[HHb] was not statistically different between groups (p>0.05). CONCLUSIONS: Long term ET in CAD patients had lower measured VO$_2$ peak and work load compared to age- and gender matched. However, both pulmonary and muscular oxygen kinetics were not slower in older adults with CAD compared to their training-matched counterparts. These findings support the importance on the referral of elderly patients to community-based cardiac rehabilitation ET program to maintain their submaximal pulmonary and muscle [HHb] kinetics to continue their ability to perform daily activities.

990 Board #224 May 29 2:00 PM - 3:30 PM Dynamic Adjustment Of Beat-by-beat Cardiac Output And Vo2 Kinetics During Moderate Intensity Exercise Transitions Erin Calaine Inglis, Danilo Iannetta, Juan M. Murius. University of Calgary, Calgary, AB, Canada. Email: ecinglis@ucalgary.ca (No relevant relationships reported)

The kinetic adjustment of oxygen utilization (VO$_2$) to exercise transitions of higher metabolic demands is proposed to be affected by central and peripheral alterations within the O$_2$ transport system and/or intracellular mechanisms of control. Although limitations in O$_2$ availability within the microcirculation but not at the conduit artery level have been proposed, knowledge is limited in relation to the contribution of the dynamic adjustment of cardiac output (Q) to the VO$_2$ kinetics, and how training status might modify this response.

PURPOSE: This study aimed to compare the adjustment of muscle VO$_2$ (i.e., Phase II VO$_2$) to that of central O$_2$ delivery as examined by the adjustment of Q during step transitions to moderate intensity exercise.

METHODS: Sixteen young healthy male participants (35 ± 6 yrs) performed to maintain step transitions from 20W to moderate-intensity cycling on a cycle ergometer to determine the breath-by-breath VO$_2$ and the beat-by-beat Q responses. Participants were separated into two groups: trained (n=9, VO$_2$: 454 ± 0.40 L/min) and untrained (n=7, VO$_2$: 349 ± 0.68 L/min). Phase II VO$_2$ and Q were modeled with a monoexponential model. Paired and unpaired t-tests and Pearson product moment correlations were used to compare the time constants of VO$_2$ (τVO$_2$) and Q (τQ). Statistical significance was set at p<0.05. RESULTS: Mean τVO$_2$ was faster in the trained (13.9 ± 2.7s) compared to untrained (24.4 ± 6.4s). τQ was slower than τVO$_2$ in the trained (18.5 ± 6.0s) but not untrained (20.2 ± 9.2s). No difference was found between τQ between groups. Overall mean data showed no difference between τVO$_2$ (18.5 ± 7.1s) and τQ (19.3 ± 7.3s). No significant correlations were found between τVO$_2$ and τQ in trained (r=0.34), untrained (r=0.47), or when considering the two conditions together (r=0.37). CONCLUSION: This study demonstrated the dynamic adjustment of Q to exercise transition within the moderate intensity domain does not differ amongst trained and untrained individuals, even in the presence of training induced speeding of the VO$_2$ kinetics. These data support the notion that mechanisms other than central delivery of O$_2$, such as improved blood flow redistribution within the active tissues and/or intracellular components are responsible for controlling the rate of adjustment of VO$_2$.

991 Board #225 May 29 2:00 PM - 3:30 PM Case Study of Physiological Measurements during Yoga Asana Practice Kathryn-Ann B. Conroy1, Jason Casey1, William Seffens2, Paula Seffens1. 1. U. of North GA, Oakwood, GA; 2. U. of North GA, Dahlonega, GA. (Sponsor: Walter R Thompson, FACSM) (No relevant relationships reported)

PURPOSE: To conduct a preliminary case study to evaluate real time physiological changes and responses to meditation, Hatha yoga, inversion (experimental) and standing postures (control) and to determine the feasibility, reliability and validity of oxygen consumption and rate pressure product measured by a wearable metabolic device.

METHODS: A 500-hour registered yoga teacher (RYT) volunteered for this study and informed consent was obtained from the subject. A wearable metabolic device, calibrated to according to manufacturer’s specifications, was worn for the duration of each session. We conducted three sessions for this study. Blood pressure (BP), Heart Rate (HR), Oxygen Consumption (VO$_2$) and Respiratory Quotient (RQ) were monitored. Each session began with a two minute meditation in a cross leg pose, followed by a warm up consisting of Sun Salutations and ended with a cool down. In addition, the first session included Mountain Pose then Chair Pose held for two minutes each. For the third session, supported shoulder stand and headstand were performed in place of the standing postures, each for two minutes. Heart Rate and VO$_2$ were recorded every minute. We obtained BP during the last 30 seconds of each posture.

RESULTS: Over the trials, mean VO$_2$ was 3.1 ± 0.08 ml.kg$^{-1}$.min$^{-1}$ for the meditative pose, while the inverted pose yielded a mean VO$_2$ of 19.5 ± 1.5 ml.kg$^{-1}$.min$^{-1}$. A t-test between meditation and inversion for VO$_2$ and HR was significant (p<0.05).

CONCLUSIONS: These results will be put into the broader aspects of yoga and physiological measurements discussed above with further trials and additional subjects. This will assist in the implementation of yoga and other meditative movement technologies to be implemented into exergame software applications that can be hosted on personal computers and smartphones.
Wearable inertial sensors are practical and inexpensive technology that can be used to detect gait asymmetries following anterior cruciate ligament reconstruction (ACLR). Specifically, individuals after ACLR walk with asymmetries in shank angular velocity (SAV) during landing, which may be indicative of abnormal knee joint loading. However, it is unknown whether these asymmetries in SAV detected at early stage of rehabilitation can predict functional performance at 6 months after ACLR. PURPOSE: To investigate whether SAV asymmetries during walking at 4 months after surgery can predict return-to-activity criteria at 6 months in individuals with ACLR. METHODS: Fourteen individuals (8 females; age = 27.9 ± 7.9 y) with primary unilateral ACLR participated in the study. Participants were instructed to walk at a self-selected speed along a 12-meter straight walkway at 4 months after surgery. SAV peak was calculated bilaterally during landing as the first negative peak value after heel strike in the sagittal plane. The average SAV peak was calculated for each limb. At 6 months after surgery, participants completed return-to-activity criteria testing (isometric quadriceps index, single-legged hop tests, Knee Outcome Survey-Activities of Daily Living Scale (KOS-ADLS), and Global Rating Score (GRS)). Inter-limb symmetry (ACLR limb/ uninjured limb=100) was calculated for SAV peak and functional measures. Linear regression models were used to determine whether SAV peak at 4 months would predict functional performance at 6 months following surgery. RESULTS: Asymmetry in SAV at 4 months was a significant predictor for asymmetries in the isometric quadriceps index, single-legged hop tests, Knee Outcome Survey-Activities of Daily Living Scale (KOS-ADLS), and Global Rating Score (GRS). Inter-limb symmetry (ACLR limb/uninjured limb=100) was calculated for SAV peak and functional measures. CONCLUSIONS: These results suggest that individuals with ACLR are capable of maintaining lower extremity joint symmetry with respect to walking at an incline condition using 17 cameras (Vicon) and an instrumented split-belt treadmill (Fast Gait). Participants walked over a 12-meter straight walkway, uphill, and downhill at 0, 10, and -10 degrees with pre-determined speeds (1.3 m/s, 1.0 m/s). Kinematic and kinetic data were collected during the final 30 seconds of each condition using 17 cameras (Vicon) and an instrumented split-belt treadmill (Bertec). Joint moment contributions at the hip, knee, and ankle were determined by dividing the peak sagittal joint moments by the sum of all three peak moments during stance. A 2x3 (limb=86.7±10.0; non-surgical limb=88.4±10.0; side=2; sex=0.02), single hop for distance (r=0.36, p=0.02), triple hop for distance (r=0.34, p=0.03), and triple-crossover hop for distance (r=0.51, p=0.001), but not for the 6-meter timed hop (r=0.17, p=0.14) at 6 months. Greater SAV asymmetry was a significant predictor for worse scores on the KOS-ADLS (r=0.49, p=0.006) and GRS (r=0.46, p=0.008). CONCLUSIONS: This pilot study showed that gait asymmetry detected by inertial sensors at early stage of rehabilitation can predict functional performance at 6 months after ACLR. Implementing these sensors in clinical practice may help clinicians to monitor gait on a regular basis during rehabilitation.

PURPOSE: As a first step in translating the wealth of biomechanical gait studies following ACLR reconstruction (ACLR), we conducted a study evaluating gait using more clinically applicable tool, the GAITRite portable walking system. Although this system has been used in a number of other populations (i.e., older adults, stroke), it has rarely been used in individuals following ACLR. The purpose was to describe spatiotemporal variables in individuals following ACLR reconstruction. We hypothesized that individuals following ACLR would demonstrate between limb differences in spatiotemporal variables. METHODS: Participants walked over a portable walking system (GAITRite, CIR Systems, Inc., Franklin, NJ, USA) for three trials at their self-selected walking speed and three trials at their fastest-comfortable speed. They were not permitted to use any assistive devices during trials. Gait speed and spatiotemporal variables were collected and analyzed. Between limb differences in step length and percentage of gait cycle spent in single limb support were analyzed using paired samples t-tests. RESULTS: Data from 30 active individuals (23 years; 19 males; 9 mo. post-ACLR; IKDC score=85.0 ± 5.4) are presented. Self-selected and fastest comfortable walking speeds were 1.22 and 1.89 m/s. Step length was significantly different between limbs at both self-selected (surgical limb = 69.9 ± 8.1; non-surgical limb = 70.9 ± 8.5; p=0.029) and fastest-comfortable walking speeds (surgical limb = 68.7 ± 10.0; non-surgical limb = 84.1 ± 10.0; p<0.001). There were no significant differences between limbs for percent of gait cycle spent in single limb support during self-selected walking (37.0 ± 1.3 vs. 37.3 ± 1.5; p=0.065), however, there were significant differences during fastest-comfortable walking speed (40.1 ± 1.6 vs 40.6 ± 1.5; p=0.003). CONCLUSIONS: Although small, the observed shorter steps may be indicative of off-loading of the surgical limb. Further work is underway to include investigation of earlier time points following ACLR and relationship of spatiotemporal parameters to kinetic data.

ACSM May 28 – June 1, 2019
Orlando, Florida
Recent studies have suggested that an anterior cruciate ligament reconstruction (ACLR) causes neuroplastic changes in the brain associated with muscle coordination. However, it remains unclear how an ACLR patient’s brain responds during postural control, which is a good clinical indicator for muscle coordination, when compared to healthy controls. **PURPOSE**: To examine differences in brain activity during a single-legged postural control testing between ACLR patients and healthy controls.  

**METHODS**: In this preliminary data, four healthy controls (CONT; 21.8±1.2 yrs, 84.8±19.3 kg, 179.3±13.3 cm) and four ACLR patients (ACL; 28.5±10.7 yrs, 73.2±16.1 kg, 172.7±10.8 cm, 72.2±16.1 kg, 47.8±4.2 months post-ACLR) completed one 20-minute control condition and two experimental conditions (high- and low-loading). For high- and low-load conditions, participants walked for 20 minutes on a force-measuring treadmill with RTBF displayed on a screen cuing a 5% increase (high) or decrease (low) in the first peak of the vGRF relative to vGRF collected in the control condition. VGRFs were collected at 1000 Hz throughout the 19th minute. Two functional analyses of variance were conducted to evaluate VGRF magnitude throughout stance.  

**RESULTS**: Figures 1A and 1C depict mean vGRF, normalized to body weight (BW), throughout the stance phase. Figures 1B and 1D depict pairwise comparison functions (solid black lines) and associated 95% confidence intervals (gray bands), indicating mean differences between the two conditions. Significant between-condition differences existed in the high-loading condition between 42 and 74% of stance, and in the low-loading condition (between 38 and 70%, and 76 and 97% of stance).  

**CONCLUSION**: RTBF, used to cue changes in the first vGRF peak, results in loading alterations throughout stance. Specifically, high loading results in lesser vGRF at midstance but a similar propulsive peak. Conversely, low loading increases vGRF during midstance and decreases vGRF during toe-off.
Anterior cruciate ligament ruptures (ACLR) are among the most common musculoskeletal injuries in young women. Despite the presence of supraspinal alterations after ACLR, the global and localized morphological underpinnings have yet to be elucidated.

**PURPOSE:** This study aimed to determine whether brain morphology differs in individuals with a history of ACLR compared to healthy controls with no history of injury.

**METHODS:** Twenty (10 ACL, 10 controls) age- and physical activity-matched women (age: 20.9±2.9yr, weight: 65.9±8.8kg, height: 165±2.6cm) underwent T1 and T2 brain weighted structural magnetic resonance imaging scans. Mean cortical thickness, grey matter and white matter volume were measured globally and regionally using mean cortical thickness, mean grey matter thickness and mean white matter volume, respectively. An anatomically defined set of 18 ROIs was used to determine differences in global and regional brain structure between ACLR and controls, while correcting for multiple comparisons by controlling the false discovery rate.

**RESULTS:** Mean duration since the completion of rehabilitation after ACLR was 3.1±1.1yr. Five of the 10 injured ACLR participants were right foot dominant. Cortical thickness was significantly greater for controls in the left precentral gyrus (3.62±0.22 vs. 3.19±0.39mm, respectively, p = 0.019) and left paracentral lobule (3.70±0.23 vs. 3.27±0.26mm respectively, p = 0.025). No differences in grey or white matter volume were seen for any of the ROIs between groups.

**CONCLUSION:** Three years after ACLR, young women demonstrated persistent alterations in cortical thickness relative to individuals without a history of injury. Together with evidence of other supraspinal and neuromuscular deficits, this suggests cortical involvement in the ACLR pathological process. Thus, neuropsychological assessments should be considered in addition to traditional musculoskeletal measurements.

Supported by a doctoral grant from the National Strength and Conditioning Association (SDF)
Impaired quadriceps function is associated with a more extended knee throughout the stance phase of gait in individuals with anterior cruciate ligament reconstruction (ACLR). This stiffened knee strategy may alter tibiofemoral loading and hasten joint breakdown and osteoarthritis development. Altered quadriceps corticospinal excitability may influence knee kinematics during gait; yet it is unknown if quadriceps corticospinal excitability associates with gait kinematics. PURPOSE: To determine associations between quadriceps corticospinal excitability and sagittal plane knee kinematics during walking for ACLR individuals. METHODS: Thirty-three individuals with unilateral ACLR participated in this cross-sectional study (72% female; 22.2 ± 3.5 years; 72.5 ± 17.2 kg; 1.7 ± 0.1 m; 49.9 ± 40.4 months post-ACLR). Quadriceps corticospinal excitability was assessed as active motor threshold (AMT) from the vastus medialis of the ACLR limb using transcranial magnetic stimulation. Three dimensional biomechanics were collected during overground walking at a self-selected speed and extracted from the first 50% of stance. We evaluated sagittal plane knee kinematics for the current study including (knee flexion excursion of the ACLR limb and gait biomechanics. CONTROL: No associations were found between quadriceps corticospinal excitability and sagittal plane knee kinematics during gait in individuals with ACLR. Central pattern generators, and not cortical excitability, may more strongly influence gait kinematics. Further work is necessary to determine the influence of altered corticospinal excitability on other gait outcomes including kinetics and lower limb muscle activity patterns.

### RESULTS:

AMT was not associated with sagittal plane knee kinematics in the ACLR limb during walking (angle at HS r = -0.13 P = 0.47; peak knee flexion angle r = -0.22 P = 0.22; knee flexion excursion r = -0.19 P = 0.29).

### CONCLUSIONS:

No associations were found between quadriceps corticospinal excitability and sagittal plane knee kinematics during gait in individuals with ACLR. Central pattern generators, and not cortical excitability, may more strongly influence gait kinematics. Further work is necessary to determine the influence of altered corticospinal excitability on other gait outcomes including kinetics and lower limb muscle activity patterns.

**Table 1**

<table>
<thead>
<tr>
<th>Group</th>
<th>Control Mean ± SD</th>
<th>Hyaluronan Injection Mean/SD</th>
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<tr>
<td>age (ys)</td>
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<tr>
<td>height (m)</td>
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**Peak IKQs (Nm/kg)**

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<tr>
<th>Group</th>
<th>Un-involved</th>
<th>Involved</th>
<th>Within Group p-value</th>
<th>Un-involved</th>
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<th>Within Group p-value</th>
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<tbody>
<tr>
<td>KAM</td>
<td>-0.82 ± 0.32</td>
<td>-0.89 ± 0.48</td>
<td>0.725</td>
<td>-0.92 ± 0.67</td>
<td>-0.93 ± 0.46</td>
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<tr>
<td>KEM</td>
<td>4.08 ± 0.83</td>
<td>1.93 ± 0.75</td>
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<td>KE</td>
<td>27.89 ± 6.28</td>
<td>18.36 ± 3.73</td>
<td>0.007</td>
<td>26.74 ± 0.82</td>
<td>21.93 ± 1.52</td>
<td>0.039</td>
</tr>
<tr>
<td>Peak</td>
<td>3.32 ± 0.65</td>
<td>2.99 ± 0.57</td>
<td>0.001</td>
<td>3.13 ± 0.36</td>
<td>2.95 ± 0.35</td>
<td>0.007</td>
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**Hyaluronan Injection Mean/SD**

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<th>Sex</th>
<th>Female = 6, Male = 3</th>
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<tbody>
<tr>
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Somatosensory function of the knee is reportedly altered following anterior cruciate ligament reconstruction (ACLR), potentially influencing the risk of osteoarthritis (OA). Poorer somatosensory function is associated with aberrant gait biomechanics in individuals diagnosed with knee OA, but this relationship has not been evaluated following ACLR. PURPOSE: To compare somatosensory function between limbs in individuals with ACLR and evaluate associations between somatosensory function of the ACLR limb and gait biomechanics. METHODS: Sixty-eight individuals with unilateral ACLR (72% females; age 21 ± 3 yr; time since ACLR 27 ± 15 mo) volunteered. Somatosensory function was assessed bilaterally as the ability to replicate a specified knee flexion angle during a joint position sense task (i.e. joint position sense error – JPSE). Gait outcomes were assessed during the first 50% of stance including vertical ground reaction force (vGRF), instantaneous loading rate, internal extension moment, and internal valgus moment. RESULTS: There was no difference in JPSE between the ACLR limb and the contralateral limb (2.9 ± 1.2° vs 2.8 ± 1.7°, p = 0.71). Additionally, there was no correlation between the ACLR limb JPSE and vGRF (r = -0.095, p = 0.44), instantaneous loading rate (r = -0.121, p = 0.33), internal extension moment (r = -0.018, p = 0.88), or internal valgus moment (r = -0.073, p = 0.55). CONCLUSIONS: JPSE did not differ between the ACLR and contralateral limbs, and JPSE in the ACLR limb was not associated with gait biomechanics. The mean time since ACLR in our sample was approximately 2 years, thus somatosensory adaptations may have occurred bilaterally at time of testing. Moreover, neuromuscular function of the contralateral limb is also influenced by ACLR, potentially confounding a comparison of JPSE between limbs that may have both undergone changes post-

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**Table 2**

<table>
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</table>
Anterior cruciate ligament reconstruction (ACLR) and obesity are primary risk factors for posttraumatic knee osteoarthritis (PTOA). ACLR leads to quadriceps dysfunction, and greater fat mass may exacerbate this dysfunction as adipose tissue negatively influences strength and muscle activation. Deficiencies in quadriceps function may result in reduced capacity to attenuate energy at the knee, potentially contributing to aberrant joint loading that contributes to PTOA.

**Purpose:** To determine the relationship between body composition and quadriceps function in individuals with ACLR.

**Methods:** Thirty-five (20 F, 15 M; 71.1 ± 12 kg, 23.7 ± 2.8 BMI; 48.35 months since ACLR) individuals at least 6 months removed from unilateral ACLR volunteered for the study. Total body fat percentage (BF%), limb fat mass (LFM), and limb lean mass (LMM) were obtained bilaterally using dual x-ray absorptiometry (DXA). LLM and LFM were normalized to total body mass. Quadriceps function was assessed bilaterally from maximal voluntary isometric contractions (MVIC) and a single limp hop (SLH) task. Peak torque (PT) was averaged from 2 MVIC trials and normalized to body mass. Maximum hop distance was averaged from 3 hop trials. Associations between measures of body composition and quadriceps function were analyzed using Pearson Product Moment correlations.

**Results:** In the ACLR limb, PT was associated with BF% (r = -0.620, p < 0.001), LFM (r = -0.652, p < 0.001), and LMM (r = -0.441, p = 0.008). PT and SLH distances for the contralateral limb were also significantly related to BF%, LFM, and LMM. Body mass index (BMI) was not significantly related to PT or SLH distance in either limb.

**Conclusion:** BF%, LFM, and LMM are related to measures of quadriceps function following ACLR. The negative associations between functional outcomes (PT and SLH distance) and measure of adipose composition (BF% and FT) indicate that greater fat tissue may contribute to exacerbated quadriceps dysfunction after ACLR. Continued research is needed to evaluate body compositional changes following ACLR and how it influences other factors related to the development of PTOA.

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**Further Reading**


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**Authors:**

Ahmad Ananian, Alexis Ortiz, FACSM, Majmaah University, Saudi Arabia. UT Health San Antonio, San Antonio, Texas.

Email: aalanazi@mu.edu.sa

(No relevant relationships reported)

**Results:**

1. Higher BMI was associated with PT and SLH distance in either limb.

2. Quadriceps muscle and hip extension moments were significantly related to PT or SLH distance in either limb.

3. Significant main effects for group and reduced quadriceps activity (F(1,10) = 11.72, p < 0.007), and greater hip extension moments (F(1,10) = 14.69, p = 0.003).

**Conclusion:** The UL showed greater injury predisposing factors compared with the PL. Although the PG group showed nearly similar landing biomechanics to the HG group during both maneuvers, they (PG) demonstrated a protective landing pattern by reducing quadriceps activity and increasing the demand on the hip extensors. These findings reinforce the clinical emphasis on improving the use of hip and knee joints during landing to reduce the risk of consequent injuries in soccer players following PG ACLR.
The structural alignment of the medial longitudinal arch has an influential role in generating the locomotive mechanisms in bipedalism. Evidence suggests healthy arch types exhibit foot function advantageous in forward propulsion. Further, studies indicate that any compositional alterations may result in accessory motion and dysfunction of the foot. However, recent anecdotal assumptions propose that such compromised foot architecture may develop biomechanical characteristics beneficial for propulsive patterns in the medial and lateral directions. The purpose of this study was to examine the influence normal arch (NA) and low (LA) arch types have on propulsive mechanics during directional-specific locomotive tasks.

METHODS: Twenty-two male collegiate athletes, eleven NA and LA, participated in the study. The Arch Height Index Measurement System was utilized to obtain foot anthropometric measurement for arch height classification. Participants performed three complete trials of lateral hopping (one-leg ski jumping; LJ), unilateral forward hopping (FH), and unilateral stationary hopping (SH), at a self-selected speed. Normalized peak mediolateral ground reaction forces (mGRFs) were collected during the propulsion phase of each task. RESULTS: A 2 (arch type) x 3 (jumping/hopping tasks) mixed-factorial ANOVA were performed to determine the effects of arch height on the propulsion phase of each condition. A significant main effect across conditions was observed (F(1, 258, 25.154) = 11.526, p = 0.001, n² = 0.366). Follow-up pairwise comparisons indicated that LJ yielded significantly greater lateral force, when compared to FH (p = 0.011) and SH (p = 0.001). Additionally, a significant difference was observed between arch height (F(1, 20) = 4.502, p = 0.047, n² = 0.184), indicating LA produced larger lateral forces when compared to the NA individuals. However, there was no significant interaction between arch height and the conditions (F(1,258, 25.154) = 1.756, p = 0.198). CONCLUSION: While the differences amongst conditions were expected, the results revealed that LA displayed larger mGRFs when compared to NA. These findings of this study may suggest that the altered foot positioning of the LA, specifically the elevated posture, may act as a beneficial source for directionally specific tasks.
The interactions between neuromuscular and metabolic processes can produce muscular contraction; thus, the sympathetic nervous system takes special relevance because of its contribution in the autonomic control, which participates in the energetic supply of the muscular fibers and in the neuromuscular performance. This performance can be evaluated by using the vertical jump test, and its relationship with autonomous regulation is determined by the analysis of heart rate variability (HRV).

**METHODS:** The aim of this study is to describe correlations between HRV and jump performance variables in young female professional soccer players.

**RESULTS:** Positive associations were found between CMJ contraction time and jump performance.

**CONCLUSIONS:** The results demonstrate the existence of a relationship between HRV and performance in female soccer players.
and train female collegiate athletes during single- and dual-task landing performances. METHODS: 65 female collegiate athletes participated. Trials were either single-task (ST) drop landings or dual-task (DT) drop with/without jumping for a suspended ball. These were performed over a 50 cm drop height in blocks of 3 ST and 6 DT pre-tests, 6 ST and 6 DT with post-trial visual feedback (peak GRF in bodyweight (BW), LA, and FPV), and 3 ST and 6 DT post-tests. Peak GRF and frontal plane knee-to-ankle ratio during landing task (ST or DT) and over time (pre-test, feedback, post-test) were compared using a two-way repeated measures ANOVA. RESULTS: There was a decrease in the peak GRF (4.29±0.93 vs. 3.55±0.75 vs. 3.44±0.66 BW, p=0.001) as well as an improvement in knee-to-ankle ratio (0.97±0.15 vs. 1.01±0.12 vs. 1.04±0.13, p<0.001) over the course of the blocked trials. A main effect showed ST to have lower peak GRF than DT (3.71±0.82 vs. 3.81±0.83 BW, p=0.002). With the greatest difference in the post-test (3.35±0.57 vs. 3.53±0.73 BW, p<0.001). CONCLUSION: Peak GRF was different between ST and DT landing but improved with immediate post-trial feedback. Knee-to-ankle ratio was not different between ST and DT landing but improved with post-trial feedback. Post-trial feedback appears to produce immediate short term changes in landing performance in female collegiate athletes within a single training session.

1018 Board #252 May 29 3:30 PM - 5:00 PM Cognition Matters: Brain Function May Explain Deficiencies In Unanticipated Single-leg Landing Quality Florian Giesche, Jan Wilke, Tobias Engeroff, Daniel Niederer, Lutz Vogt, Winfried Banzer, FACSM, Goethe University, Frankfurt, Germany. (Sponsor: Winfried Banzer, FACSM) Email: giesche@sport.uni-frankfurt.de (No relevant relationships reported)

It has been speculated that cognitive performance may play a role in injury risk during sports-related movements such as jump landings. However, there is a paucity of research concerning this hypothesis. PURPOSE: The present study aimed to elucidate the potential association between brain function and biomechanical stability as well as decision-making success in an unanticipated jump-landing task. METHODS: Twenty healthy male participants (27±4 years) performed 70 counter-movement jumps with single-leg landings (n=35 anticipated/ unanticipated each) on a pressure plate. In the anticipated condition, the required landing leg was indicated already before take-off. For the unanticipated jumps, this information was presented only during the flight phase. Biomechanical landing quality was estimated from vertical peak ground reaction force (pGRF), time to stabilization (TTS), center of pressure path way (COP), and standing errors (i.e. falls, touching the ground with the free leg). Decision-making accuracy was assessed as the amount of landing errors (wrong/both feet). Differences between conditions as well as their associations with several measures of cognitive function were analyzed controlling for relevant covariates. RESULTS: Unanticipated landings resulted in higher COP values (588 vs. 516mm, p<0.05), higher standing errors (n=1.7 vs. 0.3, p<0.05) and lower pGRF (3.35±0.73 vs. 3.53±0.73 BW, p<0.05). pGRF in COP was different between ST and DT landing but improved with immediate post-trial feedback. A main effect showed ST to have lower pGRF than DT (3.71±0.82 vs. 3.81±0.83 BW, p=0.002). With the greatest difference in the post-test (3.35±0.57 vs. 3.53±0.73 BW, p<0.001). CONCLUSION: There were significant differences in the post-test (3.35±0.57 vs. 3.53±0.73 BW, p<0.001) over the time course of the blocked trials. A main effect showed ST to have lower pGRF than DT (3.71±0.82 vs. 3.81±0.83 BW, p=0.002). With the greatest difference in the post-test (3.35±0.57 vs. 3.53±0.73 BW, p<0.001). CONCLUSION: Peak pGRF was different between ST and DT landing but improved with immediate post-trial feedback. Knee-to-ankle ratio was not different between ST and DT landing but improved with post-trial feedback. Post-trial feedback appears to produce immediate short term changes in landing performance in female collegiate athletes within a single training session.

1019 Board #253 May 29 3:30 PM - 5:00 PM Risk Factors Associated With Medial Tibial Stress Syndrome In Military Cadets During Basic Training Jonathan R. Malaver1, Jennen R. Cubides2, Rodrigo Argothy3, Daniel D. Cohen1, Universidad del Rosario, Bogotá, Colombia. 1Escuela Militar de Cadetes General José María Córdova, Bogotá, Colombia. 2Coldeportes, Bogotá, Colombia. 3Universidad de Santander (UDES), Bucaramanga, Colombia. Email: jony10_milan@hotmail.com (No relevant relationships reported)

Medial Tibial Stress Syndrome (MTSS) is one of the most frequent pathologies in military personnel. As the muscles of the lower extremity contribute to the attenuation of impact forces in activities such as running and jumping, neuromuscular performance deficiencies and asymmetries may be associated with an increased risk for musculoskeletal injuries. PURPOSE: To determine the kinetic risk factors associated with MTSS through the bilateral countermovement jump (CMJ) in army cadets. METHODS: Ethical approval was granted by the General José María Córdova Military School of Cadets where the study was conducted. This observational study was executed in a cohort of 123 cadets (followed for 24 weeks) who entered to the military school in 2017. Anthropometric, demographic data and MTSS history were recorded. Jump height (cm), concentric mean force (N/kg), peak landing force asymmetry (%), concentric mean force (N/kg), concentric mean force asymmetry (%), eccentric deceleration rate of force development (EDRFD [N*kg]), and EDRFD asymmetry (%) were evaluated through the bilateral CMJ on a pair of uniaxial force platforms. After the follow-up, the cadets with MTSS were determined through the clinical history. RESULTS: The incidence of MTSS was 13% (n=16). In the bivariate analysis, height, EDRFD asymmetry, sex (female; RR=2.84; 95% CI: 1.16-6.94), provenance (rural; RR=2.65; 95% CI: 1.04-6.72), and MTSS history (yes; RR=5.71; 95% CI= 2.23-14.62), were significantly associated with MTSS (p<0.05). In the logistic regression, EDRFD asymmetry (OR=1.03; 95% CI: 1.00-1.07), sex (OR=4.91; 95% CI= 1.38-13.37), and provenance (OR=4.82; 95% CI= 1.04-6.72), were significantly associated with MTSS (p<0.05). MTSS history was significant for p<0.01 (OR=8.95; 95% CI= 0.68-118.73). The predictive model was significantly associated with MTSS (p<0.01), had a sensitivity of 31.3% and a specificity of 99.1% (overall prognosis of 90.2%). CONCLUSIONS: While we identified important non-modifiable risk factors for MTSS in cadets during basic training, we also found that higher CMJ EDRFD asymmetry was a significant risk factor. This suggests that the bilateral CMJ may be a useful tool for pre-entry screening in and that high EDRFD asymmetry could be a potential target of pre-basic training risk reduction conditioning.

B-65 Free Communication/Poster - Firefighter Physiology Wednesday, May 29, 2019, 1:00 PM - 6:00 PM Room: CC-Hall WA2

1020 Board #254 May 29 2:00 PM - 3:30 PM A Comparison Of On- And Off-Duty Physical Activity In Career Firefighters Allison M. Barry1, Katie J. Lyman2, Nathan D. Dicks3, Kassiani D. Landin4, Christi R. McGeorge5, Tanis J. Walsh1. Pittsburgh State University, Pittsburg, KS. 1University of North Dakota, Grand Forks, ND. (Sponsor: Donna J. Terbizan, FACSM) Email: abarry@pittstate.edu (No relevant relationships reported)

Physical inactivity coupled with increasing obesity levels in firefighters plays a critical role in accumulating cardiovascular events. PURPOSE: To examine differences in career firefighters’ objectively measured physical activity (PA) levels while on- and off-duty. METHODS: Twenty-nine career firefighters (age: 34.45 ± 7.15 yr; BMI: 28.97 ± 5.22 kg ·m−2) participated in a non-experimental, within-subjects study. Firefighters wore an accelerometer during waking hours of their nine-day tour, which included three, 24-hour on-duty days and six, off-duty days. Accelerometers assessed PA intensity using Freedson (1998) cut-points and step count. Height and weight were also measured to calculate BMI. Dependent t-tests, independent t-tests, and Pearson product-moment correlations were used to analyze the data in SPSS (v24). RESULTS: Firefighters (overweight=20; obese=9; normal weight=6) met the ACSM PA guidelines more often while on-duty (n=17) compared to when they were off-duty (n=9). While on-duty, firefighters attained an average of 35.51±19.2 minutes of moderate-to-vigorous physical activity (MVPA) compared to 27.82±18.91 minutes (p=0.055, d=0.40) when off-duty. Firefighters engaged in significantly more light PA during on-duty days (351.11±59.90 minutes) compared to off-duty days (315.83±86.90 minutes) (p=0.026, d=0.40). There were significant correlations between on- and off-duty days for sedentary behavior (r = -0.53, p<0.001), moderate PA (r = -0.37, p<0.05), and MVPA (r = -0.41, p<0.05). CONCLUSION: As a group, firefighters in this study did not meet ACSM PA guidelines, especially when off-duty, which may place them at greater risk for a cardiac event. Firefighters must rely on their cardiovascular health to perform the physiologically demanding tasks that their job requires. In the future, researchers need to collaborate with fire departments across the country to assess and develop ways to enhance PA levels in firefighters with the goal of improving their overall health and well-being, which ultimately may decrease the risk of cardiac events.
PURPOSE: Some firefighting departments are composed of professional firefighters (career firefighters) while some smaller towns cannot fully fund a professional firefighting department and rely on their citizens to volunteer their time and put their lives at risk to perform fire suppression and other related firefighting tasks when those events arise. The purpose of this study was to assess the potential similarities and differences in health and physical fitness profile between career firefighters and volunteer firefighters.

METHODS: The research protocol consisted of a health and physical fitness assessment testing the 5 components of health-related fitness (body composition, cardiovascular fitness, muscular strength, muscular endurance, and flexibility) using previously published and accepted protocols. The participant population consisted of career firefighters (CFF) who were all members of the Bowling Green Fire Department in Bowling Green, KY and volunteer firefighters (VFF) who were all members of the Warren County Fire Department (Warren County, KY). The total sample size consisted of 119 firefighters comprised of 120 CFF and 19 VF.

RESULTS: An independent t-test showed evidence of CFF having a significantly higher value/percent-score for the following variables: height (p = 0.034), VO₂ max (p = 0.006), push-ups completed (p = 0.023), and plank time (p = 0.0005). VFF had a significantly higher value for the following variables: fat mass (p = 0.002), body fat percentage (p < 0.0005), and absolute grip strength (p = 0.029). There were not shown to be any significant differences between groups for the following variables: age (p = 0.299), body mass (p = 0.161), fat-free mass (p = 0.292), body mass index (p = 0.056), flexibility (p = 0.097), or relative grip strength (p = 0.934).

CONCLUSIONS: In regards to the physical fitness testing of the current sample, the VFF had a significantly worse health and fitness profile across a number of variables compared to the CFF. Despite the financial and commitment status of volunteer firefighting departments, they perform an equally dangerous and important job as firefighters of professional/career firefighting departments and more attention should be directed at developing the fitness and performance of these firefighters as well.

Low handgrip muscular strength (HMS) is associated with increased morbidity-mortality. HMS has been shown to predict some firefighters' job-related task performance. However, little is known about firefighters HMS descriptive values and there is no HMS has been shown to predict some firefighters' job-related task performance. However, little is known about firefighters HMS descriptive values and there is no correlation between HMS and job performance.

RESULTS: Absolute HMS was higher in men as compared to women: 100 (61-156) vs 64 (45-97) kgf (p = 0.05). However, the proportion of volunteers in each category was similar among genders (p = 0.26). Proportions of HMS categories are shown on Table 1. CONCLUSION: This cross-sectional study showed that about 25% of volunteers showed suboptimal HMS and that male veterans had higher strength than rookies. Data support the recommendation for upper limbs strength training among firefighters, mainly among those joining the corporation.

Table 1: Handgrip strength classification among male and female firefighters by job experience

<table>
<thead>
<tr>
<th>Sex</th>
<th>Strength Classification</th>
<th>Rookie</th>
<th>Veteran</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Good</td>
<td>101 (63.1%)</td>
<td>35 (83.3%)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Suboptimal</td>
<td>59 (36.9%)</td>
<td>7 (16.7%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Good</td>
<td>58 (73.4%)</td>
<td>7 (77.8%)</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Suboptimal</td>
<td>21 (26.6%)</td>
<td>2 (22.2%)</td>
<td></td>
</tr>
</tbody>
</table>

*: Chi-square or Fisher test

Wildland firefighters (WLFF) are required to work long hours in extreme environments resulting in high daily rates of total energy expenditure (TEE) (Ruby; 2002; Cuddy, 2015). Increasing the number of eating episodes throughout the workshift and/or providing rations that better promote convenient nutrient delivery (Cuddy, 2007; Montain, 2008) has been shown to augment self-selected work output on the fireline. Regular consumption of supplemental carbohydrate (CHO) has also demonstrated enhanced work output, particularly during the shifts’ latter hours (Cuddy, 2007). However, it remains unclear how current feeding strategies of WLFF compare to more frequent nutrient delivery.

PURPOSE: The aim of the current study was to determine the self-selected field total energy intake (TEI), composition and patterns of WLFF feeding during wildland fire suppression shifts.

METHODS: 86 WLFF (16 female, 70 male; 27±5.6±4 yrs) were deployed to 12 different wildland fire assignments across six regions of the US during the 2018 fire season. Pre- and post-shift food inventories were collected at WLFF basecamp and provided item-specific nutrient content (calories [kcal], CHO, fat, protein). Workshift nutrient consumption (TEI, feeding frequency [total number of and interval between feeding episodes], feeding episodic composition) was monitored in real-time by field researchers on the fireline via observational data capture in mobile tablets. RESULTS: Workshift length averaged 14.2±1.2 hr, TEE was 1523±639 kcal (51±10, 37.9±14.5% for CHO, fat, and protein, respectively). The total number of eating episodes was 4.3±1.7 with an average interval of 117.7±6 min. Eating episodes averaged 346±311 kcal and included 44±38 CHO. Using similar intake metrics, TEE was 893±353 and 1536±560 kcal for breakfast and dinner, respectively. CONCLUSION: The present workshift TEI approximates 34% of the TEE compared to our prior doubly labeled water studies (Ruby, 2002; Cuddy 2015). These data also demonstrate that WLFF consumption patterns using current rations may not deliver adequate nutrients for the occupational demands of WLFF. Future work should elucidate the impact of workshift provisions on overall patterns of self-selected work output.

Supported by National Technology & Development Program, USDA Forest Service
Previous research also suggests that the overall dynamic balance ability of firefighter recruits increases as they progress through their firefighter recruit training academy, but then decreases during the transition into active-duty service. However, longitudinal changes in single-leg dynamic balance asymmetries during and after firefighter recruit training academies have yet to be examined. **PURPOSE:** To describe longitudinal changes in single-leg dynamic balance asymmetries among firefighter recruits. **METHODS:** Twenty-seven male firefighter recruits (mean ± SD, age = 29.9 ± 4.1 yrs; height = 179.8 ± 4.6 cm; body mass = 87.2 ± 9.7 kg) enrolled in the same training academy volunteered to participate in the current study. The SEBTs~left~ was conducted bilaterally at the beginning (W1) and end (W14) of their firefighter training academy, as well as at the end of the probationary period of their active-duty service (W38). All SEBTs~left~ data were recorded in cm and right vs. left SEBTs~left~ asymmetries were defined as: < 4 cm and ≥ 4 cm. A Cochran’s Q Test was utilized to examine for changes in the frequency of SEBTs~left~ right vs. left asymmetries across time. An alpha of 0.05 was determined. **RESULTS:** Although the number of firefighter recruits who demonstrated a right vs. left SEBTs~left~ asymmetry of ≥ 4 cm increased from W1 to W14 (7.27 to 9.27), and from W14 to W38 (9.27 to 11.27), there was not a significant (Q = 1.333, df = 2, P = 0.513) change in asymmetry frequency over time (25.9% vs. 33.3% vs. 40.7%). **CONCLUSION:** Despite previous research suggesting that there are significant changes in dynamic balance ability among firefighter recruits as they progress through their firefighter recruit training academy and begin active-duty service, similar significant changes in single-leg dynamic balance asymmetries were not identified. Future research should prospectively examine which factors of dynamic balance ability are most predictive in MSKI risk among this cohort population.

**1025** Board #259  May 29 2:00 PM - 3:30 PM  
**Contributors to Perceived Occupational Fatigue in Career Firefighters**  
(*)No relevant relationships reported*

Firefighters are susceptible to work-related fatigue due to long and strenuous shiftwork. Work-related fatigue can be linked to the majority of the fatal and non-fatal injuries in the fire service. **PURPOSE:** The purpose of this study was to examine the influence of isometric strength, body mass index, and age on perceived work-related fatigue in career firefighters. **METHODS:** Thirty-two firefighters (29 males, 3 females; age: 33.7±9.2 years (20-50); stature: 177.2±7.6 cm (153.0-190.5); mass: 94.5±20.3 kg (64.0-152.0)) volunteered for this investigation. Participants completed an occupational fatigue questionnaire that measured three dimensions of work-related fatigue: acute fatigue (AF), chronic fatigue (CF), and inter-shift recovery (IR). Participants performed 3-4 leg extension isometric maximal voluntary contractions (MVCs) on a custom-built calibrated load-cell dynamometer with a two minute recovery period in between each contraction. Maximal strength, or isometric peak force, was calculated as the highest 100ms value during the MVC plateau. Local firefighters work three 24-h shifts on-off over one rotation followed by four days off of rest. Maximal strength testing was completed pre-rotation and post-rotation (five days apart). Percent change in maximal strength [%ΔPF = (Post-Pre)/Pre > 100] was calculated. Stepwise regression analyses were conducted for each dimension of fatigue; Predictor variables were %ΔPF, body mass index, and age. An alpha level was set *a priori* at 0.05 for all analyses. **RESULTS:** The stepwise analyses suggest that age alone significantly contributed to AF (R²=0.274, P<0.001) and CF (R²=0.280, P<0.001). Age and %ΔPF combined significantly contributed to IR (R²=0.269, P=0.004). BMI failed to significantly contribute to any of the stepwise regression models. **CONCLUSION:** These findings suggest that older firefighters experience greater levels of perceived acute and chronic work-related fatigue. Furthermore, older firefighters with greater maximal strength losses experience poorer perceived IR. While age is non-modifiable, interventions aiming to mitigate stress loss across shiftwork may be helpful at enhancing IR. Supported by the National Institute of Occupational Safety and Health (T42OH008672).

**1026** Board #260  May 29 2:00 PM - 3:30 PM  
**Sedentary Behavior and Daily Steps Count In Brazilian Wildland Military Firefighters - Brasilia Firefighters Study**  

Wildland firefighters’ (WF) routine involves long displacements and intense physical demands, interspersed with sedentary behavior (SB). Little is known about SB and daily steps pattern of WF during routine work. **PURPOSE:** We analyzed the SB and total daily steps of Brazilian WF during a 24-h shift work. **METHODS:** We evaluated 22 WF, aged 35.9±6.4 yrs, BMI of 25.3±2.9 kg/m², during the dry season. Volunteers wore an accelerometer (ActiGraph-GT3X+) during a 24-h shift work and reported main duties performed on a log. SB was evaluated by the vector magnitude using <200 counts/min as cut-off point. We compared SB and daily steps according to 3 periods of the day: morning (08:00-11:59) vs. afternoon (12:00-17:59) and evening (18:00-23:59). Night period (00:00 to 05:59) was excluded due to insufficient data. We compared SB and daily steps during the day and between those who participated or not at least one episode of wildland fire suppression (Mann-Whitney test). Friedman test with a Wilcoxon post-hoc test (p-value ≤0.02) were used to compare the 3 moments. Data are shown as median (min-max). **RESULTS:** WF spent 73 (15-142) min in the morning, 131 (17-192) min in the afternoon and 109 (13-193) min in the evening on SB. They accumulated 3,508 (1,322-12,237) steps in the morning, 4,105 (963-18,450) in the afternoon and 5,499 (371-13,883) in the evening. Those who participated or not in at least one episode of wildland fire suppression showed similar SB and daily steps (p>0.05). SB pattern throughout the day are show on Figure 1. **CONCLUSION:** WF achieved similar daily steps in the 3 periods of the day. Time spent in SB was higher in the evening as compared to the morning. Our results suggest that WF remain little time in SB as compared to other professions and achieved a high daily steps count (>10,000) during a 24-h routine work.

![Figure 1. Sedentary behavior by different moment on day among on-duty firefighters](image-url)
Firefighting is a hazardous profession. Occupational hazard may negatively impact quality of life (QoL). Firefighters’ job-related activities result in vigorous physical effort that requires considerable cardiorespiratory fitness (CRF). The National Fire Protection Association (NFPA) recommends a CRF of >42 ml·kg−1·min−1 (12 METs) for safety purposes. PURPOSE: We evaluated QoL of male and female firefighters in association with CRF. METHODS: We evaluated 104 female (35.0±6.2 yrs, BMI: 23.2±2.5 kg/m²) and 686 male (37.9±6.8 yrs, BMI: 26.3±3.0 kg/m²) Brazilian firefighters. CRF was estimated by the 12-min Cooper test and QoL was evaluated by the World Health Organization QoL questionnaire in four domains: physical (PHYD), psychological (PSYD), social relationship (SRD) and environment (ENVD). QoL was compared within each gender among those who met or did not meet the minimum CRF recommendation for firefighters. Among men we used the NFPA CRF cut-off point (12 METs) and for women we used its corresponding value from the Cooper test gender-specific classification (9.5 METs). Comparison were made by Mann-Whitney test; GLM was applied for age-adjustment and Spearman test for correlations. RESULTS: Absolute CRF among men was higher than among women: 12.2±1.7 vs 10.1±1.7 METs (p<0.001), but the proportion of volunteers who met the recommended CRF was similar between genders. QoL was similar between genders in all domains (92.9±1.8 vs 92.6±2.1 for PHYD, 70.8±2.8 vs 70.6±2.9 for PSYD, 68.8±2.6 vs 68.6±2.7 for RSD, and 68.8±2.6 vs 68.7±2.7 for ENVD). QoL scores were significantly associated with higher CRF. Firefighters with CRF above the minimum threshold showed higher values of QoL. The absence of a difference between RPE vaS and HR during MAX -1 w/helmet vs. 185.5±73.3 w/out helmet; respectively) were all significant (p<0.001). Follow-up paired t-tests revealed that for each response, SUB was significantly (p<0.001) lower than MAX. While some non-significant differences between RPE type for the SUB (39.2±1.6% vs. RPE MAX; p<0.001), and RPE vaS (76.8±17.6% vs. RPE MAX; p<0.001) were collected following each test and expressed as a percent of maximum possible response. HR was the average HR from each test and expressed as a percent of estimated maximum. A 2x3 repeated measures ANOVA was performed to determine the effect of test (SUB, MAX) on response (RPE vaS, RPE MAX; HR). An alpha of p<0.05 determined statistical significance with an adjusted alpha (12 METs). Subjects were required to finish a 90-minute exercise test (MAX). RPE vaS and RPE MAX were concurrently examined RPE vaS and HR and during SUB suggests that fire recruits may underestimate the intensity of a SUB task. Practitioners should use caution when relying solely on subjective feedback from SUB tasks as RPE may underestimate actual intensity. Despite upsides of 40-50% of heat lost through the head during exercise, little regard has been given to the role of the wildland firefighter (WLFF) helmet in uncompensable heat stress. PURPOSE: To investigate factors of heat stress with and without a standard issue WLFF helmet. METHODS: Eleven male subjects (age = 25±2.9 yrs) were recruited with a VO2 >40 ml·kg−1·min−1 and ≤565 ml·kg−1·min−1 (VO2max = 54±2.5 l·min−1). Subjects were required to finish a 90-minute exercise protocol in a heat chamber (35°C and 30% RH), with a standard WLFF para-aramid shirt and pants, cotton t-shirt, and either with or without a WLFF helmet. A randomized crossover design was implemented, with a minimum two week washout period. Blood flow to the head and neck (SBFh; SFNh), head heat (HH), Tsk skin temperature on chest and neck (Tskc; Tskn), HR, PSI, RPE, perceived head heat (PHH) and sweat rate were recorded during trials. A 2x3 ANOVA was used to analyze SBF, and 2x4 ANOVA was used to analyze HH, CT, ST, HR, PSI, RPE, and PHH. One-way ANOVA was used to analyze sweat rate. RESULTS: Nine of the 11 subjects were able to finish the 90 minute exercise trial. The HH, SBFh, and PHH (36.4±0.76°C w/helmet v. 35.22±0.98°C w/out helmet; 211.9±86.8 AU w/helmet v. 185.5±73.3 w/out helmet; 10.1±3.2 AU w/helmet v. 8.5±2.6 w/out helmet; respectively) were all significant (p<0.05) with a main effect between trials. HR, PSI, Tskc and Tskn demonstrated main effects of time (p<0.05), but were not different between trials. Sweat rate was not significant among trials (2.99±0.44 l·h−1 w/helmet v. 1.85±0.41 l·h−1 w/out helmet). CONCLUSION: These data (HH, SBFh, and PHH) suggest that the current WLFF helmet causes heat accumulation and resultant reduction of blood flow to the head. While some physiological factors (TTskc, TTskn, PSI, and sweat rate) did not reach significance between trials; trends existed for PSI (p<0.09) and RPE (p<0.09). The design of the WLFF helmet lacks ventilation, which from these data, may result in metabolic alterations, and perceived discomfort.
Official Journal of the American College of Sports Medicine

1030 Board #264 May 29 2:00 PM - 3:30 PM
Th Effects Exercise Within Personal Protective Equipment Microclimate On Mental Processing On Different Age Populations
Morgan D’Ganjian, Cory Coehoorn, Lynneth Stuart-Hill.
University of Victoria, Victoria, BC, Canada.
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the effects of exercise within personal protective equipment microclimate leading to rapid head acquisition on mental processing and decision making in different age populations. METHODS: The study was factorial in design and included 15 male participants with an age range from 19-54 who were divided into 2 groups: 30 years old and above group (>30) (n=8), and 29 years old and below group (<29) (n=7). Each group preformed a Gro/No-Gro test while wearing a Muse headband to obtain P00 ERPs, prior to post exercise in firefighting turnout gear (PPE) and t-shirts and shorts while wearing a backpack matched in mass to the gear worn in PPE (CON). Subjects completed a graded exercise test until core temperature had rose 39.5 ± 0.4 °C, or voluntary max had been achieved. The muse data was collected/analyzed by Peer-Analytics and later tested within Excel by a 2 tailed T-test between: 30+ and <29, and CON and PPE conditions. RESULTS: There was no significant differences between the 30+ and <29 P300 ERPs or within each groups CON/PPE conditions. However, both groups made significantly more errors (p<0.05) post-PPE than pre-PPE (30+: µpost = 18.375, µpre = 5.625 -29: µpost = 25.143, µpre =10.714) while only the 30+ showed significant difference between post CON/PPE trials (µpost = 18.375, µpre =12.5). There was no difference between 29 and 30 when comparing post-PPE errors. CONCLUSION: Exercising within a personal protective equipment microclimate will negatively affect executive function of decision making regardless of age.

B-66 Free Communication/Poster - Military Physiology
Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

1031 Board #265 May 29 2:00 PM - 3:30 PM
Commercial Footwear with Lateral Torsional Stiffness that May Reduce Injury Risk in Army Basic Trainees
Jesse Hall1, Erin M. Miller1, Donald L. Goss2. 1University of New England, Biddeford, ME. 2Baylor University-Keller Army Community Hospital Division I Sports Physical Therapy Fellowship, West Point, NY.
(No relevant relationships reported)

Musculoskeletal injuries place a burden on the U.S. Military with estimates that 25% of men and 50% of women experience an injury in Army Basic Training. In 2016, 18% of Cadet basic trainees at the U.S. Military Academy (USMA) sustained a lower-extremity (LE) injury. In that sample, Cadets wearing shoes with mild to moderate lateral torsional stiffness (1.30 - 2.29 Newton [N] meters[m]) were 49% less likely to incur any type of LE injury and 52% less likely to incur an overuse LE injury than recruits that had shoes with minimal (<0.130 Nm) or extreme (>0.230 Nm) lateral torsional stiffness. PURPOSE: To identify athletic footwear, commercially available at West Point, NY, with mild to moderate lateral torsional stiffness characteristics. METHODS: Twenty (10 shoes men’s size 10, 10 shoes women’s size 8) new shoes of varying brands were included in this analysis. The Shoe Stiffness in Torsion Measurements device and methods of data collection described by Zifchack, were used to quantify lateral torsional stiffness. Each shoe was measured twice by a single rater and averaged for the overall analysis. Rater reliability analyses suggest the SySTem device is useful for repeatable measurements of lateral torsional stiffness. RESULTS: Six out of 20 shoes (2 men’s, 4 women’s) demonstrated mild to moderate lateral torsional stiffness to include; Men’s New Balance Minimus MT100G, and Nike Flex 2017 RN; Women’s Skechers Go Run 3, Asics Gel-Fit Sana 3, Nike Free TR 7 Selfie, and Nike Flex Trainer 7. Fourteen out of 20 shoes (8 men’s, 6 women’s) did not demonstrate mild to moderate lateral torsional stiffness. Of those 14 shoes, 13 demonstrated extreme lateral torsional stiffness; Men’s Nike Lunar Fingertap TR, Nike Retaliation TR, Nike Air Zoom Pegasus 34, Asics FuseX Rush, Asics Gel-Contend 4, Brooks Adrenaline GTS 18, and New Balance Trufuse 860v7; Women’s Under Armour Micro G Assert 7; Asics Roadhawk FF, Asics GT 1000-6, Brooks Ghost 10, Adidas Cosmic 2, and New Balance W940GP3. One demonstrated minimal lateral torsional stiffness; Women’s Asics Metrolyte Gem. CONCLUSION: We identified 6 shoes commercially available at West Point, NY, with mild to moderate lateral torsional stiffness. These shoe recommendations can inform Cadet basic trainees on footwear that may be protective of LE injury during USMA Army Basic Combat Training.

1032 Board #266 May 29 2:00 PM - 3:30 PM
Changes in Body Composition during U.S. Army Basic Combat Training
Email: stephen.a.foulis.civ@mail.mil
(No relevant relationships reported)

The last major investigations of body composition in Basic Combat Training (BCT) were in 1989 and 1993, before training was integrated for men and women. The data demonstrated that, with BCT, most individuals gained lean mass and the fattest individuals lost the greatest amount of fat mass. Current Army accession standards are derived from the changes observed during BCT for this earlier generation of recruits. PURPOSE: To assess changes in body composition in current-day Army recruits. METHODS: Trainees (n=109 women, W, and 254 men, M), aged 17-38, body mass index 24.0±2.7 kg/m² (W, mean±SD) and 25.0±3.5 kg/m² (M), were assessed for body composition (DXA, Prodigy, GE Lunar) in the first week of BCT and during the final week (wk 8). Repeated measures ANOVA were used to assess changes in body mass (BM), body fat (%BF), and lean mass (LM). RESULTS: Average BM at entry was 62.9±8.5 kg (W), 77.1±12.2 kg (M), with changes by wk 8 of 0.3±1.1 kg (W) (p<0.01) and 1.2±4.5 kg (M) (p<0.01). Women started with 31.8±5.3% BF and lost 3.8%±2.2% (p<0.01 for both). Women began with 41.5±5.7 kg LM and gained 2.5±1.7 kg; men began with 58.2±7.0 kg LM and gained 1.7±2.1 kg. CONCLUSIONS: Compared to a national sample (NHANES), Army recruits are leaner than the US population, especially female recruits. During BCT, further gain in LM and loss of fat, especially in women, were masked in small or nonsignificant changes in BM. These pilot data provide up to-date descriptions of the entry body composition of Army recruits and the magnitude of change that occurs with BCT; further analyses of the larger cohort including musculoskeletal injury, fitness testing, and long term service outcomes will help validate and redefine Army entry standards. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army.

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One goal of Basic Combat Training (BCT) is to improve the general fitness of recruits to successfully meet the demands of military activities. Previous studies have focused on the aerobic fitness responses to BCT. In contrast few investigations have examined the changes in whole body power production following BCT and if these changes may be modified by various pre-BCT factors. More specifically, do all recruits show similar training responses in terms of muscular power production as measured by vertical jump (VJ) testing? PURPOSE: To assess changes in whole body power production following BCT and if these changes are predictive of changes in a recruit’s VJ power output following BCT.METHODS: Four hundred fourteen recruits (298 men; 116 women; (mean ± SD) age: 21 ± 3 y; height: 172 ± 9 cm; body mass: 73.0 ± 13.4 kg) performed maximal VJ testing before and after 8 weeks of U.S. Army BCT. Body mass and VJ height were used to estimate body mass (BM), body fat (%BF), and lean mass (LM). RESULTS: There was no difference between -23 and +30 when comparing post-PPE errors. CONCLUSION: Exercising within a personal protective equipment microclimate will negatively affect executive function of decision making regardless of age.

1033 Board #267 May 29 2:00 PM - 3:30 PM
Relationship Of Sex And Physical Activity On Vertical Jump Power Changes In U.S. Army Trainees
Peter N. Frykman, Kathryn M. Taylor, Barry A. Spiering, Marilyn A. Sharp, Brittany R. Hotaling, Julie M. Hughes, Stephen A. Foulis. USARIEM, Natick, MA.
Email: peter.n.frykman.civ@mail.mil
(No relevant relationships reported)

Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army.
PREVIOUS work has shown that energy expenditure increases while carrying a loaded backpack. Fewer investigations have focused on the impact of utilizing a hip strap. PURPOSE: To determine if using a backpack hip strap (HS) has any physiological effects while walking. METHODS: Thirteen subjects (23 ± 4.8 yrs; 5 females, 8 males) walked for 30 mins on a treadmill with a backpack containing 30% of the subject’s bodyweight at a 3% grade and speed eliciting 40-50% of their heart rate reserve. Two trials were performed: without a HS (UnST) and with HS (ST). Heart rate (HR), oxygen consumption (VO\textsubscript{2}), systolic blood pressure (SBP), and oxygen saturation of the quadriceps (Q SmO\textsubscript{2}) and calf (C SmO\textsubscript{2}) were measured throughout each trial. Five minute averages were calculated for HR, VO\textsubscript{2}, Q SmO\textsubscript{2}, and C SmO\textsubscript{2} at baseline (BL), mins 0-5, 6-10, 11-15, 16-20, 21-25, and 26-30. SBP was analyzed as a change score from baseline. A repeated measures ANOVA was used to evaluate the differences between trials at each time point. RESULTS: HR at mins 0-5 (UnST: 121 ± 4 bpm; ST: 120 ± 3 bpm) was elevated (p=0.001) compared to BL (UnST: 81 ± 4 bpm; ST: 80 ± 4 bpm) and remained elevated from BL for the remainder of the trial. All other HR measures were similar with no difference between trials (p=0.912). VO\textsubscript{2} at mins 0-5 (UnST: 1.6 ± 0.1 L/min; ST: 1.5 ± 0.1 L/min) was elevated (p=0.001) compared to BL (UnST: 0.38 ± 0.02 L/min; ST: 0.38 ± 0.03 L/min), but was similar to all other time points with no difference between trials (p=0.317). The change in SBP at mins 0-5 (UnST: 26 ± 8 mmHg; ST: 31 ± 6 mmHg) was similar to all other time points (p=0.115) and did not differ between trials (p=0.224). Q SmO\textsubscript{2} at mins 11-15 (UnST: 78 ± 3 %; ST: 84 ± 4 %) was higher compared to BL (UnST: 78 ± 3 %; ST: 79 ± 4 %; p=0.040) and remained elevated for the remainder of the trial with no difference between trials (p=0.515). C SmO\textsubscript{2} at mins 0-5 (UnST: 55 ± 6 %; ST: 47 ± 7 %) was lower compared to BL (UnST: 72 ± 4 %; ST: 74 ± 4 %; p=0.001) and remained lower until mins 11-15 (UnST: 69 ± 6 %; ST: 66 ± 6 %; p=0.776). No further changes occurred throughout the rest of the trial (p=0.040). C SmO\textsubscript{2} did not differ at any time between the trials (p=0.263). CONCLUSIONS: This preliminary data suggests a backpack HS has little physiological effect during 30 minutes of walking with a load of 30% the wearer body weight.

A negative energy balance has implications for the health and performance of military personnel, with women possibly more susceptible to metabolic perturbations associated with reduced energy availability than men. Women are increasingly employed in more physically arduous military roles, and therefore, there is a requirement to better understand the energy status of women operating in environments of high energy expenditures. PURPOSE: To investigate the sex differences in energy balance during 44 weeks (three terms of 14 weeks) of arduous military training. METHODS: Twenty Officer Cadets (men: n = 8; mean ± SD, age 26 ± 3 yrs, height 1.84 ± 0.07 m, body mass 85.0 ± 7.7 kg; women: n = 12; age 25 ± 3 yrs, height 1.70 ± 0.04 m, body mass 65.3 ± 5.6 kg) participated. Dietary intake was measured during each term by researcher-lead weighed food during scheduled mealtimes, and food diaries and wrapper collection during non-scheduled mealtimes, over three 10 d periods (one per term). Total energy

**Table 1.** Effects of basic combat training (BCT) on body mass, vertical jump (VJ) height, and peak power in men and women

<table>
<thead>
<tr>
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<th>Pre-BCT</th>
<th>Post-BCT</th>
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<tr>
<td><strong>Body Mass (kg)</strong></td>
<td>Men</td>
<td>Women</td>
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<tr>
<td>77.3 ± 12.7</td>
<td>75.9 ± 9.9*</td>
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<tr>
<td>62.2 ± 8.0</td>
<td>62.7 ± 7.2</td>
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<tr>
<td><strong>VJ Height (cm)</strong></td>
<td>Men</td>
<td>Women</td>
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<tr>
<td>51 ± 9</td>
<td>50 ± 9*</td>
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<tr>
<td>35 ± 17</td>
<td>36 ± 6*</td>
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<tr>
<td><strong>VJ Peak Power (W)</strong></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>7761 ± 652</td>
<td>7643 ± 618*</td>
<td></td>
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<tr>
<td>6221 ± 491</td>
<td>6291 ± 472*</td>
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</tbody>
</table>

Values = mean ± SD; * = significant sex by time interaction; ** = significantly different than corresponding Pre-BCT value.

CONCLUSIONS: Men and women demonstrated differential responses to BCT; however, the changes were extremely small, indicating that BCT is not an effective stimulus to improve VJ performance.

Supported by the U.S. Army Medical Research and Materiel Command.

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

The military continues to evaluate body composition as a consideration for service. However, limited data are available comparing active duty (AD) and civilian (CIV) individuals. PURPOSE: To evaluate body composition of fat mass (FM), fat-free mass (FFM) and percent body fat (%fat) in AD and CIV men and women. METHODS: AD: men (n = 213; 32.1 ± 7.5 yrs, 177.6 ± 7 cm, 87.6 ± 12.7 kg) and women (n = 115; 32.2 ± 9.3 yrs, 163.1 ± 8.0 cm, 70.4 ± 11.3 kg) and CIV men (n = 6, 46.6 ± 7.5 yrs, 177.7 ± 7.6 cm, 89.6 ± 15.0 kg) and women (n = 46, 40.0 ± 9.6 yrs, 163.4 ± 6.4 cm, 59.5 ± 15.9 kg) were stratified by exercise level as sedentary (SED), low active (LACT), active (ACT), and Very active (VACT) based on standard parameters. Each participant volunteered to be measured by whole body plethysmography. RESULTS: A sex x duty x activity (2 x 2 x 4) MANOVA produced nonsignificant interaction effects (p=0.32) for SfAF, FM, and FFM. Men were significantly lower in SfAF (23.5 ± 8.3%) and higher in FFM (66.6 ± 8.3%) than women (33.6 ± 8.5% and 47.3 ± 6.0 kg, respectively), with no significant difference in FM (21.6 ± 10.2 vs 25.1 ± 10.2 kg). AD was significantly lower in %fat (26.5 ± 9.3%) and FM (21.8 ± 9.3 kg) and higher in FFM (59.7 ± 11.9 kg) than CIV (51.2 ± 10.46%, 26.0 ± 11.5 kg, and 55.6 ± 12.0 kg, respectively). More active individuals had significantly lower %fat (24.1 ± 9.0%) and FM (19.8 ± 8.9 kg) with no significant difference in FFM than sedentary individuals (33.0 ± 8.2%, 27.7 ± 9.9 kg, and 54.9 ± 10.9 kg, respectively). Age was significantly correlated with %fat (r = -0.20) and FM (r = -0.18) but accounted for no more than 4% of the common variable between them. Age was also negatively correlated with activity level in AD (r = -0.23, p<0.001) but not in CIV (r = -0.03, p=0.78). The proportion of AD were ACT (51%) or VACT (16%) compared to CIV (30% and 11%, respectively). When sex was partitioned out, body mass index (BMI) had a slightly stronger correlation with %fat and FM in CIV (r = 0.78 and 0.91, respectively) than in AD (r = 0.70 and 0.82, respectively). CONCLUSION: Air Force AD personnel have better body composition profiles than CIV personnel but both appear to have a higher FM and %fat over time based on cross-section analysis. Further research should investigate the ability of other indices to longitudinally track body composition changes in military personnel.
expenditure (TEE) was measured over each 10 d sampling period using doubly labelled water. Body composition was measured by DXA at the start of training and at the end of each term. RESULTS: Average daily energy intake (3160 ± 568 vs 2609 ± 568 kcal d⁻¹) and TEE (4552 ± 534 vs 3365 ± 416 kcal d⁻¹) were higher for men than women, respectively (both P < 0.005). Both sexes demonstrated negative average daily energy balance, with a greater deficit in men compared to women (−1333 ± 965 vs −756 ± 826 kcal d⁻¹, respectively, P = 0.016). There was no difference in average daily carbohydrate intake (4.8 ± 0.9 vs 4.7 ± 1.6 g·kg⁻¹·d⁻¹, respectively), but OCs consumed a bolus of DLW and provided daily urine samples, which were analysed by mass spectrometry to determine TEE. The TEE equation was applied to the remaining 23 observations to quantify the mean bias ± 95% Limits of Agreement (LoA) between TEE and TEE. RESULTS: The TEE equation ([TEE] = 563 ± 110 + 0.88x ± TEE) exhibited a strong correlation (r = 0.826) and a Standard Error of the Estimate of 475 kcal·day⁻¹. Applying the equation reduced mean bias ± 95% LoA against TEE from −194 ± 1055 kcal·day⁻¹ to 0.79 ± 996 kcal·day⁻¹.

CONCLUSIONS: The TEE equation developed in this study improves the estimation of TEEDLW from a PAM in military populations compared to an existing TEECIV equation. Future research should explore data processing techniques to identify different physical activity types from wrist-worn PAM in military settings to further improve TEE estimation and validate these equations in different military cohorts.

Military operations lasting several months may cause negative changes in aerobic fitness of deployed soldiers. Despite the well-known benefits of physical training on soldier readiness, intervention studies focusing on endurance performance during military operations are lacking.

PURPOSE: To investigate inter-individual variation in training adaptations of endurance performance during deployment.

METHODS: 91 male soldiers (50.8 ± 0.8 y) volunteered for the baseline tests including assessments of body composition, physical performance (3000-m run, max. isometric leg and arm extension, 1-min push-ups and sit-ups, and standing long jump), as well as a military simulation test (MST). Training was monitored using diaries. After the 19-week follow-up, the available data was divided into two groups based on the change in endurance performance: Responders (n = 25) decreased their 3000-m run time while non-responders (n = 24) maintained or increased their 3000-m run time.

RESULTS: The responders initially had higher fat mass (12.8 ± 3.6 vs. 9.6 ± 5.7 kg, p < 0.001), lower muscle mass (38.0 ± 3.9 vs. 40.3 ± 4.1 kg, p = 0.046), poorer standing long jump (227 ± 16 vs. 242 ± 27 cm, p = 0.016) and MST time improved (−13.6 ± 6.8 vs. 14.2 ± 20.4 %, p < 0.001). However, their fat mass decreased (−7.6 ± 11.7 vs. −7.5 ± 6.6 %, p = 0.006) more when compared to the non-responders. Both groups performed a similar volume of endurance training during the follow-up (1.7 ± 0.8 vs. 1.9 ± 2.8 times/week, p = 0.22). During the operation, the responders maintained their training frequency at the level of pre-deployment (5 ± 1.1 vs. 1.2 ± 1.9 times/week, p = 0.012). In addition, they performed lower body strength training with lower average volume load (1435 ± 6076 vs. 1948 ± 6202 kg·week⁻¹, p = 0.010). However, their fat mass decreased (−7.6 ± 11.7 vs. 14.2 ± 20.4 %, p = 0.001) and MST time improved (−13.6 ± 6.8 vs. −7.5 ± 6.6 %, p = 0.006) more when compared to the non-responders.

CONCLUSIONS: Soldiers who initially demonstrated lower physical fitness and higher fat mass improved their physical performance more than their non-responders counterparts. Positive training responses in non-responders might have been achieved using higher volume and/or intensity of endurance training. In addition, it is obvious that more individualized strengths and weaknesses should be emphasised during prolonged military operations.
1041 Board #275 May 29 2:00 PM - 3:30 PM The Effect of Body Mass on Physical Performance in Naval Special Warfare Operators

Dallas Wood1, David Swain, FACSM. 2Naval Special Warfare, Virginia Beach, VA. 1Old Dominion University, Norfolk, VA.

(No relevant relationships reported)

The Effect of Body Mass on Physical Performance in Naval Special Warfare Operators

Dallas E. Wood, David P. Swain, FACSM. Naval Special Warfare, Virginia Beach, VA, Old Dominion University, Norfolk, VA US Naval Special Operations Forces have performed some of the US Military’s most rigorous missions. The Human Performance Program (HPP) developed a physical performance testing battery to assess and monitor physical fitness. Testing bias relative to body mass has been noted in past literature, including military physical fitness tests. PURPOSE: This retrospective study looked to determine if there is body mass bias in the HPP performance assessment and if an optimum body mass for each performance test could be determined. METHODS: Data from 333 subjects (age: 28.4 ± 5.0 yr; height: 178.4 ± 6.2 cm; mass: 86.0 ± 9.2 kg) were analyzed to compare body mass to performance on the eight performance tests: standing long jump, Pro-Agility test, weighted pull-up, body weight bench press, 1-RM deadlift, 274-m shuttle run, 4.83-km run, and 800-m swim. Linear regression analysis was used to analyze the relationship of body mass to performance; a 2nd degree polynomial was utilized to determine best-fit curves for each of the physical performance tests; ANOVA was utilized to examine differences in performance between body mass quartiles.

RESULTS: Significantly better performance for lighter subjects was found in the Pro-Agility test, weighted pull-up, body weight bench press, 1-RM deadlift, 274-m shuttle run, and 4.83-km run. Heavier subjects performed better in the 1-RM deadlift. Second-degree polynomial regression revealed optimum body mass for the Pro-Agility test, 274-m shuttle run, and 4.83-km run to be somewhat heavier than the lowest body mass.

CONCLUSION: These findings could help professionals better assess and train operators of varying body size. The views and opinions expressed are the authors’ and do not reflect those of Naval Special Warfare Command, the US Navy or the Department of Defense.

1042 Board #276 May 29 2:00 PM - 3:30 PM Minimalist Style Military Boot Improves Running Economy Under Load In Trained Males

Eric K. O’Neal1, Montia T. Pace1, Jonathan C. Swain1, Ryan T. Albino1, James M. Green, FACSM1, Lauren G. Killen1, Jeffrey D. Simpson2, Harish Chander2. 1University of North Alabama, Florence, AL. 2University of West Florida, Pensacola, FL.

(No relevant relationships reported)

PURPOSE: Minimalist style boots (MIN) may improve running economy for soldiers under load versus the traditional boot type (TRD). However, running economy (RE) under load with MIN has not been examined. METHODS: In this study, male participants (n = 14) completed a VO2 peak test (46.6 ± 7.3 mL/kg/min) under load (16 kg) while wearing their normal athletic shoes. Treadmill speed for RE tests was determined by the slowest pace in which participants completed a full stage with running gait pattern during the VO2 peak test. Load was applied using a ~7.5 kg weighted compression garment to simulate body armor and a ruck sack of ~8.5 kg. During the second trial participants completed two, 5-min running treadmill exercise bouts with the same load arrangement while wearing MIN (~500 g) and TRD (~800 g). RE was evaluated using indirect calorimetry (TrueOne2400, Parvo Medics Inc. Provo, Utah) and calculated by averaging the 60-s average values of minutes 3-4 and 4-5 with confirmation of steady state (difference in VO2 < 0.1 L/min between minutes). There was a 10-min rest period between running bouts (counter-balanced crossover design). RESULTS: Paired sample t-tests indicated a significant difference (p = 0.003) in RE between MIN (2.95 ± 0.28 L/min) and TRD (3.04 ± 0.30). Thirteen participants had lower RE during MIN producing a small-moderate effect size (Cohen’s d = 0.32). RER also increased (p < .001) during TRD (0.99 ± 0.07) versus MIN (0.94 ± 0.06). Overall, leg, and breathing RPE (p < 0.05) were all improved during MIN.

CONCLUSIONS: When moving at minimal running speed under load, MIN provides notable improvement in RE.
Sleep is a critically important component of health, but is often restricted in a military environment as a stressor in training and in preparation for operations. Following the recent opening of combat roles to women serving in the UK military, quantifying sleep parameters during arduous training, and understanding how men and women respond to disturbed sleep, is necessary for management of health and performance. Significant differences in sleep parameters have been described among service members, but gender differences have not. PURPOSE: To quantify sleep duration and efficiency in male and female Officer Cadets over 7 days of arduous basic military training. METHODS: To quantify sleep parameters in 26 Officer Cadets (mean ± SD; 9 men; age: 25.3 ± 3.2 y, height: 1.83 ± 0.07 m, weight: 84.7 ± 7.2 kg; and 17 women; age: 24.8 ± 2.5 y, height: 1.71 ± 0.04 m, weight: 70.6 ± 6.4 kg) in comparison to a 21-day close quarters combat (CQC) training program. Measures of HRV, marksmanship, and tactical/safety violations (errors) were recorded prior to (anticipated), during, (execution), and immediately after (recovery) a similar shooting task on Day 1 and Day 21 of training. RESULTS: Heart rate was significantly less at every time point on Day 21 when compared to Day 1 (anticipated: −8.9%, execution: −11.5%, recovery: −8.6%; p < .05). The mean normalized low frequency power (LFnu)—a measure of sympathetic drive—was not different between days (p > .05), but it was significantly lower during the execution phase in comparison to the anticipation (−11.2%) and recovery phases (−12.0%, p < .05). The mean normalized high frequency power (HFnu)—a measure of parasympathetic modulation—was 14.9% higher in Day 21 compared to Day 1 (p < .05). In addition, the HFnu was 17.7% lower in the recovery compared to the execution phase (p < .05). The mean ratio of LF/HF was not different between days (p > .05), but it was significantly higher during recovery (35.4%) when compared to the execution phase (p < .05). Pearson product-moment correlation analysis revealed there was also a positive correlation between the LF/HF power ratio during the anticipation phase and the number of errors committed during execution on Day 1 (r = .635, p < .05). CONCLUSION: There is a positive correlation between sympathetic drive, during the anticipation phase of CQC training, and error rate at the onset of CQC training. These data suggest that those with a lower sympathetic tone perform better than those with a higher sympathetic tone.

**REFERENCES**


**ABSTRACT**

Concussions are common in military personnel and may result in an increased risk of musculoskeletal injury. The underlying mechanisms for this increase risk are unknown and warrant additional research. One plausible explanation may be that neuromotor deficiencies may enhance injury risk following concussion through altered muscular activation or contraction timing. PURPOSE: To compare military personnel with at least one concussion during the past 1 month to 2 years (CONCUSED) to military branches-, age- and Special Forces group- matched controls (CONTROL) on physiological, musculoskeletal and biomechanical performance. METHODS: A total of 48 (24 CONCUSED, 24 CONTROL) male Air Force Special Operators aged 19 to 34 years participated in the study. Participants provided self-reported demographics and injury history and the following assessments: 1) physiological- body composition, anaerobic power and capacity, aerobic capacity and lactate threshold; 2) musculoskeletal- isokinetic strength testing of the lower extremity, including time to peak torque for each muscle group, and balance using the Neurocom system; and 3) biomechanical- single-leg jump and landing tasks, including landing kinematics of the hip, knee and ankle. A C.50 decision tree algorithm and one-way ANOVA were used to compare the two groups on the physiological, musculoskeletal, and biomechanical outcomes. RESULTS: No differences were demonstrated using one-way ANOVA. The C.50 algorithm revealed CONCUSED demonstrated quicker time to peak flexion angle during the single-leg landing task (−0.170 sec; CONCUSED: −22 vs. CONTROL: −14), longer time to peak torque in knee extension isokinetic strength testing (>500 m/cs; CONCUSED: n=18 vs. CONTROL: n=4) and longer knee flexion angle at initial contact (>77°; CONCUSED: n=18 vs. CONTROL: n=2). Conclusion: The findings supported the hypothesis that CONCUSED military personnel would demonstrate altered neuromuscular control in landing strategies and muscular activation. Future research should assess prospectively potential neuromuscular changes following concussion and determine if these changes increase the risk of subsequent musculoskeletal injuries and concussion.

**REFERENCES**

**Effects Of Exercise And Sanqi Ginseng Interventions On Mtss Of Swat Trainees**

Yuxin Liu1, Weimo Zhu, FACSM1, Nanjing Forest Police College, Nanjing, China. 1University of Illinois at Urbana-Champaign, Urbana, IL. (Sponsor: Weimo Zhu, FACSM) Email: 467885289@qq.com (No relevant relationships reported)

**PURPOSE:** To investigate the therapy effects of exercise and Sanqi Ginseng, a Chinese herbs, and their combination on medial tibial stress syndrome (MTSS) of the special weapons and tactics (SWAT) trainees.

**METHODS:** 162 SWAT trainees with MTSS were divided randomly into 3 groups: exercise (E), Sanqi ginseng tablets group (S), and their combination (ES). Participants in E-group maintained the original training, including jumping and all of other training movements, for four months while S-group used oral Sanqi ginseng tablets, (1.2 g for each time, 3 times per day to control the pain at a mid-level for 4 months) without training, and finally, ES-group took both exercise and Sanqi at the same time. The MTSS healing rates measured (numerical ratings scale (NRS) = 0 was seemed as healing) were compared 4 months later. The tibia bone mineral density and average lumbar T score, left and right leg muscle mass, subjective pain NRS were tested also before and after the intervention.

**RESULTS:** The healing rates of E, S and ES groups were 63.0, 88.9, 96.3%, respectively; the average NRS in E (mean = 1.04 & SD = 0.3) group after the intervention was lower than E (mean =3.5 & SD =0.46, p<0.05, η²=0.899) and S (mean =1.4 & SD = 0.51, p = 0.05, η²=0.023), and the lower limb muscle mass was significantly higher that than in the other two groups (p<0.05, for SE vs E, η²=0.595; for SE vs S, η²=0.266).

**CONCLUSIONS:** A combination of exercise and Sanqi ginseng could effectively reduce the NRS during training process, resulting in a better healing effect of MTSS.

**An Examination of Physiological Responses in EMT Students During Occupational and Heat Stress**

Hayden Gerhart1, Amy Fiorentini1, Kristi Storti1, Robert Alman1, Yongsuk Seo2, Louis Pesci1, Madeleine Byales, FACSM1, 1Indiana University of Pennsylvania, Indiana, PA. 2Center for Disease Control and Prevention, Pittsburgh, Pa. (Sponsor: Madeleine P. Byales, FACSM) Email: ldgerhart@gmail.com (No relevant relationships reported)

**PURPOSE:** The purpose of the present study is to observe the impact of a hyperthermic environment on physiological responses in EMT students performing a simulated occupational task. **METHODS:** Ten EMT students completed a simulated occupational task in two conditions; thermoneutral environment, or hyperthermic environment (100°F, 60-70% RH). The following primary dependent variables were analyzed; heart rate (HR), mean arterial pressure (MAP), rating of perceived exertion (RPE), oxygen consumption (Vo2), thermal sensation (TS), mood (TMD), core temperature (Tc), and mean skin temperature (MST). Following 30 minutes of acclimation participants completed an aerobic bout of exercise followed immediately by an anaerobic bout of exercise. The aerobic exercise consisted of a 15-minute treadmill walk at 70%–80% of their previously determined maximal heart rate. The anaerobic exercise consisted of lifting a 50 lb. sandbag to a metronome over the course of 5 minutes. This process was repeated once, resulting in a total exercise time of 30 minutes. **RESULTS:** A main effect for condition was found for Tc (p=0.033), further explained by elevated Tc post-exercise in the hyperthermic condition (38.0±0.3°C) compared to the thermoneutral condition (37.7±0.3°C) (p=0.002). A significant time by condition interaction was seen for TS (p=0.043), further explained by elevated TS scores at every time point with the exception of post-exercise. During exercise, average TS score was 83.5±8.7°C in the hyperthermic condition, compared to 75.5±7.8°C in the thermoneutral condition (p=0.05). MST also elicit a significant time by condition interaction (p=0.033). MST was elevated at all time points in the hyperthermic condition when compared to the thermoneutral condition. Average MST during exercise was 36.7±0.7°C in the hyperthermic condition, compared to 33.4±0.7°C.
in the thermoneutral condition (p<0.001). No difference was observed for TMD between conditions (p=0.554), although a worsening mood following acclimation (19.96±42.00) compared to baseline (-7.08±74.41) was observed. CONCLUSION: Future research should emphasize a focus on maintaining a lower core and skin temperature while focusing on enhanced mood under occupational and heat stress in order to improve physiological and motor performance.

The use of nonsteroidal anti-inflammatory drugs (NSAID) is common practice by participants in marathons and other endurance events. Previous research suggests that renal stress is apparent immediately following marathon completion. However, the potential exacerbating effect of NSAID use during a marathon is not well-understood.

PURPOSE: Investigate the effect of NSAID use on biomarkers of renal stress following a marathon. METHODS: Twenty-two volunteer participants (14 males, 8 females; 38 ± 10.2y, 70.7 ± 10.1kg, 171.0 ± 7.7cm) at the Kansas City Marathon were recruited and assigned to either a control (n = 15) or NSAID (n = 7) group based on planned or habitual use. Pre-race NSAID ingestion was self-reported as 9.15 ± 4.62 mg/kg of ibuprofen (n=4) or 3.75 ± 1.73mg/kg naproxen sodium (n=3). Urine samples were collected pre-marathon, post-marathon, and 24-h post-marathon. Samples were stored at -80°C and later analyzed for urinary neutrophil gelatinase lipocandin (uNGAL) and urinary cystatin C (uCyC). A robust two-way mixed ANOVA with trimmed means was utilized to account for potential outliers. When significant interaction or main effects were observed, pairwise comparisons were calculated using robust bootstrapped effect sizes with 95% confidence intervals. RESULTS: Immediately post-marathon, there was a significant increase in uNGAL (Cohen’s d = 0.47 95%CI [0.23,0.85]) but there was no longer a significant elevation by 24-h post-marathon (Cohen’s d = 0.16 95%CI [0.61,3.36]). There were no significant effects detected for Cystatin C. Further, NSAID ingestion did not affect uCyC or uNGAL values. CONCLUSION: Renal stress biomarkers suggest potential kidney tubular injury immediately post-marathon, but potential renal stress was negated by 24-h of recovery. Moderate NSAID ingestion before the marathon did not affect kidney stress biomarkers.

Police officers’ responses to violent situations are frequently scrutinized. PURPOSE: This study was created to establish a Target Assessment, Action, and Accuracy Protocol (TAAAP), assessing law enforcement personnel’s decision making and firearm proficiency in a dynamic environment. We hypothesized the TAAAP would result in a greater performance differentiation than a traditional shooting test. METHODS: Healthy, non-coloboid, law enforcement officers (n=7) participated in four trials; traditional fatigued, TAAAP fatigued, traditional fresh, and TAAAP fresh. The traditional protocol required officers to fire eight shots in 15 s at a target 3 m away, then fire four rounds in 6 s at a target 6.1 m away. Following a magazine change, the protocol was repeated. The TAAAP consisted of multiple targets, both hostile and friendly, at varying distances across five separate shooting bays. Fatigued protocols required participants to run until volitional fatigue and shoot, whereas subjects had no physical exertion prior to beginning the fresh trials. Shooting accuracy and response time were collected and analyzed. RESULTS: The traditional shooting test demonstrated an accuracy rate of 88 ±9% while the TAAAP demonstrated an accuracy rate of 49 ±17%. The findings of the current study demonstrated TAAAP is a more challenging assessment tool as compared to traditional shooting tasks. CONCLUSIONS: While the traditional task demonstrated a potential ceiling effect, the TAAAP may provide a better example of shooting accuracy in naturalistic settings when compared to the results from officer involved shootings at less than 6.1 m.

PURPOSE: The purpose of this investigation was to examine the relationship between maximal oxygen uptake (VO2max) and anaerobic power in Special Weapons and Tactics (SWAT) team members of law enforcement. METHODS: Fourteen healthy men and one healthy woman (age: 33 ± 6 y, height: 179.6 ± 6.7 cm, body mass: 89.6 ± 10.4 kg) performed a graded exercise test to measure VO2max and a Wingate Anaerobic Test to measure anaerobic power on two separate occasions. VO2max was determined with a graded exercise test on a motorized treadmill using the Costill-Fox protocol. Anaerobic power was determined using the Wingate Anaerobic Test where participants cycled against a resistance of 9% of body mass (8 ± 1 kg) on a Wingate cycle ergometer. Pearson’s r correlations were conducted to analyze the relationship between absolute VO2max and absolute power as well as relative VO2max and relative power. RESULTS: Absolute VO2max was significantly positively correlated to absolute peak power (r = 0.60; p = 0.02) and absolute average power (r = 0.75; p = 0.01). Moreover, relative VO2max was significantly positively correlated to relative peak power (r = 0.56; p = 0.03) and relative average power (r = 0.64; p = 0.01). CONCLUSIONS: There are moderate to strong positive correlations between VO2max and anaerobic power. It is possible that adaptations that occur with high intensity anaerobic exertions might be related to changes in aerobic metabolism. Future research might consider examining the effectiveness of anaerobic power training on aerobic fitness among the tactical athlete populations.
Shift work including rotating shift and night shift has been suggested to be associated with risk of adverse pregnancy outcomes due to disrupted circadian rhythms and neuroendocrine adaptations which may affect fetal growth and timing of parturition.

**PURPOSE:** To evaluate the association between shift work and pregnancy outcomes.

**METHODS:** Five electronic databases and two grey literature sources were searched up to March 12, 2018 and the results underwent duplicate independent screening. Studies of all designs were included (except case studies), and contained information on the Population [women who engaged in paid work during pregnancy], Exposure [rotating shift work (working a pattern of days and nights) or fixed night shift (typical working day between 22:00 to 06:00)], Comparator [fixed day shift (typical working day between 8:00-18:00)], and Outcomes [preterm birth, low birthweight, small for gestational age, miscarriage, gestational hypertension and pre-eclampsia]. Pooled odds ratio (OR) and 95% confidence interval (CI) were calculated using a random-effect, inverse variance method. Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework was used to assess the quality of evidence.

**RESULTS:** A total of 22 observational studies (N=145,671) were included. “Low” to “Very low” quality evidence from observational studies revealed that compared with fixed day shift, rotating shift was associated with an increased odds of preterm delivery (OR: 1.16, 95% CI: 1.03, 1.34) and having a small-for-gestational age baby (OR: 1.23, 95% CI: 1.08, 1.39, I²=11%). Fixed night shift was associated with an increase odds of preterm delivery (OR: 1.25, 95% CI: 1.05, 1.48, F=36%), miscarriage (OR: 1.31, 95% CI: 1.09, 1.57, F=34%) and gestational hypertension (OR: 1.22, 95% CI: 1.01, 1.48, F=0%). When meta-analysis was restricted only to adjusted ORs, fixed night shift was associated with an increase in risk of miscarriage (OR: 1.34, 95% CI: 1.10, 1.63, F=38%). Rotating shift or fixed night shift were not significantly associated with low birth weight or pre-eclampsia. **CONCLUSIONS:** Pregnant women who work with rotating shift or fixed night shift have an increased risk of adverse pregnancy outcomes.

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**Method:**

1. **Participants:** A total of 9 healthy young men (21.5±1.5 yrs, 172.2±5.2 cm, 68.4±9.9 kg), who formed an intramural collegiate team and regularly played recreational soccer, participated in two of four-week experiments. Each was conducted in the fall (October, FS) and the Spring (April, SS). Before (Wk0) and after (Wk4) the experiments, their maximal oxygen uptake (VO2max) forced vital capacity (FVC), forced expiratory volume in first second (FEV1), FEV1/FVC, and systolic and diastolic blood pressure (SBP, DBP) were measured. During each of the experimental period, they played on average of 6 sessions while recording their heart rate. In each session (120 min) they played for an intensity of 5.5 to 7.5 times of VO2max in FS and SS, respectively) followed by 55±5 min of friendly game (at 84±3.0 or 82±6.1% of VO2max in FS and SS, respectively). Each play session, FVC, FEV1, FEV1/FVC, SBP, and DBP were measured. Air quality was measured by light-scattering method: PM10 and PM2.5 in FS was 44.0±34.1 and 24.1±23.7 μg/m3, while those in SS was 92.0±23.7 and 49.1±25.7 μg/m3, respectively.

2. **RESULTS:** The change of measured variables between Wk0 and Wk4 was 107 of PM10 and 8 vs. 69 μg/m3 of PM2.5 in FS; 28 vs. 159 of PM10 and 17 vs. 90 μg/m3 of PM2.5 in SS, respectively. The lowest and the highest particulate concentrations were compared in each season (20 vs. 107 of PM10 and 8 vs. 69 μg/m3 of PM2.5 in FS; 28 vs. 159 of PM10 and 17 vs. 90 μg/m3 of PM2.5 in SS), no differences were noticed during FS. But FVC and FEV1 were increased higher after play sessions in highly polluted air than clean air.

**CONCLUSIONS:** In general, the concentration of fine particulate matter in the air affect pulmonary and blood pressure responses of the recreational exercisers. But the highest concentration of particulate matter in the air may influence on pulmonary responses after vigorous outdoor activities.

**PURPOSE:** Power meters provide objective monitoring of exercise intensity, unaffected by day-to-day physiological variations. The validity and reliability of most power meters have been assessed in laboratory settings with controlled, stable environmental conditions. Since a factor of importance for athletes exercising in a wide range of different environmental temperatures is the accurate recording of the training values regardless of environmental fluctuations. The purpose of this study was to examine potential differences in power output of the CompuTrainer, PowerTap, and Vector power meters in hot and cold compared to a room temperature environment.

**METHODS:** Recreationally trained participants (7 males, 3 females, n = 10, age: 24 ± 1 years, height: 176 ± 6.1 cm, weight: 75.4 ± 10 kg, VO2peak: 56.6 ± 8.3 ml·kg⁻¹·min⁻¹) completed three incremental VO2peak cycling trials in hot (33°C), cold (7°C), and room temperature (RT, 20°C) conditions. The power meters were placed on a standard road bicycle and power output was logged and recorded. **RESULTS:** The CompuTrainer’s power output was higher in the RT trial compared to the cold (p = 0.006) and hot (p = 0.047), but not between the hot and cold trial (p = 0.734). The PowerTap’s power output was not different in RT and cold (p = 0.875), but was lower in the hot compared to RT (p < 0.001) and compared to cold (p < 0.001). The Stages’ power output was not different between RT and cold (p = 0.234), but was lower in the hot compared to RT (< 0.001) and cold (< 0.001). The Vector’s power output was not different between RT and cold (p = 0.067) but was lower in the hot compared to RT (p < 0.001) and cold (p < 0.001). **CONCLUSION:** Environmental temperature may affect the reproducibility of power meters, thus revealing the significance of recognizing potential differences between temperatures when choosing a power meter.
**Official Journal of the American College of Sports Medicine**

**Board #294**  
**May 29 2:00 PM - 3:30 PM**  
**Blood Pressure Responses to Air Pollution in Chinese Children: Effect Modification by Obesity**  
Zhaohuan Gui¹, Mao Wang¹, Li Cai¹, Jun Ma², Yinghua Ma³, Jin Jing³, Yajun Chen¹  
¹School of Public Health, Sun Yat-sen University, Guangzhou, China.  
²School of Public Health, Peking University, Guangzhou, China.  
(No relevant relationships reported)

**PURPOSE:** To assess effect modification by obesity on the association between pollutants and blood pressure (BP) in Chinese children.

**METHODS:** We investigated 26,039 Chinese children, aged 6-18 years old, from 50 elementary schools and 44 middle schools from seven provinces in China in 2014. The weight, height, waist circumferences, and BP were measured. Total seven and half months concentrations of particulates with an aerodynamic diameter < 2.5 and ≤10 μm (PM₂.₅ and PM₁₀), ozone (O₃) sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and carbon monoxide (CO) were assessed based on the measurement from national monitoring stations and the personal short-term inhalation rate. Two-level regression analysis was used to examine the effects, controlling for sex, age, early life factors, physical activity, screen time, socioeconomic status, passive smoking exposure, and family history of hypertension.

**RESULTS:** The results showed that associations existed between elevated BP and pollutants. The increase in systolic BP ranged from 0.21 mmHg per 62.2 mg/m³ increase for CO (95%CI: 0.07-0.40 mmHg) to 1.49 mmHg per 1320.4 μg/m³ increase for PM₁₀ (95%CI: 1.21-1.86 mmHg). The increases in mean diastolic BP ranged from 0.42 mmHg per 368.6 μg/m³ increase for NO₂ (95%CI: 0.22-0.62 mmHg) to 0.82 mmHg per 1320.4 μg/m³ increase for PM₁₀ (95%CI: 0.54-1.10 mmHg). Compared to children with normal weight or non-abdominal obesity, underweight, overweight, obese, or abdominally obese children exhibited consistently stronger effects. PM₂.₅, PM₁₀, SO₂, O₃, and CO are associated with increased BP among Chinese children. Underweight, overweight, obesity, and abdominal obesity may increase the risk.

**CONCLUSIONS:** Study findings indicate that high levels of PM₂.₅, PM₁₀, SO₂, O₃, and CO associated with increased BP among Chinese children. Underweight, overweight, obesity, and abdominal obesity may increase the risk.

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**Board #295**  
**May 29 2:00 PM - 3:30 PM**  
**Effect of Two Equipment Load Bearing Strategies on Low Back Discomfort in On-duty Police Officers**  
Jeffrey M. Janot, Chantal Bougie, Anna Kohler, Sierra Fried, Jessica Nagel, Maddy Downing, Lindsey Opelt, Marquell Johnson, Nick Beltz, Andrew Floren, Saori Braun  
University of Wisconsin-Eau Claire, EAU CLAIRE, WI.  
Email: janotjm@uwec.edu  
(No relevant relationships reported)

**PURPOSE:** To examine the cross-sectional association between 25(OH)D status and several markers of physical performance in youth club soccer athletes.

**METHODS:** 42 adolescent, male and female club soccer players age 14-18 were recruited during the winter season. 25(OH)D status, measured in January, was assessed from a capillary blood sample analyzed using liquid chromatography-tandem mass spectrometry. Physical performance was evaluated using a variety of agility, muscular strength, and cardiorespiratory fitness tests. Participants were classified as 25(OH)D Deficient (< 30 nmol/L), Insufficient (30-75 nmol/L), or Sufficient (> 75 nmol/L) and a relationship between physical performance and 25(OH)D classification was determined using a one-way ANOVA.

**RESULTS:** Mean 25(OH)D status was 76.0 ± 16.7 nmol/L. 19% (8/42) of the participants were vitamin D deficient, 55% (23/42) were vitamin D insufficient, and 26% (11/42) were vitamin D sufficient. There were no associations found between 25(OH)D status and the variety of agility, muscular strength, and cardiorespiratory fitness tests (p > 0.05).

**CONCLUSIONS:** This investigation demonstrates there are no associations between 25(OH)D status and physical performance in adolescent soccer players. Our participants were competitive adolescent athletes with none being severely deficient which may mask associations in this population group.

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**Board #297**  
**May 29 3:30 PM - 5:00 PM**  
**Acute and Chronic Changes of Hematological Variables in College Football Athletes with Sickle Cell Trait**  
Haoyan Wang¹, Nathan P. Lemoine, Jr.¹, Matt Martone², Brian A. Irving, FACSM³, Guillaume Spielmann¹, Jack Marucci, Shelly Mullinen¹, Derek D. Calvert¹, Timothy S. Church², Jennifer Rood³, Brian Harrell³, Neil M. Johannsen³  
¹Louisiana State University, Baton Rouge, LA. ²Pennington Biomedical, Baton Rouge, LA. ³Baton Rouge General Sports Medicine, Baton Rouge, LA.  
Email: hwang56@lsu.edu  
(No relevant relationships reported)

**PURPOSE:** To determine the acute and chronic changes of hematological in NCAA Division I football players with sickle cell trait (SCT) and healthy control (CON) before and after a single practice (acute) and pre-and post-training camp in pre-season (chronic). **METHODS:** Eight athletes (n=4 CON; n=4 SCT) had blood drawn before and after a single pre-season scrimmage. Hemoglobin electrophoresis (Hb-A, Hb-A2, Hb-S and Hb-F), complete blood count, and chemistry panel were analyzed before and after a single pre-season scrimmage. Hemoglobin electrophoresis (Hb-A, Hb-A2, Hb-S and Hb-F), complete blood count, and chemistry panel 26 were analyzed using 2-way RM ANOVA. **RESULTS:** Baseline total hemoglobin content was similar between SCT and CON (mean±SD: 141±1.06 g/dL vs. 145.1±0.6 g/dL; P=0.41). However, Hb-A was lower (58±1.3% vs. 66.6±17.5%; P=0.02) and Hb-S was higher in SCT than CON (36.8±3.6% vs. 29.2±3.1%; P=0.001), and results were consistent at all time points. After a single practice, uric acid was significantly higher in SCT than CON (36.8±3.6% vs. 29.2±3.1%; P=0.001), and results were consistent at all time points. After a single practice, uric acid was significantly higher in SCT than CON (P<0.001). However, blood urea nitrogen (BUN) was lower in SCT (16.1±3.5 mg/dL) than CON (23.1±4.1 mg/dL; P=0.006). The chronic changes between pre-and-post camp showed that SCT had lower in BUN (16.1±3.5 mg/dL vs. 20.5±3.3 mg/dL; P=0.015) and total bilirubin (0.73±0.14 mg/dL vs. 1.13±0.27 mg/dL; P=0.027) compared to CON. In complete blood count profile, white blood count, neutrophils, lymphocytes, and monocytes significantly decreased in both groups (P<0.05). **CONCLUSION:** Both acute and chronic changes showed SCT had lower BUN than CON suggesting exercise might have different effects on kidney function between two groups. Subclinical changes in resting immune cell counts between pre- and post-training camp suggest that athletes’ immune function may be dampened by repeated bouts of exhaustive exercise.
1064 Board #298 May 29 3:30 PM - 5:00 PM Blood Flow Response and Changes in Fluid Distributions after Percussive Massage Therapy

Timothy R. Macaulay, Joel E. Ramirez, Jachyung Choi, Malcolm Jones, E. Todd Schroeder, FACSM. University of Southern California, Los Angeles, CA.

Email: tmacaulay@usc.edu

(No relevant relationships reported)

PURPOSE: Percussive massage therapy is a widely used modality for sports rehabilitation and recovery after intense exercise. Recent advancements in handheld vibration technology have further increased its popularity. While athletes, trainers, and therapists collectively tout its practical benefits for sports performance, the underlying mechanisms are largely unknown. To provide such insight, we assessed blood flow response and changes in fluid distributions after applying percussive massage therapy to the quadriceps muscles of each leg.

METHODS: Forty-one participants (23 female, 25.1 ± 3.0 years of age) with a range of body fat percentage (23.8 ± 7.9%) were tested. Percussive massage therapy was applied for 5 minutes by a study investigator. Two devices were used simultaneously, Theragun G2PRO and HyperIce Hypervolt, with similar speed setting (40 percussions per second) and randomly assigned to one of each participants’ legs. A thermal camera (FLIR C2) was used as a proxy for blood flow. All images were taken with participants seated and an ice-water slurry by their abducted legs as a control for temperature.

RESULTS: Immediately after the treatment, there was no difference in surface temperature compared to baseline in either thigh. However, the temperature in both thighs was greater than baseline in the 5th to 8th minutes (~3°F, P < 0.006), indicating a delayed blood flow response. Temperatures returned to baseline by the 12th minute post-massage. Differences between devices were observed. The percent change from baseline was significantly greater in the G2PRO thigh than the Hypervolt thigh at minutes 5 (3.7% vs 3.2%), 6 (3.7% vs 3.2%), 7 (3.6% vs 3.1%), and 12 (1.9% vs 1.4%, respectively) post-massage (all P < 0.006). For ECW and ECW/TW, a significant decrease was observed only in the G2PRO leg between 2 and 4 minutes post-massage (P < 0.0167). However, there was no difference between legs.

CONCLUSIONS: Overall, the G2PRO and Hypervolt induce a delayed blood flow response; however, the G2PRO has a larger, longer-lasting effect. In addition, the G2PRO appears to influence fluid distributions, while the Hypervolt does not.

1065 Board #299 May 29 3:30 PM - 5:00 PM Low Energy Availability May Cause REE Suppression and Bone Loss In Japanese Male Athletes

Motoko Taguchi1, Kuniko Moto1, Sihyung Lee2, Suguru Torii1, Nobuko Honju, FACSM2, Waseda University, Saitama, Japan.

1University of Arizona, Tucson, AZ. (Sponsor: Nobuko Honju, FACSM)

(No relevant relationships reported)

PURPOSE: Recently, it has been reported that low energy availability (EA) affects physical conditions (i.e. impairments of metabolic rate, bone health, immune functions, protein synthesis etc.) in male athletes as well as female. However, few EA data of male athletes have been reported. The aim of this study was to estimate EA of Japanese male athletes, and to examine the relationship between their EA and resting energy expenditure (REE), and the status of bone health.

METHODS: Five male collegiate long-distance runners (age: 19 ± 6.8 yrs., average running time: 133±20 min/day) during 8 weeks were participated in this study. Total energy intake (TEI) was assessed using 7-day dietary records with food pictures that were taken by the athletes. Further, they were interviewed on their food picture and physical conditions (impairments of metabolic rate, bone health, immune functions, protein synthesis etc.).

RESULTS: The ratio of measured TEI to predicted REE (0.91), energy metabolism of these athletes seemed to be suppressed. In addition, the value of NTs showed a high value exceeding the reference range, subjects were considered to be in a state where bone resorption was promoted.

CONCLUSIONS: These data suggested that low EA could impair energy metabolism and bone health in Japanese male collegiate long-distance runners.

1066 Board #300 May 29 3:30 PM - 5:00 PM Nocturnal Hypoglycemia Incidents Following Moderate and Vigorous Physical Activity in Athletes With Type 1 Diabetes

Jason R. Jaggers, Kristi King, Kupper Wintergerst. University of Louisville, Louisville, KY. (Sponsor: Ann Swank, FACSM)

Email: jason.jaggers@louisville.edu

(No relevant relationships reported)

PURPOSE: For adolescent athletes with type 1 diabetes mellitus (T1DM), proper glucose management during and after prolonged activity could prove difficult because of the body’s response throughout the process of gluconeogenesis. Understanding their body’s glucose response to physical activity could aid in effectively addressing nocturnal hypoglycemia. Therefore, the purpose of this investigation was to examine the acute temporal associations between blood glucose and measures of moderate and vigorous intensity physical activity via an accelerometer in a sample of athletes with T1DM.

METHODS: 10 adolescent athletes with diagnosed T1DM between the ages of 13 - 17 and who were involved in competitive sports in the previous 12 months were recruited for this study. All participants wore an accelerometer and continuous glucose monitor (CGM) consecutively for a minimum of 2-weeks with a total of 168 patient-days of collected data. Nocturnal hypoglycemia was defined as a blood glucose reading <70 mg/dl during sleeping hours that lasted ≥ 10 minutes as indicated by the CGM.

RESULTS: Incidents of nocturnal hypoglycemia occurred 29% of the nights measured with an average duration of 52.3 ± 41.04 minutes. A multiple linear regression showed vigorous intensity physical activity was a significant predictor of nocturnal hypoglycemia after controlling for all variables (β=0.169, p=0.02) with an average time of 26 minutes of vigorous intensity. CONCLUSIONS: Engaging in vigorous intensity physical activity increased the risk of prolonged nocturnal hypoglycemia in adolescent athletes with T1DM. Incorporating accelerometers into patient care could prove beneficial when making further recommendations for athletes by improving glucose management.

Funded by Children’s Hospital Foundation, Christensen Family, Norton Children’s Hospital, and University of Louisville.

1067 Board #301 May 29 3:30 PM - 5:00 PM The Implications of New Blood Pressure Guidelines on Hypertension Prevalence in Former NFL Players

Garrett H. Williams, Genevieve E. Smith, Mark M. Cassidy, Gregory W. Stewart, FACSM. Tulane University School of Medicine, New Orleans, LA. (Sponsor: Gregory Stewart, MD, FACSM)

(No relevant relationships reported)

Purpose: Examine potential implications of the new 2017 ACC/AHA hypertension (HTN) guidelines on the prevalence of HTN in a population of former professional football players.

Methods: Blood pressure (BP), height, weight, and waist circumference were collected from former professional football players (n = 1240) between April 2015 and August 2018 during cardiovascular screening events held throughout the U.S. Demographic information was collected, including age, race, career playing position, and previous HTN diagnosis. HTN status was assessed via 2010 JNC (2010) and 2017 ACC/AHA (2017) guidelines. Means were analyzed using one-way ANOVA, correlation, and Chi-Square testing.

Results: The overall prevalence of hypertension BP observed in this cohort was 38.5% (2010) and 70.5% (2017; p < 0.0001). While all subjects previously identified as having stage 1 HTN by 2010 guidelines were re-categorized as stage 2 under new 2017 guidelines, 72.8% of subjects previously identified as prehypertensive were re-categorized as having stage 1 HTN. There was an overall increase (p < 0.0001) in HTN prevalence by 2017 versus 2010 criteria in all groups when data were stratified by age, race, and playing position. There was an 83.4% increase in the prevalence of previously undiagnosed HTN under the new 2017 guidelines (48.6%) versus 2010 guidelines (26.5%; p < 0.0001). Correlation of body mass index and waist circumference with HTN revealed a significant association (p < 0.0001) of body mass index and HTN under both 2010 guidelines (r = 0.2306) and 2017 guidelines (r = 0.1547). Conversely, the association between waist circumference and HTN under both 2010 guidelines (26.5%; p < 0.0001) was better than that of 2017 guidelines (r = 0.0422; p = 0.1379), but only the correlation with HTN under 2010 guidelines was found to be significant.

Conclusions: Changes to the guidelines for the categorization of BP are expected to substantially increase HTN diagnosis in this population of former professional football players, as previously undiagnosed HTN under the new 2017 guidelines almost doubled in the current study. Given the significant increase in former players found to have stage 2 HTN, it is also likely that the number of men in this population prescribed antihypertensive medications will increase substantially.
Purpose: Visceral fat is related to cardiometabolic risk in athletes as well as non-athletes. Magnetic resonance imaging (MRI) estimates visceral adipose tissue (VAT) from a direct differentiation of VAT from subcutaneous adipose tissue. Recently, some validation studies of VAT assessment using dual X-ray absorptiometry (DXA) have been reported. This study aimed to compare DXA measurements of VAT with the gold standard MRI in athletes with wide ranges of body size.

Methods: This study included 77 male collegiate athletes (age, 20 ± 2 yr; height, 175.1 ± 7.4 cm; body weight, 79.6 ± 17.4 kg; body mass index, 25.9 ± 5.3 kg/m²) from different sports (e.g., sumo, judo, lósters, wrestlers, basketball, volleyball, swimming, etc.). Paired measurement of VAT was performed using MRI (Signa 1.5T; General Electric Co., Ltd., WI, USA) and DXA (Horizon A configured with software APEX 5.6, Hologic Inc.). MRI-VAT volume was calculated by integrating six 65-mm single MRI slices corresponding to the level of DXA-VAT volume measurement. Data were compared using Wilcoxon signed rank test and a Bland-Altman plot was used to assess systematic error. Data were shown as mean ± SD for parametric data and median (Inter quartile range) for nonparametric data.

Results: The VAT volumes of DXA (248 [212 - 298] cm³) and MRI (211 [180 - 269] cm³) differed significantly (p<0.01). Regression analysis showed a linear relationship between MRI and DXA VAT volume measurement. Data were compared using Wilcoxon signed rank test and a Bland-Altman plot was used to assess systematic error. Data were shown as mean ± SD for parametric data and median (Inter quartile range) for nonparametric data.

Conclusions: The VAT volumes of DXA (248 [212 - 298] cm³) and MRI (211 [180 - 269] cm³) differed significantly (p<0.01) and regression analysis showed a linear relationship between MRI and DXA VAT volume overestimated by 37 ± 50 cm³ compared with MRI-VAT volume, with no systematic error (p=0.75).
adequate, and varied between different sport disciplines. Water-sports athletes drank less than other athletes. Education and intervention should be conducted to improve athletes drinking behavior and hydration status.

### 1072 Board #306 May 29 2:00 PM - 3:30 PM

**Medical Encounters, Cardiac Arrests and Deaths During a 109km Mass-Participation Cycling Event Involving 102251 Starters**

Jannelene Killips, Martin Schwellnuss, FACSM; Dina Janse Van Rensburg, FACSM; Sonja Swanepoel, Esne Jordaan,

**Method:** This retrospective, descriptive study was conducted during the Cape Town Cycle Tour (109km) in South Africa over 3 years, and involved 102251 race starters. Medical encounters were recorded on race day each year and are reported as an incidence rate (IR per 1000 starters; 95% CI). Overall illness-related (organ) system or injury-related (by anatomical region) encounters, and severity (moderate, serious, life-threatening, sudden cardiac arrest/ death) were recorded.

**Results:** In 3 years, 539 medical encounters were recorded (IR 5.27 (4.84-5.74), with a significantly higher injury (3.23; 2.90-3.60) compared to illness-related (2.10; 1.84-2.40) (p<0.001) incidence. Incidence of serious life-threatening medical encounters was 0.49% (95%CI; 0.37-0.65) and 2 cardiac arrests and 1 death occurred (1/11225 and 1/102251 respectively). Injury incidence was highest in upper limb (1.85; 1.60-2.13), lower limb (0.96; 0.79-1.0) and head/ neck (0.77; 0.62-0.96) while illnesses incidence was highest for fluid/electrolyte abnormalities (0.59; 0.46-0.76) and the cardiovascular system (0.48; 0.36-0.63).

**Conclusions:** In a 109km community-based mass participation cycling event, 1 in 190 cyclists starting the race required medical assistance or evaluation by the medical team on race day. Injury-related (1 in 310 cyclists) encounters were higher than illness-related medical encounters (1 in 476) among race starters. Serious life-threatening medical encounters occurred in 1 in 2045 race starters. Risk factors associated with medical encounters need to be determined to enable implementation of safer cycling strategies.

### 1073 Board #307 May 29 3:30 PM - 5:00 PM

**Impact of Silver Ion Laundry Treatment on Athletic Gear and Environmental Pathogens and Athlete Health**

Priya Balachandran, John J. Openshaw, FACSM; Dina Janse Van Rensburg, FACSM; Sonja Swanepoel, Esne Jordaan,

**Method:** This study was conducted as part of the Silver Sanitary project. Silver ion treatment of the textiles resulted in dramatic decreases in textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.). Silver ion treatment of the textiles during the final rinse stage of the facility’s standard laundry study, conducted at a professional sports facility over a six-month period, included athlete’s clothing and towels, towels on athletics benches, and towels in the shower. Samples were collected before initiating the silver ion textile treatment to determine initial CFU levels.

**Results:** Significantly higher (99.9% and 99.5%) reductions in silver ion treatment of the textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.). Silver ion treatment of the textiles resulted in dramatic decreases in textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.). Silver ion treatment of the textiles during the final rinse stage of the facility’s standard laundry

### 1074 Board #308 May 29 3:30 PM - 5:00 PM

**Effects of Mistletoe Extract Supplementation on Inflammation Markers after Strenuous Exercise in Rowers**

Soo-Min Hae, Jung-Sook Kim, Bo-Sung Kim, Jeong-Ah Lee, Yoon-Jung Choi, Do-Yeon Kim, FACSM; John J. Openshaw, FACSM; Dina Janse Van Rensburg, FACSM; Sonja Swanepoel, Esne Jordaan, FACSM; South African Medical Research Council, Cape Town, South Africa.

**Method:** This study aimed to identify the effect of mistletoe extract consumption on inflammatory markers of university male rowing athletes for 8 weeks during the winter training period. This study included 20 male rowing athletes divided into the Korean Mistletoe extract supplement group (KME, n = 10) and the control group (CON, n = 10). The KME group took 110 ml of mistletoe extract every morning and evening after meals (total of 220 mL) for eight weeks. Before and after taking mistletoe for eight weeks, 2,000 m rowing performance capabilities were measured, and KME group took 110 ml of mistletoe extract after recovery from the rowing exercise. Blood samples were collected during the rest, immediately after exercise, and after 30 min of recovery. Among inflammatory markers, IL-6 and TNF-α were analyzed. Results: Both groups showed a significantly reduced, 2,000 m rowing time (KME: p < 0.001, CON; p < 0.01), and the total number of strokes were significantly fewer in the KME group than in the CON group (p = 0.05). After supplementation the levels of IL-6 and TNF-α were lower in the KME group than in the CON group in all periods of the rest (p = 0.001), immediately after exercise (IL-6: p = 0.01, TNF-α: p < 0.001), and after 30 min of recovery (p < 0.01). Conclusion: Therefore, mistletoe extract intake can reduce the serum inflammatory cytokine levels (which are otherwise increased due to high-strength exercise) among active anti-inflammatory activity.

### 1075 Board #309 May 29 3:30 PM - 5:00 PM

**A Retrospective Analysis Of VPBs In Trained Bicuspid Aortic Valve Athletes.**

Matteo Donadei, Lorenzo Casatori, Giorgio Galanti, Pietro Arnedo Modesti, Laura Stefanini, Sports Medicine, Florence, Italy; 2Sports Medicine-FIMS (Italian Federation of Sport Medicine), Florence, Italy; 3Sports Medicine Center-University of Florence, Florence, Italy.

**Purpose:** Bicuspid aortic valve (BAV) represents a common congenital cardiac disease (1-2%) normally compatible with sports activity. In case of competitive sports, the eligibility can be otherwise limited by the presence of symptoms, aortic valve dysfunction or arrhythmias. The investigation aims to verify, in a large cohort of BAV athletes, the prevalence of ventricular arrhythmic events (VPBs) found at the maximal exercise test (ET) at the first sports medicine clinical evaluation. Methods: A sample of 356 BAV athletes, regularly followed at Sports Medicine Center of the University of Florence, since 10 years, was retrospectively evaluated for arrhythmic events found at the first check-up. The athletes (321 M and 35 F) were in the range of 8-50 years old (median 24.00 ± 14.14) and practiced sports at high cardiovascular impact (predominantly soccer, basketball and track and field). Inclusion criteria were to undergo a 2D echocardiography and ET conducted at 85% of their maximal effort. VPBs were reported if they were ≥ 3 at rest and/or during the test. Exclusion criteria were age > 50 years and the presence of any other cardiac or systemic structural disease. They were matched with a control group of 400 athletes (age 19.70±9.7) without BAV and similarly trained. Results: Only 25 (7.02%) showed VPBs at the ET. The total amount was 403 single VPBs and 4 monomorphic couples; a polymorphic pattern was present in only 3 athletes and only 5 had induced-exercise VPBs at peak. None of them showed acute events or had major arrhythmias. The difference of the VPBs prevalence in BAV athletes versus control (VPBs in 6.25%) was not significant (p > 0.05). Conclusions: Prevalence of VPBs is low in BAV athletes and it seems to be not different from athletes without BAV. In case of sports eligibility, BAV should not be considered as a cause of major arrhythmic events. More data in this field could optimize the cost/effective ratio for the eventual ECG holder indications.
Body composition is an important consideration for athletes and coaches. Air displacement plethysmography (ADP) is often preferred in this population due to relative ease of administration and accuracy of measurement. However, other methods may provide a quicker or more cost-effective way of determining body fat percentage (BF%) in athletes. PURPOSE: To compare BF% from various body fat estimators to the criterion of ADP in female Division-I collegiate athletes. METHODS: Forty-eight female athletes (25.2 ± 25.8 kg) underwent a body composition test battery consisting of: 1) hand-to-foot bioelectrical impedance spectroscopy (HF-BIS); 2) hand-to-foot bioelectrical impedance analysis (HF-BIA); 3) foot-to-foot BIA (FF-BIA); and 4) 3-site Jackson-Pollack skinfold (SF). All SF testing was performed by the same test administrator, and BF% was estimated using the Brozek body density formula. Mean comparisons were assessed using a one-way ANOVA against the criterion of ADP and all correlations were run using Pearson’s product moment correlations. RESULTS: Significant, positive relationships were found between all variables when compared to ADP (HF-BIS: r = 0.68, p < 0.01; HF-BIA: r = 0.79, p < 0.01; FF-BIA: r = 0.76, p < 0.01; and SF: r = 0.84, p = 0.01). When compared to the criterion of ADP (22.2 ± 7.1%), only the HF-BIA (26.1 ± 5.4%) was found to significantly overestimate BF% (p = 0.03). No significance was noted with HF-BIS (25.5 ± 5.6%, p = 0.38), FF-BIA (22.1 ± 5.7%, p = 0.16), or SF (24.6 ± 6.1%, p = 0.21). CONCLUSION: The results of this study suggest that a moderate-to-strong relationship exists between BF% estimated via ADP and other laboratory and field-based methods. Given the strength of its relationship to ADP, it appears 3-site SF analysis may provide a cheaper, time-saving estimate of BF% in Division-I female athletes.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

1080 Board #314 May 29 3:30 PM - 5:00 PM
Effect of Low Ph Magnesium-sulfate Foam on Night Leg Cramps: A Double-blind Randomized Trial
Toni Marie Torres-McClehe 1, Scott M. Strayer 2, Erin M. Moore 1, Amber Williams 1, James Hardin 1, Samantha R. Weber 1, Allison B. Smith 1, Justin M. Goins 1.
1University of South Carolina, Columbia, SC; 2University of South Carolina School of Medicine, Columbia, SC; 1University of South Florida, Tampa, FL.
Email: torressmc@mailbox.sc.edu

INTRODUCTION: A large portion of the adult population suffers from night leg cramps (NLC); but there are few safe and effective treatment options. Magnesium oxide supplementation has been found ineffective; however, low pH topical foam with magnesium sulfate has not been examined. PURPOSE: Examine the effectiveness of a topical low pH foam with magnesium sulfate on NLC frequency and severity/pain and the effects on activities of daily life. METHODS: A double-blind randomized trial of 36 females (27-9) adult participants (age: 52.0 ± 11.9 yrs.; weight: 94.8 ± 24.3 kg; height: 167.9 ± 9.0 cm; body fat%: 39.8%±12.3%) who experienced a minimum of 3-NLCs per week were recruited from local medical facilities in southeast region. Participants were randomized into 2 groups (Control [C] or Intervention [INT]) and completed a 14 consecutive day home-based treatment (Theraworx Relief®). Participants were given 5 bottles of foam (C or INT) to rub on their lower limbs twice a day and in the event of a cramp for the 14 days and completed surveys to assess frequency of NLC, pain levels, restless leg syndrome quality of life questionnaire (RLSQL) and the Total Social Function on the total RLSQL. Although there was no difference in frequency and severity/pain of NLCs between groups, we did see a significant reduction in NLCs within the INT group in emotional well-being (-13.3; p<.01). Regression models also demonstrated significant improvement in the INT group in emotional well-being (-13.3; P<.03), total number of NLCs (-1.9; P<.02), and severity x frequency (-12.8; P<.02). The C group had significant improvements in daily (-11.5; P<.03) and social function (-10.9; P<.04). Conclusion: Theraworx Relief® with magnesium significantly improved quality of life as measured by domains on the total RLSQL. Although there was no difference in frequency and severity of NLCs between groups, we did see a significant reduction in NLCs within the intervention group. Few evidence-based treatments options are available for NLCs. Given the high prevalence of this condition and potential impact on health and well-being this treatment has the potential to improve health outcomes in patients who suffer with NLCs.

1081 Board #315 May 29 3:30 PM - 5:00 PM
Difference Between USI Humeral-Ulnar Medial Joint Space Measurements Using Gravity-induced Vs. 3kg External Load Valgus Forces
Arie J. van Duijn 1, Shawn D. Felton 2, Jacqueline van Duijn 1, Evert Myer 1, Florida International University, Miami, FL; 1Florida Gulf Coast University, Everglade, FL; 2Florida International University, Miami, FL.
Email: avanduijn@gcu.edu

PURPOSE: Injuries of the ulnar collateral ligament (UCL) are a common pathology in overhead athletes. Ultrasound imaging is becoming a more common diagnostic tool to diagnose UCL pathology. Ultrasound imaging protocols have been described using external mechanical valgus forces to evaluate medial joint space (MJS) opening as an indicator of joint instability and UCL insufficiency. However, this external mechanical force is often poorly tolerated by athletes with acute injuries. A gravity induced valgus force is often better tolerated, however this method may potentially result in lesser joint space opening measurements. The purpose of this pilot study was to examine differences in joint space opening measurements between these two methods of applying valgus force while performing ultrasound imaging. METHODS: Nine asymptomatic NCAA Division I collegiate baseball pitchers (age 20.1 ± 1.3 yrs) participated in this study. Ultrasound images were obtained of the MJS in the participant’s throwing arm using a GE LOGIQ e ultrasound unit. Participants were placed supine with elbow position at 30 degrees, with a wedge placed underneath the humerus creating a gravity induced valgus force on the MJS. Ultrasound imaging measurements to evaluate MJS opening were performed from the apex of the trochlea to the apex of the ulna. A 3-kg valgus force, as measured by a hand-held dynamometer, was applied 20 cm distal to the medial epicondyle, and the imaging measurement was repeated. A paired t-test was performed to evaluate differences in joint space measurements between the two test protocols. RESULTS: There was no significant difference between the MJS measurements (mean difference .005cm, t = -.743, p<.479) using the gravity-induced valgus method (mean opening .41cm, SD .074cm) and the 3kg external force method (mean opening .44cm, SD .071cm).

CONCLUSIONS: The results of this pilot study indicate that a gravity induced valgus force during ultrasound imaging of the UCL and MJS may yield similar joint opening compared to a mechanically induced 3kg external force. As external valgus force is often poorly tolerated in the presence of acute injury, gravity induced force may provide for an alternate method of evaluating medial joint space opening. Further research is recommended using larger sample size and symptomatic populations.

B-69 Free Communication/Poster - Diabetes

1082 Board #316 May 29 3:30 PM - 5:00 PM
Comparison of Two Diabetic Education Programs Designed to Tread Adult-Onset Diabetes Mellitus
Judy R. Wilson, FACSM, Katelyn Wilson, Cynthia Trowbridge, Mark Ricard. University of Texas @ Arlington, Arlington, TX.
Email: jrwilson@uta.edu

INTRODUCTION: Diabetes mellitus or adult onset diabetes or type 2 diabetes, is the most common form of diabetes. Millions of Americans are diagnosed with type 2 diabetes every year, and many more are unaware they are at high risk. PURPOSE: The purpose of this study was to compare the diabetic education programs of two certified diabetic dietitians, one with a focus on diet and the other with a focus on exercise, over 6 months, to determine which program was more successful in the treatment of type 2 diabetes. METHODS: Forty participants were randomly selected and separated into two groups. The subject pool was limited to those using oral diabetic medications. All participants had an initial evaluation of body mass index (BMI), hemoglobin A1c, fasting blood sugar, waist circumference, and weight. These measurements were repeated again after three and six months of treatment for analysis. The exercise group and the diet group each included 10 males and 10 females. The exercise (E) group met with their trainer five times per week and the diet (D) group received information about choosing foods to limit impact on blood glucose. A 2 x 3 repeated measures ANOVA was used to determine the effects of an exercise vs diet program. RESULTS: All participants completed their respective programs. The exercise group (10 males, 10 females) was 62.4 ± 8.6 yrs and the diet group (10 males, 10 females) was 65.1 ± 9.8 yrs. The exercise group (31.9 ± 4.5) had a significant decrease (p<.05) in BMI at 6 months when compared to the diet group (29.5 ± 4.32). Measurements of A1c (E=8.4%±0.7%; D=7.7%±1.5%), fasting blood glucose (E=132.2±13.4 mg/dl; D=132.2±16.0 mg/dl), waist circumference (E=40.4±4.5 in; D=45.2±6.5 in), and weight (E=207.9±43.1 lbs; D=222±43.8 lbs) decreased in both groups over the six month study, however, the changes were accelerated in the exercise group resulting in significantly lower values. CONCLUSION: After six months of either an intensive exercise regimen or diet regimen, there were significant decreases seen for all variables. However, the results for the exercise group were associated with accelerated decreases as compared to the diet group by a significant margin. Individualized exercise programs appear to be the most effective at controlling type 2 diabetes with the potential for decreasing the risk of other comorbidities.
differ between the CON and PMW groups during the first 7-day monitoring period. Compared to baseline, the PMW improved the 3-h average glucose after breakfast (−0.35 mmol/L, p < 0.03) and lunch (−0.34 mmol/L, p < 0.01), enough to remain in target ranges for blood glucose (5.0 - 7.4 mmol/L). No difference was seen after dinner in the PMW group (−0.11 mmol/L, p = 0.22), due to reduced adherence (40%) to PMW after dinner. CONCLUSIONS: Preliminary data supports the notion that PMW can improve blood glucose levels after breakfast and lunch in women with GDM when adhered to, however, the impact of dinner requires further research. PMW may be an effective adjunct to standard-care for the management of GDM in pregnancy.

1084 Board #318 May 29 3:30 PM - 5:00 PM Accuracy Of A Handheld Blood Glucose Monitor During Exercise And An Oral Glucose Tolerance Test James R. Peterson, Davoncie M. Granderson, Clayton L. Camic, Peter J. Chomentowski, Steven M. Howell, Emerson Sebastian. Northern Illinois University, DeKalb, IL. (Sponsor: Carl Foster, FACSM)

Purpose: The purpose of the present study was to examine the validity and reliability of a handheld blood glucose monitor during an oral glucose tolerance test (OGTT) and 60-minute bout of exercise.

Methods: A total of 30 subjects (mean age ± SD = 22.3 ± 1.9 yrs; body mass = 77.6 ± 14.2 kg, height = 171.3 ± 9.6 cm; physical activity = 4.2 ± 4.3 hr wk−1) volunteered to participate in a single visit to the laboratory for an OGTT (n=15) or 60-minute treadmill exercise test (n=15). For the OGTT, the subjects were required to visit the laboratory in the morning following an 8-hour overnight fast and ingest a 75-gram load of glucose. For the treadmill test, the subjects were required to walk at 5.6 km·hr−1 for 60 minutes. Blood glucose concentrations were measured from the fingertip at six different time points during the OGTT (0, 10, 20, 30, 60, and 90 min) and treadmill test (0, 5, 10, 15, 30, and 60 min). Each blood sample was analyzed four times at each time point, two by the reference method and two by the handheld monitor.

Results: Our findings indicated that the blood glucose values provided by the handheld monitor were significantly (P < 0.05) greater than the reference method at all time points of the OGTT and treadmill test. In addition, the handheld device exhibited an overall mean absolute relative deviation (±SD) of 9.0 (±7.0) and did not meet the 95% accuracy requirements of ISO 15197:2013 (only 87.2% of all values met the criteria). The Bland–Altman plot for constant error (reference method - handheld monitor) versus the reference method indicated an average negative bias (95% CI = −8.2 mg·dL−1) that increased (r = 0.23) at higher blood glucose values. Intradevice reliability analyses for the handheld monitor on two consecutive measurements taken at the same time points demonstrated the intra-class correlation (ICC) was R = 0.99 and coefficient of variation (CV) = 3.0%, with no meaningful difference between measurements.

Conclusions: The present findings indicate that the handheld monitor provided highly reliable, yet inaccurately high blood glucose values compared to the reference method during the dynamic conditions associated with an OGTT and exercise.

1085 Board #319 May 29 3:30 PM - 5:00 PM Effects of IT-based Interactive Exercise Education Program on Exercise Duration in Gestational Diabetes Mellitus Patients Ah Reum Jung1, Yoon Hee Choi2, Dae Tack Lee1. ‘Kookmin university, Seoul, Korea, Republic of. ‘The Catholic University of Korea Seoul St. Mary’s Hospital, Seoul, Korea, Republic of. Email: jahr05@naver.com (No relevant relationships reported)

Purpose: Adoption of Information Technology (IT) to promote and manage health behaviors in clinical settings is an emerging modality. This study investigates the effects of IT-based interactive exercise education program on exercise duration in Gestational Diabetes Mellitus (GDM) patients.

Methods: For 3 months long study, 49 pregnant women (33.6±3.3 yrs, 161±5 cm, 60.6±13.8 kg, and 23.4±5.1 kg/m²) volunteered (n=22, as ≥1 times/week). Statistical software SAS version 9.4 were used and statistical differences in VE/VO2, VE/VCO2 equivalents and VE/VCO2 slope were calculated at anaerobic threshold (AT) and peak exercise. Results: AT, Peak

CPEP Results

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<th>AT</th>
<th>Peak</th>
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<tr>
<td>VE/VCO2 Slope</td>
<td>OUES</td>
<td>VE/ VO2</td>
</tr>
<tr>
<td>Normal (n=9)</td>
<td>20 ± 6</td>
<td>2672 ± 1164</td>
</tr>
<tr>
<td>CAA (n=9)</td>
<td>*27 ± 7</td>
<td>*1617 ± 580</td>
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Inter-group comparisons were made using an unpaired student t-test. *P<0.05, **P<0.01.

Conclusion: Both groups had similar exercise intensity. There were significant differences in VE/VO2, VE/VCO2 equivalents and VE/VCO2 slope at peak exercise suggesting aerobic and ventilatory inefficiency in CAA patients. There was a significant frequency of ischemic response to exercise uncovered equally by each testing modalities. Combined use of Mibi and echo improves diagnostic yield in CAA patients with ischemia.
The slope of the relationship between ventilation rate (V̇E) and rate of carbon dioxide production (V̇CO₂) known as ventilatory efficiency (V̇E/V̇CO₂), is associated with mortality in clinical populations and may have prognostic utility in apparently healthy adults. Despite its prognostic potential, there is currently no standardized method for calculating the V̇E/V̇CO₂ slope in apparently healthy adults.

**Purpose:** To compare how different methods of data averaging influence the calculation of the V̇E/V̇CO₂ slope from a maximal cardiopulmonary exercise test (CPX).

**METHODS:** Two hundred seventy-two apparently healthy adults (49% female, age 44 ± 20 y, body mass index 27.1 ± 5.6 kg/m², V̇CO₂ 33.3 ± 12.5 mL/kg/min) performed a maximal CPX to determine cardiorespiratory fitness. For each test, the V̇E/V̇CO₂ slope was determined by commercially available metabolic software (ParvoMedics TrueOne 2400) calculating CPX data using time averages of 60, 30, 20, 15, and 10s, and also by averaging every 4 breaths. Pearson correlations and one-way analysis of variance with Dunnett’s multiple comparison tests were used to examine differences between averaging methods. The criterion method was the 20s average.

**RESULTS:** The different data averaging methods were all significantly correlated to the criterion (all \(P<0.001\); \(r=0.99\)). However, in comparison to the criterion mean (29.6 ± 4.6), all other methods were significantly different (60s: 29.2 ± 4.6; 15s: 29.7 ± 4.7; 10s: 29.7 ± 4.7; 4-breath: 30.4 ± 4.9; all \(P<0.001\)), with the exception of 30s averaging (29.5±4.6; \(P=0.22\)). The greatest difference from the criterion occurred with the 4-breath averaging method (mean difference -0.9; CI -1.0, -0.8).

**CONCLUSIONS:** The calculation of ventilatory efficiency is impacted by varying methods of data averaging. However, the differences between data averaging methods is small and future research is needed to determine if these differences influence the prognostic utility of ventilatory efficiency in this population.
Previous studies suggested blacks have lower estimated cardiorespiratory fitness (CRF) levels compared to whites, reflecting a higher burden of obesity among blacks. Lesser known are the joint effects of race and measures of obesity on directly measured CRF. PURPOSE: To characterize the impact of obesity [body mass index (BMI) and body fat percent (% fat)] on directly measured CRF in blacks and whites.

METHODS: We included 874 Activity Counseling Trial participants (24.8% self-reported blacks) who completed maximal oxygen uptake (VO2 peak) treadmill exercise test, BMI, and percent body fat, determined by skinfold measurement, at baseline. Linear regression models were constructed with VO2 peak as the outcome and adjusted for age, sex, race, socioeconomic status, BMI, % body fat, and cardiovascular risk factors.

RESULTS: VO2 peak indexed to body mass was substantially lower in blacks (20.40 vs 26.70 ml/kg/min, p<.0001), reflecting higher indices of obesity in blacks (BMI: 32.73 vs 28.32, p < .0001; % body fat 36.58 vs. 31.44, p < .0001). Similar findings were observed comparing absolute VO2 peak (1919.18 vs 2229.72 ml/min, p<.001). In multivariable adjusted models, black race was strongly associated with lower absolute and indexed VO2 peak [Std. Beta (blacks vs. whites) = -0.12 & -0.14 respectively p < 0.0001 for both]. There was a significant interaction between race and both BMI (p = 0.0001) and % body fat (p<0.0001) on indexed VO2 peak. In race-stratified analyses, we observed a modestly weaker association between BMI and VO2 peak in blacks (see Table). Similar findings were observed for % body fat.

CONCLUSIONS: Directly measured VO2 peak is lower in blacks reflecting a higher burden of obesity. Nevertheless, the impact of obesity on VO2 peak is modestly greater among whites, suggesting excessive adipose tissue has a slightly more negative impact on VO2 peak among whites.
Chronic heart failure (CHF) is a complex multifaceted disease that has wide ranging detrimental effects on each step in the delivery and utilization of O₂ irrespective of CHF etiology. Aerobic capacity (VO₂peak) is a well-recognized biomarker of physical functional status, clinicians might report both 6-MWD and 6-MWW to created a more complete assessment of their patients with a history of cancer. The strength of these associations supports developing a predictive equation for VO₂peak based on 6-MWW. However, the gender disparity in VO₂peak and 6-MWW is due to the fact that distance alone is not a determinant of work performed and hence not a measure of energy expenditure. The results of this case study suggest that successful implementation of an exercise therapy program can be effective in a health and fitness center. With the growing number of cancer survivors there will be an increased need for the development of cancer exercise training that is easy to implement in a local fitness facility. This study shows the relative ease of implementation in a community based fitness facility.