Mid-Atlantic Regional Chapter of the American College of Sports Medicine (MARC-ACSM)

43rd Annual Scientific Meeting – 2020

Abstracts

Hydration Status Effect on Anaerobic Power and Fatigue in Collegiate Female Soccer Players

Jacklyn S. Alencewicz, Bridgette R. Buckalew, Angelica R. Del Vecchio, Evan L. Matthews, David Phillips, Peter A. Hosick. Montclair State University, Montclair, NJ.

The impact of hypohydration on anaerobic performance has yet to be fully elucidated. Furthermore, the available literature typically uses heat and/or exercise-induced hypohydration protocols which may exacerbate the impact that hypohydration has on anaerobic performance. Conversely, without controlling for menstrual cycle phase, fluid retention during the luteal phase could mask hypohydration's impact. **PURPOSE:** To determine the effect of a non-fatiguing thermoneutral (NFT) fluid restriction on repeated 30-s Wingate efforts and fatigue in active women during the early follicular menstrual phase. **METHODS:** Subjects (n=3) completed a euhydrated (EUH) and hypohydrated (HYP) trial in random order. Hypohydration was achieved via a 48-hr passive, thermoneutral fluid restriction. Upon reporting to the lab, subjects provided a urine sample to confirm euhydration or hypohydration via urine specific gravity (USG), urine color, and pre-fatigue perceived thirst scores. Subjects cycled at 6.5% of their peak power output (PPO) prior to and immediately following the completion of three 30-s Wingate trials with a four-minute passive rest between each Wingate. Paired t-tests were used to compare USG, urine color, pre-fatigue thirst score between trials. A 2x3 ANOVA assessed differences in peak power, anaerobic capacity (AC), anaerobic power (AP), and fatigue index (FI) between the trials and with respect to time. **RESULTS:** USG (1.004±0.002 g·cm^3 vs. 1.027±0.007 g·cm^3, $p<0.05$), urine color (1±0 vs. 6±1, $p<0.05$), and pre-fatigue perceived thirst scores (3±0.577 vs. 7±1.528, $p<0.05$) were significantly increased in the HYP trial. AC decreased in each subsequent trial during the HYP condition (W1: 7.68±0.4 W/kg; W2: 6.96±0.44 W/kg; W3: 6.22±0.59 W/kg, $p<0.05$); however, in the EUH condition, AC decreased during the second Wingate trial, but rebounded during the third trial (W1: 9.35±4.02 W/kg; W2: 8.81±3.99 W/kg; W3: 9.12±4.61 W/kg, $p>0.05$). **CONCLUSIONS:** This preliminary analysis suggests that hypohydration induced via a NFT fluid restriction may adversely impact average anaerobic power during repeated anaerobic performance.

Lower Body Maximal Strength and Peak Aerobic Capacity Predict Assessment Outcomes of Military Relevant Tasks

Ian T. Allen[1], Kellen T. Krajewski[1], Adam J. Sterczala[1], Mita Lovaleker[1], Shawn D. Flanagan[1], Brian J. Martin[1], Qi Mi[1], Nizam U. Ahamed[1], Sophie L. Wardle[2], Thomas J. O'Leary[2], Julie P. Greeves[2], Chris Connaboy[1], Bradley C. Nindl[1], FACSM
[1]Neuromuscular Research Laboratory/Warrior Human Performance Research Center, Department of Sports Medicine and Nutrition, University of Pittsburgh, Pittsburgh, PA, USA
[2]Army Health and Performance Research, Ministry of Defence, UK

Physical Employment Standards (PES) define the minimum physical requirements of military roles and comprise a series of physical assessments including casualty drag, repeated lift and carry, and water can carry. To effectively design strength and conditioning programs to prepare personnel for occupational demands, the performance characteristics of each task should be elucidated. **Purpose:** To examine the relationship between physical performance (maximal lower body strength, aerobic capacity) and UK military PES. **Methods:** Forty-one healthy,

recreationally active men (26.59 ± 5.33yrs, 177.95 ± 6.92cm, 84.04 ± 16.68kg) completed three separate visits. At the first visit, peak aerobic capacity was assessed with an incremental Bruce Protocol VO_{2max} test. At the second visit, maximal lower body strength was assessed by determination of one repetition maximum (1RM) back squat and deadlift. At the third visit, PES tests were undertaken, consisting of: 20m 111kg casualty dummy drag, 240m 2x20kg water can carry, and repeated lift and carry (40 laps around a 15m cone, 20 with and without a 20kg sandbag). Descriptive statistics were calculated and assessed for normality. Separate linear regressions were conducted to analyze the relationship between deadlift 1RM, back squat 1RM, and aerobic capacity with the PES tests. The alpha was set *a priori* as $p \leq 0.05$. **Results:** Peak aerobic capacity predicted repeated lift and carry [r=-0.620, ß=-0.150, F(1,39)=24.41,p<0.001] and water can carry [r=-0.482, ß=-0.057, F(1,39)=11.79,p=0.001] completion times. Deadlift 1RM predicted casualty drag [r=-0.447, ß=-0.106, F(1,39)=9.76,p=0.003] and water can carry [r=-0.387, ß=-0.013, F(1,39)=6.87,p=0.012] completion times. Back squat 1RM predicted casualty drag completion time [r=-0.561, ß=-0.135, F(1,39)=17.90,p<0.001]. **Conclusion:** These findings demonstrate that repeated lift and carry performance is predominantly dictated by aerobic fitness, whereas casualty drag, and water can carry performance are highly related to maximal lower body strength. Thus, military training should include concurrent resistance and aerobic exercise to prepare soldiers for the PES test and the physiological demands of combat roles.

Supported by UK Ministry of Defence (WGCC 5.5.6-Task 0107)

Dietary Acid Load and Blood Pressure Responses in Healthy Adults

Michael Axler, Andrea Lobene, Katarina Smiljanec, Macarena Ramos-Gonzalez, Alexis Mbakwe, Theodore DeConne, Christopher R. Martens, Shannon Lennon. University of Delaware, Newark, DE

Mild metabolic acidosis, as influenced by dietary intake, has been the topic of many epidemiological studies as a contributing factor to developing high blood pressure (BP). Diets that include an abundance of fruits and vegetables are marked by a high potassium intake that contributes to a decreased renal acid load. In contrast, a Western diet, which is typically deficient in potassium and higher in protein and phosphorus, is characterized by a higher acid load that may negatively alter acid-base balance and contribute to future cardiovascular events. **PURPOSE:** To investigate the relation between dietary acid load and BP in healthy adults. **METHODS:** Healthy adults, aged 18-79 years old were included in this retrospective analysis. Dietary acid load was approximated using the Potential Renal Acid Load (PRAL), which is strongly influenced by dietary intake of protein, phosphorus and potassium assessed from a 3-day diet record. The average of three seated BP measurements were used for our analysis. Associations between PRAL and BP were assessed using bivariate and partial Pearson correlations. **RESULTS:** One hundred and fifty-four subjects (78M/76F; 39 ± 2 yrs; BMI 25 ± 0.3 kg/m²) were included in this study. Average PRAL was 13.4 ± 1.6 mEq/day and is consistent with a high protein and low potassium diet. Total energy intake was 2089 ± 48 kcals/day. PRAL was positively associated with systolic BP (SBP) and pulse pressure (PP) (SBP: r=0.171, p=0.034; PP: r=0.261, p=0.001) but not with diastolic BP (DBP: r=-0.050, p=0.539). When sex and age were included as covariates, PRAL was positively correlated with both SBP and PP (SBP: r=0.205, p=0.011; PP: r=0.234, p=0.004) but not DBP (DBP: r=0.007, p=0.936). **CONCLUSION:** These findings indicate that a higher dietary acid load,

correlates with a higher SBP and PP. This relation remains even after accounting for age and sex.
Supported by NIH Grant P20GM113125

Similar Corticospinal Excitability in Military Men and Women During Simulated Operational Stress

Alaska L. Beck, Felix Proessl, Maria Canino, Meaghan E. Beckner, Adam J. Sterczala, Courtenay Dunn-Lewis, William R. Conkright, Aaron M. Sinnott, Alice LaGoy, Shawn R. Eagle, Fabio Ferrarelli, Anne Germain, Christopher Connaboy, Bradley C. Nindl, FACSM, and Shawn D. Flanagan

Neuromuscular Research Laboratory/Warrior Human Performance Research Center, Department of Sports Medicine and Nutrition, University of Pittsburgh, Pittsburgh, PA.

Sleep- and caloric restriction as well as physical exertion are common during combat, but the possibility that such operational stressors exert sex-specific effects on corticomotor system function is untested. **PURPOSE:** To examine corticospinal responses to simulated operational stress in men and women. **METHODS:** Fifty-two military members (39 men; Age: 26 ± 6yr, Height:174 ± 9cm, Weight: 80 ± 13kg, BF%: 22 ± 7%) completed a corticospinal testing battery on five consecutive days. After familiarization (D0), baseline testing and air-displacement plethysmography were performed on D1. Simulated operational stress was imposed on D2-3, followed by a recovery day (D4). Operational stress consisted of exposure to fatiguing physical exertion, 50% caloric restriction, and sleep restriction/disruption consisting of 2hr segments of sleep separated by 2hr (4hr sleep total). Maximal voluntary isometric contractions (MVC) of the first dorsal interosseus (FDI) and vastus lateralis (VL) were performed each day in conjunction with electromyographic (EMG) recordings. Corticospinal excitability was then assessed with stimulus response curves at 15% MVC using transcranial magnetic stimulation and a figure-of-eight (FDI) or double-cone (VL) coil over the motor cortex hotspot. Motor evoked potentials (MEP) were quantified as peak-to-peak EMG amplitudes 15-65ms post-TMS and fitted to a sigmoidal curve (SC) via nonlinear regression. Corticospinal excitability was determined as the maximum of the SC (SC_{MAX}). Mixed-models ANOVAs with Bonferroni-corrections were used to compare MVC force, EMG, and SC_{MAX} between sexes and across time with body fat percentage as a covariate. **RESULTS:** The FDI and VL presented stereotypic responses, with greater force (adjusted $p<0.001$, diff: 1011.5 ± 451.0N) but smaller MEPs in the VL (diff: 3.0 ± 2.4mV, adjusted $p<0.001$). Men produced greater VL MVC than women (adjusted $p=0.02$, diff: 286.5 ± 843.7N), but SC_{MAX} was similar ($p>0.05$) at each time point regardless of muscle. **CONCLUSION:** Despite differences in maximal lower extremity force, corticospinal function in men and women did not differ in response to military operational stress. These findings provide initial evidence for shared neuromuscular resiliency and recovery profiles in men and women exposed to operational stress.

Supported by the Department of Defense W81XWH-16-PHTBIRP-CR3A.

Impact of Aerobic Fitness on Cognitive Performance During Simulated Military Operational Stress

Meaghan E. Beckner[1], William R. Conkright[1], Aaron M. Sinnott[1], Alice D. LaGoy[1], Felix Proessl[1], Peter G. Roma[2], Mathias Basner[3], Mita Lovalekar[1], Brian J. Martin[1], Shawn D. Flanagan[1], Anne Germain[1], Fabio Ferrarelli[1], Christopher Connaboy[1], Bradley C. Nindl, FACSM[1]. [1]University of Pittsburgh, Pittsburgh, PA, [2]KBR/NASA Johnson Space Center, Houston, TX, [3]University of Pennsylvania, Philadelphia, PA

Low aerobic fitness, associated with cognitive impairment, may exacerbate the negative impact of military operational stress on vigilance and working memory compromising performance and safety. **PURPOSE:** To determine the effects of aerobic fitness on cognitive function during simulated military operational stress (SMOS). **METHODS:** Fifty-three male Service Members (SMs) (26.2 ± 5.3 yrs, 178.0 ± 6.5 cm, 84.8 ± 13.8 kg, 19.9 ± 6.9 %BF) completed a 5-day/night SMOS protocol consisting of daily physical and cognitive evaluations from 0900-2230. Assessments of psychomotor vigilance (PVT), working memory (2Back), and risk propensity (BART) were completed daily at 0900. 100% of caloric demands and 8 hours of sleep were provided on D1 (familiarization), D2 (baseline), and D5 (recovery). On D3-D4, SMs were allotted 50% of caloric needs and permitted to sleep from 0100-0300 and 0500-0700. SMs were split into aerobic fitness tertiles based on treadmill VO_{2peak} test completed on D1 (LOW: ≤ 45.0; MOD: > 45.0, ≤ 51.54; HIGH: > 51.54 mL·kg·min^{-1}). Friedman tests and Bonferroni-corrected pairwise comparisons determined changes in 2Back, BART, and PVT reaction time (RT) and accuracy (ACC) across D2, D4, and D5 for each level of aerobic fitness. **RESULTS:** PVT RT slowed from D2 to D4 in LOW SMs ($p = 0.003$), accompanied by a decrease in ACC ($p = 0.001$). MOD SMs maintained PVT RT across SMOS ($p= 0.069$), but ACC decreased D2 to D4 ($p = 0.015$). HIGH SMs maintained PVT ACC across days ($p = 0.062$) despite a slower RT from D2 to D4 ($p = 0.011$). No difference was observed between D2 and D5 PVT RT or ACC across groups ($p > 0.05$). 2Back ACC declined from D2 to D4 in MOD SMs ($p = 0.003$). No other significant changes in 2Back were observed. BART ACC increased across SMOS at each level of fitness (LOW $p = 0.045$; MOD $p = 0.030$; HIGH $p = 0.037$) despite no change in RT (ps > 0.05). Risk propensity increased from D2 to D5 in both LOW and HIGH groups (ps < 0.017), but did not reach statistical significance in MOD ($p = 0.080$). **CONCLUSION:** SMs with low aerobic fitness were more susceptible to cognitive performance decrements under operational stress. Impaired vigilance and increased risk-taking can reduce operational readiness and effectiveness. Aerobic fitness is likely not only important for physical demands, but also cognitive demands associated with military operations.

Funded by the Department of Defense (Award # W81XWH-17-2-0070). The results and opinions herein are those of the authors and do not necessarily constitute endorsement of the Department of Defense.

Sleep Regularity Metrics are Associated with Decreased Physical Activity in Children

Felicia R. Berube, Michele N. D'Agata, Elissa K. Hoopes, Freda Patterson, Melissa A.H. Witman.
University of Delaware, Newark, DE

Healthy lifestyle factors, like regular physical activity (PA) and good sleep habits are developed during childhood and influence future cardiovascular disease (CVD) risk. Sleep duration is the

most commonly reported sleep metric; however, sleep health is now recognized to be multidimensional. Sleep regularity includes the variability in sleep duration (sleep duration standard deviation (SDSD)) and sleep timing (sleep midpoint standard deviation (SMSD)). Relations between short sleep duration and attenuated PA in children have been established, but it is unclear if sleep regularity is related to PA in this population as more irregular sleep and reduced PA may eventually lead to declines in cardiovascular (CV) health. **PURPOSE:** To evaluate if objectively measured sleep regularity metrics are associated with PA metrics in apparently healthy children. **METHODS:** Free-living sleep regularity metrics (SDSD, SMSD, sleep duration) and PA metrics (sedentary bouts, METS, steps/day) were recorded in 26 healthy 7-12-year-old children (10±2 yrs, 11 B/15 G) for 7 consecutive days and nights via wrist accelerometry. **RESULTS:** SDSD averaged 0.8±0.5 hours/night, SMSD averaged 53±36 minutes/night, and sleep duration averaged 7.8±0.6 hours/night. Sedentary bouts were significantly and positively associated with SDSD and SMSD and remained significant in regression models adjusting for sleep duration ($p \leq 0.05$). METS were unrelated to SDSD, but were significantly and positively associated with SMSD ($p \leq 0.05$). After adjusting for sleep duration, METS were significantly and positively associated with SDSD ($p \leq 0.05$), but no longer significantly related to SMSD. Steps/day were unrelated to SDSD, but were significantly and negatively associated with SMSD ($p \leq 0.05$). However, steps/day were unrelated to both SDSD and SMSD when adjusting for sleep duration. **CONCLUSION:** Data from the present study suggest that more irregular sleep is associated with lower PA levels, particularly sedentary bouts and METS, in children ages 7-12 after adjusting for sleep duration. These findings are important as CV health can begin to decline as early as the first decade of life. Thus, promoting healthy behaviors such as physical activity and regular sleep/wake habits in addition to adequate sleep duration likely benefit CV health in youth.

Supported in part by NIH grant P20GM113125

The Effects of Ketone Supplementation on Recovery in Collegiate Male Soccer Players: Pilot Trial

Shannon Brawley, Logan DeJonge, Noah Esbenshade, Aaron Shula, and Chloe Williams, Jeffrey Buxton, Andrew Koutnik, Philip Prins. Grove City College, Grove City, PA. University of South Florida, Tampa, FL.

The ability to recover appropriately following exhaustive physical activity is paramount to the success of athletes at all levels of competition. Currently, numerous strategies exist to aid in recovery following exercise including the use of nutritional supplements. Ketone esters are a novel supplement that may help to mitigate acute effects of exhaustive exercise however this has yet to be elucidated. **PURPOSE:** To investigate the effects of ketone ester supplementation on acute recovery in male NCAA DIII collegiate soccer players. **METHODS:** A double-blind randomized crossover design was employed for this study. Four male collegiate soccer players (age 19.0±0.0, height 172.8±12.5 cm, weight 71.9±5.8 kg, VO_2max 56.2±2.4 $mL \cdot kg^{-1} \cdot min^{-1}$) completed a countermovement jump (CMJ) and the running-based anaerobic sprint test (RAST) following assessment of blood biomarkers (blood lactate, blood ketones and blood glucose). Immediately after baseline measures, subjects completed part A of the Loughborough Intermittent Shuttle Test (LIST) to mimic the physical demands of a 90 min soccer match. Subjects consumed either the ketone ester (KE) or placebo (PLA) drink. Blood biomarkers were assessed immediately after

LIST, 30 minutes post-drink and 5 hours post LIST. Additionally, CMJ and RAST were repeated 5 hours post LIST. Soreness and fatigue were measured using Visual Analog Scale before, immediately post and 5 hours post LIST. Lastly, GI distress was measured 30 minutes post drink. **RESULTS:** There were no significant differences for the CMJ, RAST, VAS and GI distress (*p's* >0.05). A significant difference in blood ketone values was observed between conditions (p=0.004), with the KE drink producing significantly higher values 30 min post LIST (3.6 ± 0.8 mmol/L) than the PLA (0.2 ± 0.1 mmol/L). **CONCLUSION:** Although, ketone ester supplement promotes rapid and elevated ketosis the findings of this pilot study indicate that there were no differences in acute recovery measures following ingestion of a KE or PLA beverage.

Supported by Grove City College Exercise Science Department

Left Ventricular Mass in Physically Active Adults with a Family History of Hypertension

Kerry N. Callaghan, Peter A. Hosick, Evan L. Matthews. Montclair State University, Montclair, NJ

Having a positive family history of hypertension (+FHH) is associated with pre-pathologic increases in left ventricular mass (LVM); potentially due to high-normal blood pressure (BP). Regular physical activity can lead to non-pathological changes in left ventricular (LV) morphology and decreased BP. It is possible that the lower BP due to habitual physical activity may counteract some of the influence of having a +FHH. **PURPOSE:** To determine if young physically active adults with a +FHH will have greater LVM compared to young active adults with a negative family history of hypertension (-FHH). **METHODS:** Healthy young (18-32yrs) subjects were asked to self-report family history of hypertension status and habitual physical activity behavior. Subjects then underwent an echocardiogram. Subjects were excluded from this retrospective analysis if there was a prior diagnosis of cardiovascular-related disease, hypertension, or if they did not participate in regular physical activity. **RESULTS:** Of the 41 subjects, 54% (n=22: M=13, 59%; W=9, 41%) reported +FHH and the remaining 46% (n=19: M=11, 58%; W=8, 42%) reported a -FHH. There were no differences between groups for systolic BP (-FHH 116±14; +FHH 119±12 mmHg; p=0.42), diastolic BP (-FHH 68±7; +FHH 68±7 mmHg; p=0.87), or heart rate (-FHH 67±15; +FHH 63±8 bpm; p=0.28). The +FHH group had greater LV posterior wall thickness (-FHH 0.92±0.15; +FHH 1.02±0.15 cm; p=0.04), but similar LV septal wall (-FHH 0.93± 0.18; +FHH 1.02±0.19 cm; p=0.15), and LV diastolic diameter (-FHH 4.53±0.40; +FHH 4.60±0.37 cm; p=0.55). When indexed to body surface area, LVM was significantly greater in +FHH subjects (-FHH 76.11±19.42; +FHH 90.70±17.63 g/m^2; p=0.02). **CONCLUSION:** This preliminary analysis suggests that, despite similar resting blood pressure, physically active young adults with a family history of hypertension have elevated LV mass compared to their counterparts without a family history of hypertension.

Sensorimotor Cortical Thickness Moderates Corticospinal Excitability

Maria C. Canino, Felix Proessl, Alaska L. Beck, Courtenay Dunn-Lewis, William J. Kraemer, Shawn D. Flanagan
University of Pittsburgh, Pittsburgh, PA, The Ohio State University, Columbus, OH

Transcranial magnetic stimulation (TMS) is commonly used to examine corticospinal excitability (CSE) and related behaviors. Individual differences in brain morphology may influence responses to TMS, but clarification is needed. **PURPOSE:** To explore the relationship between cortical thickness and CSE when targeted to the lower extremity corticomotor representation. **METHODS:** Twenty women (20.4±1.8yr) completed 3T T1-weighted MRI scans to determine the thickness of cortical regions of interest including the precentral gyrus (PrG), postcentral gyrus (PoG) and paracentral lobule (PCL). Corticospinal excitability (CSE) was assessed during an isometric squat performed at 15% of maximal force. Five single pulses were delivered at 40-90% stimulator output (SO) in randomized 10% increments using a figure-of-eight coil targeting the primary motor cortex vastus lateralis (VL) representation. CSE was measured in the VL as the peak-to-peak amplitude of the electromyographic response from 15-65ms post-TMS. The largest MEP at each SO was selected, averaged and retained for analysis. Pearson correlations were used to examine the relationship between CSE, PCL, PrG and PoG thickness. **RESULTS:** CSE exhibited a moderate inverse relationship to PCL thickness ($r=-0.43$, $p<0.01$), but was not correlated with PrG ($r=0.01$, $p=0.95$) or PoG ($r=0.03$, $p=0.84$) thickness. **CONCLUSION:** Corticospinal responses are sensitive to differences in sensorimotor cortical morphology. In contrast to PrG and PoG, PCL thickness was associated with CSE, which supports the contention that corticomotor contributions to CSE are topographically specific. Cortical thickness should be further explored as a moderating factor for TMS.

Practical Applications of Electromyography for Strength Coaches: A Case Study of the Isometric Squat

Bailey T. Capra, Angelica R. Del Vecchio, Evan L. Matthews, David A. Phillips, Montclair State University, Montclair, NJ

Electromyography (EMG) provides quantitative information such as identification of muscle activity, relative muscle activity, and fatigue. This information is valuable to strength coaches as it allows for the development of novel performance-enhancing strategies; however, EMG is not regularly utilized by strength coaches. **PURPOSE**: To provide strength coaches with a method of measurement that offers immediate and actionable information on lower extremity muscular compensation patterns using the isometric squat and EMG. **METHODS**: 10 subjects completed a 2-minute isometric squat at 30% of their maximum voluntary contraction (MVC) and a 2-minute isometric handgrip trial at 30% of their MVC. These protocols were counterbalanced between subjects. The handgrip protocol was used to identify the expected EMG response solely due to fatigue, i.e. when no muscle compensation is possible. The change in EMG during the isometric handgrip from 20-30s to 110-120s was examined using a dependent *t*-test. 95% CI upper and lower limits from the forearm EMG data were used as thresholds to signify compensatory muscle activation strategies of the vastus medialis, biceps femoris, erector spinae, and gluteus maximus during the isometric squat. Values above the 95% CI upper limit indicate muscle compensation by increasing its contribution, while values below the 95% CI lower limit indicate the muscle reducing its contribution. **RESULTS**: In this case study we highlight a subject with a vastus medialis compensation strategy. This subject had a +188% and +35% change in vastus medialis and gluteus maximus activity, respectively, indicating a greater reliance on those muscles. Additionally, the

subject had a -12% change in both the biceps femoris and erector spinae muscles, indicating avoidance or unloading of those muscles. **CONCLUSION**: Strength coaches can use this information to design conditioning programs to focus on specific areas of the kinetic chain with the goal being to keep all %MVC values within the expected range solely due to fatigue. A 2 minute isometric squat in conjunction with EMG of the lower extremity, can be used to acquire quantitative data for strength and conditioning programs.

SPRINT INTERVAL TRAINING ON STATIONARY AIR BIKE SHOWS BENEFITS TO CARDIORESPIRATORY ADAPTATIONS WHILE BEING TIME-EFFICIENT

Mason Cervantes[1], Bert H. Jacobson, FACSM[2], Masoud Moghaddam[1]
[1]Salisbury University, Salisbury, MD; [2]Oklahoma State University, Stillwater, OK

Sprint interval training (SIT) refers to a group of brief intermittent exercises that are performed at maximal-effort intensity. Despite less volume and duration, SIT elicits cardiorespiratory adaptations similar to moderate-intensity continuous training (MICT). **PURPOSE:** To investigate the cardiorespiratory adaptations of high-volume MICT, and low-volume SIT protocols, including ultrashort-SIT (US), and short-SIT (SS), utilizing stationary air bikes. **METHODS:** Eighteen recreationally active females were randomly assigned to the three performance groups, MICT (n=6), US (n=5), and SS (n=7) to complete the intervention 3 days a week for 4 weeks. MICT protocol included 30 minutes of cycling at 75% of maximal heart rate reserve, while the US and SS sessions consisted of 3 sets of 8 intervals at all-out intensity. SS and US protocols were performed with 20 seconds of work:10 seconds of rest and 10 seconds of work:5 seconds of rest, with 5- and 2.5-minute recovery periods between sets, respectively. A ramp protocol was used before and after the intervention via cycle ergometer to assess aerobic performance. Absolute VO2max (A-VO2max) and time to exhaustion (TTE) were measured and analyzed with 2-way mixed factorial ANOVAs. Additionally, total work (TW) during 12 sessions were recorded and analyzed with one-way ANOVA. **RESULTS:** There were significant ($p < 0.05$) differences in TW (MICT: 1529.3 ± 271.4 cal., US: 687.2 ± 118.9 cal., SS: 1125.9 ± 89.7 cal.) between groups. While, all groups significantly ($p < 0.05$) improved A-VO2max (MICT: 2124.5 ± 245.7 to 2425.3 ± 443.2 ml/min, US: 2224.4 ± 321.9 to 2451.9 ± 406.4 ml/min, SS: 2155.7 ± 249.4 to 2430.2 ± 412.9 ml/min), as well as TTE (MICT: 11:30 ± 01:11 to 12:29 ± 01:00 min, US: 12:39 ± 01:34 to 13:31 ± 01:30 min, SS: 11:47 ± 00:44 to 12:47 ± 00:39 min). **CONCLUSION:** Although there were significant group differences in TW, it is evident that the aerobic performance (i.e., A-VO2max and TTE) was similarly improved in all groups. These findings suggest that performing SIT on a stationary air bike is valuable due to time-efficiency and cardiorespiratory adaptations. Furthermore, performing US at 10s:5s work-to-rest ratio can improve aerobic performance with a shorter time commitment compared to SS and MICT groups.

In Emerging Adulthood, Perceived Stress is Linked to Poor Diet Quality

Alexandria Colón, Christina D. Langan, Sonali Malhotra, Shravani Vanapalli, Jodi N. Dowthwaite. Binghamton University, Binghamton, NY

PURPOSE: Food insecurity, perceived stress, exercise, and diet quality may affect body mass index (BMI, kg/m^2) in emerging adulthood, setting up long-term chronic disease risk. We asked first-year undergraduates to self-report home-life exposures from their final year of high school for evaluation of associations with current BMI. **METHODS:** First-year students provided informed consent and were surveyed by electronic questionnaire (Aug-Oct 2019). Exclusion criteria were: diagnosed eating disorder and pregnancy. Variables of interest were assessed using the perceived stress scale (PSS: high score, high stress) and questions on race/ethnicity, socioeconomic status, food insecurity, diet quality, and exercise participation. Current height and weight were self-reported for BMI calculation. Spearman's correlations and Mann-Whitney U tests were used (SPSS v25, $\alpha < 0.05$). **RESULTS:** Sample size was n=94, with 25% reporting minority status. Only 10% reported benefit participation or food insecurity; no PSS differences were detected based on Free or Reduced-Price Lunch participation. PSS score was correlated with poor diet quality (rho= +0.241, p= 0.019). No significant associations were observed among food insecurity, exercise dose, PSS, and BMI. Of concern, 23% reported no consistent physical activity aside from high school physical education classes (prior year). C**ONCLUSION:** Higher perceived stress was associated with poorer diet quality. This link suggests that unhealthy eating may be a coping mechanism, or individuals who eat unhealthy foods may perceive stress as higher. Future research should examine stress exposure, PSS score, food insecurity, diet quality, and BMI in a more socioeconomically diverse sample.

Supported in part by grants to Binghamton University from the following: Howard Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, New York State Regional Economic Development Council, and SUNY Investment & Performance program.

Extracellular Vesicle Concentration but Not Size Differs Between Men and Women During Military Operational Stress

William R. Conkright, Meaghan E. Beckner, Amrita Sahu, Zachary J. Clemens, Mita Lovalekar, Qi Mi, Brian J. Martin, Shawn D. Flanagan, Fabrisia Ambrosio, Bradley C. Nindl, FACSM. University of Pittsburgh, Pittsburgh, PA

Extracellular vesicles (EVs) are known mediators of intercellular communication in states of homeostasis and hormesis. Study of EV heterogeneity may extend our understanding of their physiological impact. However, no study has yet characterized EVs in the context of military operational stress. **PURPOSE:** Characterize EV profiles before and after physical exertion during simulated military operational stress (SMOS) in men and women. **METHODS:** Ten male and 10 female service members between the ages of 19 and 37 with average body fat percentages of 18.8% and 28.2%, respectively, completed a 5-day SMOS protocol comprised of daily cognitive tasks, marksmanship, and physical exertion. Sleep and energy intake were restricted by half (4 h; 50% estimated needs) on days 2 and 3 of the 5-day study. Blood was drawn on day 1 (baseline) and day 3 (peak stress) before and after an occupationally-relevant physical exertion protocol lasting approximately 90 min. EVs were isolated using size exclusion chromatography and characterized for size and concentration with nanoparticle tracking analysis. EV concentration was square root-transformed to satisfy assumptions from linear statistics. Data were analyzed to assess the influence of sex, day, and time with three-way mixed ANOVAs. **RESULTS:** There were no three-

way interactions for mean EV concentration (particles/mL) or size (nm) ($p > 0.05$ for both). For EV concentration, there was a two-way interaction between sex*day ($p = 0.026$) and sex*time ($p = 0.029$). EV concentration declined from day 1 to day 3 in men ($p = 0.003$) but not women ($p = 0.115$). There was no change in EV concentration from pre- to post-exertion in men ($p = 0.701$), but women displayed reduced EV concentrations after exertion ($p = 0.003$). There was a main effect of day ($p = 0.002$) and time ($p = 0.001$) on mean EV size, which increased from day 1 to day 3 and from pre- to post-exercise when averaged across time and day, respectively. **CONCLUSION:** We demonstrate that common military operational stressors decrease EV concentrations in men but not women. Mean EV size increases from pre- to post-exertion and across operational stress in both sexes. These findings highlight sex differences in intercellular signaling mechanisms that warrant further investigation of the biological content stored within EVs and their physiological impact.

Funded by the Department of Defense (Award # W81XWH-17-2-0070). The results and opinions herein are those of the authors and do not necessarily constitute endorsement of the Department of Defense.

Age of First Exposure Does Not Predict Quality of Life in Adult Rugby Players

Katelyn M. Costantini, Katherine J. Hunzinger, C. Buz Swanik, Thomas A. Buckley
University of Delaware, Newark, DE

Exposure to repetitive head impacts (RHI) at a young age may negatively affect neurodevelopment and lead to increased behavioral and mood symptoms later in life. When assessed by age of first exposure (AFE), results of AFE on cognitive and psychological outcomes in predominantly male cohorts has yielded mixed results. As such, expansion to other cohorts to investigate the effect of sex on AFE and neurophysiological outcomes is needed. Rugby is a unique cohort as it is typically started in college and continued through adulthood. In addition, it is the only collision sport in which men and women play by the same rules. **PURPOSE:** To investigate the association of AFE and Quality of Life (QoL) measurements in adult rugby players by sex. **METHODS:** An online questionnaire was completed by adult rugby players. Participants completed the following QoL measures: Brief-Symptoms Inventory 18 (BSI-18: sub scores include Somatization, Depression, Anxiety, and Global Severity Index (GSI)), Short Form 12 (SF-12: sub scores Physical (PCS) and Mental Component Score (MCS)), and Satisfaction with Life Survey (SWLS). A generalized linear model was used to examine the association between AFE and all QoL outcome measures; predictors in the models included AFE (continuous), age (years), concussion history (yes/no), and sex (M/F). **RESULTS:** 1,037 (age: 31.6 $\pm$ 11.3 years, 59.0% male) participated in this study. AFE was not a significant predictor for all outcomes (p = 0.160-0.971). Sex was a significant predictor for BSI-18 (Somatization), whereby males reported 16.7% lower symptoms than females (p=0.021; 2.11$\pm$ 2.83 vs. 2.67$\pm$ 3.19 respectively) and SF-12 (MCS), whereby males had 3.67 points higher score (i.e., better) than females (p<0.001; 48.09$\pm$10.93 vs. 43.36$\pm$11.64 respectively). **CONCLUSION:** There was no association between earlier AFE and worse QoL in adult rugby players suggesting that earlier exposure to RHI via collision sports was not associated with poorer QoL outcomes. These results suggest that, at least in young adults, participation in collision sports with RHI are not associated with lower QoL, potentially due to regular physical activity, however, the neurological health in later life remains to be explored.

Supported by the University of Delaware's Unidel Distinguished Graduate Scholars Fellowship.

The Effects of a Regular Yoga Practice on Psychophysiological Measures in College Students

Olivia A. Cunningham, Alexandra N. McQuillen, Melissa A. Reed FACSM, Selen Razon, and Meghan G. Ramick. West Chester University, West Chester, PA

College aged students experience a developmentally challenging transition that increases the risk of developing mental and physical health issues. When practiced regularly, yoga has been shown to have favorable psychological and physiological effects which may help to alleviate the burden of these physical and mental health issues in the collegiate population. Specifically, a regular yoga practice has been shown to have favorable effects on stress, anxiety, and cardiovascular measures. **PURPOSE** The purpose of this study was to test the hypothesis that 12 weeks of a regular Ashtanga yoga practice (150 minutes/week) would improve measures of cardiovascular and psychological health in college students. **METHODS** Twenty-two college students (21±1.2 yrs; 21 female) participated in this study. Height, weight, waist/hip circumference, resting blood pressure and heart rate, fasting blood glucose and cholesterol, and psychological health (STAI form Y-1 and Y-2) were assessed prior to the end of the third week of the semester (PRE). Subjects participated in their Yoga I class throughout Fall semester. After the 12th week of class, participants reported to the laboratory for follow up testing (POST). **RESULTS** A significant improvement in trait anxiety (Y-2), assessing participants' disposition to develop anxiety as a part of their personality, was observed after 12 weeks of a regular yoga program (PRE: 39±2 vs POST: 34±1.8; $p<0.01$). There was no change in state anxiety (Y-1), assessing participants' levels of anxiety "in the moment" (PRE: 34±1.7 vs POST: 33±1.9; $p=0.96$). There was also no change in weight, waist/hip circumference, resting heart rate (PRE: 67±2.4 vs POST: 66±1.7bpm), resting blood pressure (PRE_{SYS}: 109±2.2 vs $POST_{SYS}$: 107±2.2mmHg; PRE_{DIA} 67±1.9 vs $POST_{DIA}$ 64±1.7mmHg), fasting blood glucose (PRE: 90±1.8 vs POST: 90±2mg/dL), or cholesterol (PRE: 176±12 vs POST: 172±9.3mg/dL) measurements. **CONCLUSION** 12 weeks of regular practice in a beginner Ashtanga yoga program improved measures of (personality) trait-anxiety in college students.

Heart Rate Variability and Plank Exergaming with an Always-Superior Partner

Margaret Daeche[1], Michael Bruneau Jr.[1], Stephen Samendinger[2]
[1]Drexel University, Philadelphia, PA, [2]Farmingdale State College, Farmingdale, NY

Heart rate variability (HRV) may be an indicator of exercise training and autonomic nervous system regulation. However, the relationship between HRV and isometric abdominal plank exercise has not been studied. **PURPOSE:** To explore HRV in response to a series of isometric exercises between conditions in which subjects exercise alone or with software-generated partners (SGP) of varying superior ability. **METHODS:** One-hundred eighty-one participants completed five sets of planks to volitional fatigue with 30 sec of rest between each set (block 1). Participants were randomized into one of four conditions, which required performing five additional planks

after a 10-min rest period, alone (control) or with an SGP who was either 1%, 40% or 100% better based on block 1 plank averaged times. Partner condition dynamics were created for the participant by providing visual and verbal feedback on the SGP's block 1 and concurrent plank performance. HRV was measured continuously as the root mean square standard deviation (RMSSD) during a 5-min rest, during each block, and during a 10-min rest. Analyses of variance assessed differences in HRV between conditions, across blocks, and during the 10 min rest period with resting HRV as a covariate. **RESULTS:** Significant decreases in HRV for the total sample were observed across the entire plank exergame session (F = 3.758, p=.05). Pairwise comparisons revealed significant decreases in HRV for the total sample between blocks 1 and 2 (t = -0.413, p<.001) and block 1 and the 10 min rest period (t = -0.407, p<.001). No main effect differences in HRV were found between conditions for the RMSSD at rest, within each block or during the 10 min rest period (p >.05); however, pairwise comparisons for block 2 revealed significant differences in HRV between control and the 100% partnered exergame plank condition (t = -0.188, p<.017). Plank performance time (in sec) was significantly different between the control and 40% condition (p = .014) but not between partnered conditions or the 1% and 100% conditions and control (reported previously but not the primary aim of this study). **CONCLUSION:** Isometric plank exercise may facilitate decreases in HRV, as demonstrated by subjects planking alone. This effect may be mitigated when exercising with an SGP who is always extremely superior in ability than the subject themselves.

Indices of Resistance Artery Function in Upper and Lower Limbs are related in Young Women

Michele N. D'Agata, Elissa K. Hoopes, Felicia R. Berube, Melissa A.H. Witman. University of Delaware, Newark, DE

Conduit artery function, traditionally assessed by brachial artery flow-mediated dilation (FMD), has long been used to demonstrate vascular dysfunction and predict cardiovascular disease risk and incidence. Passive leg movement (PLM) is a relatively novel, noninvasive assessment of vascular function that has been previously validated against FMD, but only in men. Additionally, the hyperemic response to PLM is largely reflective of downstream resistance artery function, however comparisons with other assessments of microvascular function such as the reactive hyperemia (RH) following FMD cuff release have not been well-elucidated. **PURPOSE:** Therefore, the purpose of this study was to compare the hyperemic responses to PLM to both FMD and FMD RH indices in healthy young women. **METHODS:** PLM and FMD/RH were performed on 59 healthy premenopausal women (22±3 years) during the early follicular phase of the menstrual cycle. Blood flow velocity and arterial diameter were assessed using doppler ultrasound and blood flow was calculated. Pearson's r correlations were used to evaluate relations between PLM and FMD/RH variables. **RESULTS:** There were significant positive relations between peak FMD RH and peak PLM blood flow (r=0.33, p=0.01), the overall change in blood flow from baseline to peak RH (Δ) for both FMD and PLM (r=0.27, p=0.04), and blood flow area under the curve (AUC) for both FMD RH and PLM (r=0.34, p=0.01). However, there was no relation between brachial artery FMD% and peak PLM, ΔPLM or PLM AUC (all p>0.05). **CONCLUSION:** In this population of healthy young women, upper and lower limb resistance artery function as assessed by FMD RH and PLM, respectively, are positively related, suggesting they reflect some of the same microvascular physiological responses. However, upper limb conduit artery function assessed by traditional FMD% was not related to any PLM indices, suggesting that

in young women, FMD% and PLM are capturing differenct aspects of vasclar function and should not be used interchangeably.

Supported in part by NIH grant P20GM113125

Challenges and Barriers to Resistance Training in Middle-Aged Women

Ruth M. Dangelo, Luke Haile. Bloomsburg University, Bloomsburg, PA

Women are prone to developing chronic diseases such as osteoporosis, arthritis, diabetes, heart disease, and cancer. Participation in resistance exercise can provide considerable health benefits and help prevent such chronic conditions, yet significantly less women participate in regular resistance exercise than men. **Purpose:** To discover the barriers that prevent women from participating in regular resistance exercise. **Methods:** In late 2019, all female faculty members from a mid-sized university were sent a questionnaire via email. Eighty-two women participated and ranged in age from 25 to 74 years. The questionnaire consisted of eight demographic questions and 37 statements about barriers related to resistance exercise. Subjects rated each statement on a Likert scale of 1 to 5, with 1 as strongly disagree, 2 as disagree, 3 as neutral, 4 as agree, and 5 as strongly agree. Statements with mean scores > 3 were identified as the greatest barriers to resistance exercise. **Results:** 48.78% (n=40) of subjects participated in the recommended two or more days per week of resistance exercise. The seven statements with mean scores > 3 were: "I do not have enough time to do resistance exercise," ($\overline{x}$=3.29) "I am too tired to do resistance exercise," ($\overline{x}$=3.26) "Resistance exercise makes my muscles sore," ($\overline{x}$=3.1) "I do not have friends to do resistance exercise with me," ($\overline{x}$ =3.11) "I would rather do cardio or aerobic exercise than resistance exercise," ($\overline{x}$ =3.15) "A fitness facility membership or exercise classes are too expensive," ($\overline{x}$ =3.06) and "Going to a fitness facility is inconvenient" ($\overline{x}$=3.77). **Conclusion:** Women experience a variety of barriers to resistance exercise. Healthcare and exercise science professionals should take these barriers into account when creating resistance exercise programs.

Central Vascular Reactivity to Mental Stress in Emergency Responders

Jacob P. DeBlois[1], Wesley K. Lefferts[1,2], Kevin S. Heffernan[1].
[1]Syracuse University, Syracuse, NY; [2]Iowa State University, Ames, IA.

Central vascular function (stiffness, pressure wave energy transmission, hemodynamics) can impact high-flow end-organs such as the myocardium. Police officers, firefighters, emergency medical services personnel, and military personnel ("emergency responders" [ER]) experience more on-duty deaths from cardiac events than other occupational groups. As ER face unique occupational stressors, central vascular stress reactivity (CVSR) may contribute to cardiac risk. **PURPOSE:** Determine if ER have greater CVSR compared with non-ER (NER). **METHODS:** 9 ER and 9 age-, sex-, race-, and body fat-matched NER (n = 2 women; Table 1) had central vascular function assessed at rest and during 3 min of mental stress (Stroop). Potential covariates included: fasting cholesterol, lipids, and glucose from a fingerstick sample; physical activity via the International Physical Activity Questionnaire (IPAQ); and depressive symptomology from the Center for Epidemiologic Studies Depression Scale (CESD). Aortic stiffness was assessed using

carotid-femoral pulse wave velocity. Doppler ultrasound was used to measure carotid artery β stiffness, while Wave Intensity Analysis provided measures of pressure wave energy transmission. Carotid pressures were measured using applanation tonometry. CVSR was calculated as mental stress – resting. **RESULTS:** Groups had similar metabolic profiles and IPAQ scores ($p \geq 0.11$). CESD score was greater in ER than NER ($p = 0.04$) and was used as a covariate for analyses. CVSR was similar between groups for all variables ($p > 0.05$; Table 1). **CONCLUSION:** Despite more depressive symptomology, ER do not have greater central vascular function changes to stress compared with NER, suggesting high resiliency during mental stress in ER.

Supported by NIH Grant 1R03MD011306-01A1

Longer Rest Intervals Attenuate Rate Pressure Product Response to Resistance Exercise in Untrained Young Women

Angelica R. Del Vecchio, Peter A. Hosick, David A. Phillips, Evan L. Matthews.
Montclair State University, Montclair, NJ

It is recommended for most sedentary adults to adopt strength based resistance exercise as a means of improving or maintaining health. However, previously untrained individuals may be at elevated risk of a cardiovascular event when initiating a resistance exercise program due to acute increases in cardiovascular stress. Previous research has suggested that increasing rest intervals between sets of resistance exercise may attenuate blood pressure (BP) responses. However, it is unknown if this is true for healthy, untrained young women beginning muscular strength focused exercise programs. **PURPOSE**: To compare the effect of rest interval duration [60s vs 180s] during muscular strength resistance exercise on BP, heart rate (HR), and rate pressure product (RPP) in untrained women. **METHODS**: 15 healthy untrained women performed 5 sets of 10 repetitions of leg extension exercise at 70% of their 1 repetition maximum on two occasions with differing rest interval durations; 60s (short rest [SR]) and 180s (long rest [LR]). Cardiovascular responses were continuously measured during exercise and recovery using finger photoplethysmography. **RESULTS**: Participants were generally young (22 ± 2 yrs) and normotensive with normal resting values (averaged across trials: SBP 106 ± 7 mmHg; DBP 77 ± 6 mmHg; HR 76 ± 10 BPM). During the final 10s of exercise epoch SBP was greater in the SR vs LR condition ($p = 0.020$; $\eta^2_p = 0.329$). During the 31-60s rest epoch the following were greater in the SR vs LR conditions: SBP ($p = 0.002$; $\eta^2_p = 0.503$), HR ($p = 0.020$; $\eta^2_p = 0.329$), and RPP ($p = 0.016$; $\eta^2_p = 0.347$). During the final 30s of each rest interval (SR: 31-60s; LR: 151-180s) the following were greater in the SR vs LR conditions: SBP ($p = 0.002$; $\eta^2_p = 0.524$), HR ($p = 0.001$; $\eta^2_p = 0.546$), and RPP ($p < 0.001$; $\eta^2_p = 0.552$). **CONCLUSION**: Longer rest intervals attenuated the SBP, HR, and RPP responses during resistance exercise. This indicates that longer rest intervals may reduce unnecessary risk associated with starting resistance exercise training in untrained women.

Prevalence of Behavior Modification Curricular Requirements in CAAHEP/COAES Accredited Exercise Science Programs

Erin L. Dopke, Lauren S. Kerner, John J. Guers, Drue T. Stapleton. Rider University, Lawrenceville, NJ

The benefits of physical activity and exercise are well established and far reaching. However, exercise compliance remains an issue and, to an extent, mitigates the benefits. Educational competencies regarding knowledge of behavior modification techniques are outlined by the Commission on the Accreditation of Allied Health Programs (CAAHEP) and the Council on the Accreditation of Exercise Science (COAES); how these competencies are met is less clear. Given the complexities of physical activity behavior, dedicated coursework addressing the fundamentals of behavior modification would be of value. **PURPOSE**: To examine the prevalence of curricular requirements focused on behavior change in CAAHEP/COAES accredited exercise science programs. **METHODS**: We conducted a search of the listed course curriculum for CAAHEP/COAES accredited exercise science programs offering a baccalaureate program (n=65), to determine if a class focusing on behavior modification was mandatory. We further broke the schools down by region of the American College of Sports Medicine and by Carnegie Classification. A Student's T-Test was used to determine differences between two groups. Significant was set a $p<0.05$. **RESULTS**: Of the 65 accredited institutions, 19 contained a specific course in behavior modification ($p<0.05$). Of these 19 schools, institutions within the Mid-Atlantic Region (MARC) were more likely to require a course on behavior change while five regions (Alaska, Central States, Northwest, Rocky Mountains, Texas) required no courses or had no accredited programs. Carnegie level Master's Colleges & Universities (Master's degree granting without high research activity) were more likely to require courses on behavior change (42%) when compared with smaller baccalaureate schools (21%) and larger schools offering doctoral degrees (37%). **CONCLUSION**: Despite established educational competencies, many accredited exercise science programs do not include curricular requirements in behavior modification. While this may satisfy programmatic accreditors, in order to maximize the benefits of physical activity and exercise and elevate the preparation of the next generation of exercise professionals, dedicated coursework in behavior change should be incorporated into exercise science curricula.

Murine Gut Microbial Communities Influenced by Physical Activity and Diet, But Not Gender

Robert A. Dowden[1], Paul J. Wisniewski[1], Lee J. Kerkhof[1] & Sara C. Campbell[1], FACSM.
[1]Rutgers, The State University of New Jersey, New Brunswick, NJ

The gut microbiota is known to be influenced by a myriad of environmental and genetic factors. Recently, our lab has shown the impact of host genotype and exercise on the selection of individual bacterial species in the mouse gut. **PURPOSE**: Here, we sought to examine changes to gut communities to voluntary wheel running (VWR) and very high fat (VHF, 60% fat) feeding over 12 weeks in male (M) and female (F) C57Bl/6Tac wildtype mice. **METHODS**: Following a two-week acclimation period, 224 mice were randomly assigned to one of four treatments for each sex (n=7/group): (1) control diet (10% fat) sedentary (CD-S); (2) VHF diet sedentary (VHF-S); (3) CD exercise (CD-X) & (4) VHF diet exercise (VHF-X). Throughout the study mice had ad libitum access to food, water and running wheels, where appropriate. Fecal samples were collected each week and analyzed by rRNA operon profiling to tract changes in gut communities over time by

nanopore sequencing. **RESULTS**: 23 separate MinION runs yielded $2.64x10^7$ raw reads each collected over 24 hours and sized (3.7-6.0 kb) yielding $1.38x10^7$ rRNA operons. Sequence reads were screened against a ribosomal operon database (OpDB) using MegaBlast and yielded $1.16x10^7$ quality alignments (≥1000 bp) which were binned into 1,912 species dominated by *Lachnospiraceae bacterium 28-4., Ruminococcus bromii* and *Parabcteroides spp.* β-diversity analysis showed clustering by activity for weeks 3 (p=0.001) and 4 (p=0.035) as well as for diet (p=0.001, p=0.005), where week 8 communities exhibited clustering by diet (p=0.001) only. Sex did not significantly affect β-diversity at all time points. Differential abundance testing showed increased abundance of *Turicibacter sanguinis* & *Paraclostridium bifermentans* in sedentary mice where *Muribaculum intestinale* & *Traorella massiliensis* spp. were more abundant in exercise mice. **CONCLUSION**: This preliminary data contributes to emerging evidence demonstrating the role of host activity and diet, but not gender, to alter gut microbial communities.

Pre-Sleep Low Glycemic Modified Starch Does Not Improve Next Morning Running Performance in Endurance Athletes

Monique D. Dudar, Emilie D. Bode, Karly R. Fishkin, Rochelle A. Brown, Madeleine M. Carré, Noa R. Mills, Michael J. Ormsbee, FACSM, Stephen J. Ives
Skidmore College, Saratoga Springs, NY, Florida State University, Tallahassee, FL, University of KwaZulu-Natal, Durban, South Africa

PURPOSE: To determine the effects of pre-sleep supplementation with a novel low glycemic index (LGI) carbohydrate (CHO) on next morning substrate utilization, gastrointestinal distress (GID), and endurance running performance (5km time trial, TT) using a double-blind, randomized placebo-controlled, crossover design. **METHODS:** Trained participants (n=14, 8/6 male/female; 28±9 yrs) were familiarized with the procedures and completed a VO_{2peak} test (to determine eligibility). For the experimental trials (3 total), participants were randomly assigned to consume 270 kcal of LGI CHO, 270 kcal of high glycemic index (HGI) CHO, or 0 kal of placebo (PLA) at least 2 hours after their last meal and within 30 minutes prior to sleep the evening before each trial. Each trial was separated by a minimum of 72 hours. Upon arriving to the lab in a fasted state, baseline measures of energy expenditure (REE), substrate utilization, blood glucose, satiety, and GID were assessed. Next, an incremental exercise test (IET) was performed at 55, 65, and 75% of the participants VO_{2peak} (VO_{2peak} 55 ± 7 ml/kg/min). GID and rating of perceived exertion (RPE) was recorded every five minutes and substrate utilization was obtained on a 15 second interval. Finally, participants were instructed to complete a best effort 5km TT on a treadmill. Significance was established at $p \leq 0.05$. **RESULTS:** There were no differences across supplement in any measure at baseline. During IET, there was a trend for greater CHO utilization with LGI compared to HGI (PLA, 56±11; HGI, 60±14; LGI, 63±14%, p=0.16, η^2=0.14). Supplement had no significant effect on GID at any point. 5km TT performance was also unaffected by supplement (PLA, 21.6±9.5; HGI, 23.0±7.8; LGI, 24.1±4.5 min, p=0.94, η^2=0.01). **CONCLUSION:** Pre-sleep CHO supplementation did not affect next-morning resting substrate utilization, BG, GID, or 5km TT performance. The trend towards higher CHO utilization during IET after pre-sleep LGI, might suggest that such supplementation increases morning CHO availability.

Natural Fluctuations in Progesterone Do Not Impact Endothelial Function in Healthy Premenopausal Women

Lauren E. Eagan[1], Catalina A. Chesney[1], Sara E. Mascone[1], Ninette Shenouda[2], Sushant M. Ranadive[1]. [1]University of Maryland, College Park, MD. [2]University of Delaware, Newark, DE.

Endogenous sex hormone concentrations vary across the menstrual cycle of naturally menstruating premenopausal women and may elicit concomitant changes in vascular function. Specifically, estrogen (E2) may enhance vascular function partially by increasing nitric oxide bioavailability. In contrast, the influence of progesterone (P4) on endothelial function remains unclear, with some data suggesting it increases nitric oxide bioavailability and other data suggesting it antagonizes the dilatory effects of E2. **PURPOSE:** To elucidate the effect of P4 on vascular function, in the presence of minimal fluctuations in E2 concentrations in healthy premenopausal women. **METHODS:** Sex hormones and endothelial function were measured in ten healthy premenopausal women (22±2 y) during the early follicular phase (EF, within 5 days of the onset of menstruation) and the early luteal phase (EL, 4±2 days post-ovulation) of a single menstrual cycle. Serum concentrations of E2 and P4 were analyzed using enzyme-linked immunosorbent assays. Independent concentrations of E2 and P4 were calculated, as well as the progesterone-to-estrogen ratio (P4:E2). Endothelial function was assessed via brachial artery flow-mediated dilation (FMD). %FMD was calculated as the percent change in brachial artery diameter following an ischemic stimulus. Data were compared between phases with paired t-tests. **RESULTS:** Serum concentrations of E2 and P4 increased from the EF to the EL phase (91.8±34.5 vs. 120.9±32.6 pg/mL, p=0.01 and 1.4±0.6 vs. 5.1±3.6 ng/mL, p=0.01, respectively). As a result of the P4 surge in the EL phase, the P4:E2 was significantly higher in the EL phase as compared to the EF phase (42.9±30.5 vs. 15.5±4.8, p=0.02). %FMD did not vary between the EF and EL phases (9.6±4.4 vs. 9.5±3.5 %, p=0.97). **CONCLUSION:** The endothelial function of healthy premenopausal women is stable in the presence of significant fluctuation in P4 concentrations, despite minimal fluctuation in E2 concentrations.

Collegiate Collision Sport Athletes have Slower Trail Making Test Performance than Non-Collision Sport Athletes.

Zarek O. Fasoranti, Alexander L. Enrique, Katherine J. Hunzinger, Kelsey N. Bryk, Thomas W. Kaminski, Thomas A. Buckley, University of Delaware, Newark, Delaware

Considerable concern has been raised regarding the effects of repetitive head impacts (RHI) during collision sports on neurological health. In older symptomatic populations, RHI appears to be associated with cognitive and behavioral deficits; but, in younger college aged athletes there were no deficits noted using commercially available neurocognitive tests designed to assess concussion. However, broader neurocognitive assessments have not been performed in this population. **PURPOSE**: To determine the effects of collision sport participation on the electronic version of the Trail Making Test (TMT) A and TMT-B performance. **METHODS**: This study utilized a cross-sectional design of 1,208 intercollegiate NCAA Division I athletes (53% female, mean age: 19.0 $\pm$ 6.0). Participants completed a tablet-based TMT-A and B test during pre-season prior to competing in intercollegiate athletics. The independent variable was sport type (collision, contact, non-contact) and the dependent variables were the TMT-A and TMT-B time.

Dependent variables were compared by a one-way ANOVA, controlling for concussion history, and significant main effects were followed up with Tukey post-hoc test and Cohen's d was calculated for effect size. **RESULTS**: There was no significant main effect in TMT-A for group ($F=0.940$, $p=0.391$) for the collision (20.8 $\pm$ 6.2 sec), contact (20.9 $\pm$ 4.9 sec), and non-contact (20.4 $\pm$ 5.4 sec) athletes. However, there was a significant main effect for TMT-B ($F=10.956$, $p<0.001$). Post hoc tests identified a difference ($p<0.001$, $d=0.29$) between the collision (40.8 $\pm$ 11.7 sec) and non-contact group (37.7 $\pm$ 10.0 sec). There were no significant post-hoc differences for the contact group (39.2 $\pm$ 10.4 sec). **CONCLUSION:** The results of this study suggest that college athletes participating in collision sports have slower TMT-B times than those participating in non-contact sports, but the effect size was small ($d=0.29$). While this study was not designed to ascertain the underlying mechanisms, these results raise additional health concerns regarding the effects of RHI on neurological health in collision sports athletes.

Supported by the NCAA/DoD CARE Grand Alliance: W81XWH-14-2-0151

Assessing the Relationship Between Vape Use and Cardiovascular Disease Risk

Steven Filby, Praveen Veerabhadrappa, Matthew Rhudy.
The Pennsylvania State University, Berks campus, Reading, PA

PURPOSE: The purpose of this study was to assess the relationship between e-cigarette use and physical activity and cardiovascular health. **METHODS:** Twenty-five (13M/12F; ~21yrs) healthy college students were recruited from the Pennsylvania State University, Berks campus. Vapers (current, or use <3 months) and non-vapers were assigned based on self-report. Blood pressure and heart-rate were measured to assess cardiovascular health. Fitbit Charge-HR was deployed to evaluate students' weekly physical activity levels. **RESULTS:** Nine-vapers and 16-non-vapers; blood pressure (128/76 vs. 123/75 mmHg), heart-rate (76 vs. 84bpm), step counts (6061 vs. 7878steps), PO2 (97 vs. 98), walking distance (2.81 vs. 3.67mi/day), sedentary (943 vs. 805min/day), lightly activity (178 vs. 213min/day) were recorded without statistical significance due to a small sample. **CONCLUSION:** Vapers were overall pre-hypertensive and 30% less active compared to non-vapers indicating an increased risk for cardiovascular disease compared to non-vapers.

Association between Physical Activity and Mortality in Patients with Claudication

Andrew W. Gardner,1 Odessa Addison,2,3 Leslie I. Katzel,2,3 Polly S. Montgomery,1 Steven J. Prior,2,3 Monica C. Serra,4 John D. Sorkin 2,3
1 Penn State College of Medicine, Hershey, PA, 2 University of Maryland School of Medicine, Baltimore, MD, 3VA Maryland Health Care System, Baltimore, MD, 4UT Health San Antonio, TX.

Purpose: To determine the association between light intensity physical activity and the incidence of all-cause and cardiovascular mortality in patients with peripheral artery disease (PAD) limited by claudication followed for up to 18.7 years. **Methods:** A total of 528 patients with PAD and claudication were screened in Baltimore between 1994 and 2002, and 386 were deemed eligible

for the study. At baseline, patients were classified into three physical activity groups: 1) physically sedentary, 2) light intensity, and 3) moderate-to-vigorous intensity based on a questionnaire. All-cause and cardiovascular mortality of patients through December 2014 was determined using the National Death Index and the U.S. Department of Veterans Affairs and the U.S. Department of Defense Suicide Data Repository. **Results:** Median survival time was 9.9 years (IQR 4.9-15.7 years, range 0.38-18.7 years). During follow-up, 257 patients (66.6%) died, consisting of 40/48 (83.3%) from the sedentary group, 135/210 (64.3%) from the light intensity group, and 82/128 (64.0%) from the moderate-to-vigorous intensity group. For all-cause mortality, light intensity activity status (hazard ratio [HR]=0.523, p=0.0007) and moderate-to-vigorous intensity status (HR=0.425, p<0.0001) were significant predictors. .During follow-up, 125 patients died due to cardiovascular causes (32.4%), in which light intensity activity status (HR=0.511, p=0.0113) and moderate-to-vigorous intensity activity status (HR=0.341, p=0.0003) were significant predictors. **Conclusions:** Light intensity physical activity is associated with nearly 50% lower risk of all-cause and cardiovascular mortality in high-risk patients with PAD and claudication. Furthermore, moderate-to-vigorous intensity physical activity performed regularly is associated with 58% and 66% lower risk of all-cause and cardiovascular mortality, respectively. The survival benefits associated with light intensity physical activity makes it a compelling behavioral intervention that extends beyond improving ambulation.
Supported by NIA (R01-AG-16685, K01) and (P60-AG-12583 and P60-AG-28747).

Racial Differences in Heart Rate, Cardiac Autonomic Modulation and Physical Activity in Children

Alaina C. Glasgow, Wesley K. Lefferts, Brooks. B. Gump, Kevin S. Heffernan. Syracuse University, Syracuse, NY

A “Cardiovascular Conundrum” exists between Black and White individuals in which Black individuals have increased cardiac parasympathetic activity but are at a greater risk for cardiovascular disease compared to White individuals. This conundrum may begin in childhood and manifest as decreased heart rate (HR) and increased heart rate variability (HRV) in Black children. The cause of increased parasympathetic activity in Black individuals is unknown. Physical activity (PA) is associated with higher levels of parasympathetic activity and may contribute to greater parasympathetic activity in Black children. **PURPOSE**: To examine if lower HR and higher HRV in Black children is related to possible racial differences in PA. **METHODS**: One-hundred sixty-eight children (Black: n=102, White: n=66) ages 10.5±0.9 years underwent cardiac-autonomic assessment. HR and HRV were measured using a polar HR monitor. Normalized high frequency (HF) power of HRV was taken as a measure of parasympathetic modulation and the low frequency-to-high frequency (LF/HF) ratio as a measure of sympathovagal balance. PA (log PA) was objectively measured for 7 days using an accelerometer. Analysis of variance determined group differences in HR, HRV, and PA between Black and White children. Analysis of covariance controlled for the influence of log PA for group differences in HR, HFnu, and LF/HF ratio. **RESULTS**: HR trended to be lower in Black children than White children (Black: 73±11 bpm, White: 76±10 bpm; F=3.70, p=0.056). Black children had higher HFnu (Black: 65.50±14.83%, White: 58.67±13.12%; F=9.29, p=0.003) and lower LF/HF ratio than White children (Black: 0.62±0.47, White: 0.80±0.48; F=5.85, p=0.017). Log PA was not different

between groups (Black: 5.62±0.12 counts/day, White: 5.60±0.15 counts/day; F=1.85, p=0.188). Co-varying for PA had no effect on group differences in HR (F=2.90, p=0.091), HFnu (F=8.85, p=0.003), or LF/HF ratio (F=5.54, p=0.020). **CONCLUSION**: Black children exhibit increased parasympathetic modulation and lower sympathovagal balance that likely contributes to a lower resting HR. Racial differences in HR and HRV are not likely due to PA levels. Therefore, other factors may contribute to increased cardiac parasympathetic activity in Black children.

Supported by NIH/NIEHS Grant R01 ES023252 02

Arterial Stiffness and Wave Reflections Predict Postural Sway in Young Adults

Andrew R. Heckel, Jacob P. DeBlois, Allison Keller, Alaina C. Glasgow, Kevin S. Heffernan
Syracuse University, Syracuse, NY

Vascular function is associated with many indices of physical function, including muscle strength, exercise tolerance and gait speed. Balance, measured as postural sway, is an important component of physical function that may be influenced by vascular function. Arterial stiffening and increases in pulsatile blood pressure may be detrimental to the structural and functional components of the brain that are important for postural control. Whether vascular function predicts postural sway is unclear. **PURPOSE:** To examine whether measures of vascular function predict postural sway in young adults. **METHODS:** 112 young adults (21.3±3.8 years; n = 78 women) participated in this study. Postural sway was measured in triplicate while participants stood on a foam surface with their eyes closed for 30 seconds. The average total center of pressure path length from the three trials was used for this analysis. Measures of vascular function were estimated using an oscillometric blood pressure device while at rest in the supine position. Vascular function measures included pulse wave velocity (PWV), augmentation index (AIx), pulse pressure (PP) amplification, and total vascular resistance (TVR). PWV, AIx, PP amplification and TVR were entered into a backward stepwise regression model to determine significant predictors of postural sway. **RESULTS:** The results from backward stepwise regression indicated that PWV ($\beta = 0.194$, $p<0.05$) and AIx ($\beta = -0.316$, $p<0.01$) significantly predicted postural sway, explaining 13.2% of the variance in postural sway. Variables not included in the model were PP amplification and TVR ($p>0.05$). **CONCLUSION:** PWV and AIx were found to be significant predictors of postural sway in young adults. These findings suggest that increased arterial stiffness may negatively influence balance, while wave reflections may be protective for balance. Arterial stiffening may lead to increases in pressure and flow pulsatility that could detrimentally affect the components of the brain important for postural control. In contrast, wave reflections may act as a buffer against forward pulsatile energy to help protect those components of the brain.

Supported by NIH Grant 1R03MD011306-01A1

Skeletal Muscle Angiogenic Growth Factors following Exercise Training and Weight Loss in Obese Older Adults

James M. Heilman[1], William S. Evans[1], Steven J. Prior[1,2,3]. [1]Department of Kinesiology, University of Maryland School of Public Health, College Park, MD, USA [2]Baltimore Veterans

Affairs Geriatric Research, Education and Clinical Center and Research and Development Service, Baltimore, MD, USA[3] Division of Geriatrics and Palliative Medicine, Department of Medicine, University of Maryland School of Medicine, Baltimore, MD, USA

Adults with impaired glucose tolerance (IGT) have lower skeletal muscle capillarization compared with normal glucose tolerant (NGT) adults; however, aerobic exercise with weight loss (AEX+WL) increases skeletal muscle capillarization and glucose tolerance in people with IGT. Angiogenic growth factors are essential for increases in capillarization, but it is unclear if these growth factors are linked to baseline deficits in capillarization in those with IGT vs. NGT, or to the benefits of AEX+WL in those with IGT. **PURPOSE:** Determine the effects of AEX+WL on skeletal muscle angiogenic factor expression in older adults with IGT or NGT. **METHODS:** Sixteen overweight or obese men 50-75 years of age completed 6 months of thrice-weekly AEX training with dietary counseling to achieve >5% WL. Subjects underwent oral glucose tolerance tests and vastus lateralis muscle biopsies. Vascular endothelial growth factor (VEGF), placental growth factor (PlGF), soluble fms-like tyrosine kinase receptor-1 (sFlt-1) and basic fibroblast growth factor (bFGF) levels were measured by ELISA and expressed relative to total protein. Repeated measures ANOVA was used to evaluate AEX+WL (baseline vs. 6-month) and group (IGT vs. NGT) effects. **RESULTS:** At baseline, all growth factor levels were numerically lower in IGT compared with NGT, but these did not reach statistical significance. Following AEX+WL, body weight and percent body fat were reduced by 10% and 14.5%, respectively, in all subjects ($P < 0.001$ for both), and 120-minute postprandial glucose decreased by 27% in the IGT group ($P < 0.001$). There was a main effect of AEX+WL to increase VEGF (0.095 ± 0.016 vs. 0.114 ± 0.018 ng/µg, $P < 0.05$), PlGF (0.004 ± 0.001 vs. 0.005 ± 0.001 ng/µg, $P < 0.05$), and sFlt-1 (0.216 ± 0.029 vs. 0.264 ± 0.036 ng/µg, $P < 0.01$); however, there were no significant AEX+WL * group interaction effects. **CONCLUSION:** Six-months of AEX+WL increased skeletal muscle angiogenic growth factor levels in older, obese adults with IGT and NGT. These findings coincided with improved glucose tolerance, percent body fat, and aerobic fitness, which extends our previous findings that AEX+WL improves glucose tolerance, in part due to increases in muscle capillarization.

Funding: NIH K23-AG040775 and the Department of Veterans Affairs

Exercise and Caffeine Use in College Sleep and Mental Health

Ripley A. Hoffman, Devin V. Link, Alexa N. Schwartz, Sydney E. Silverman, Jodi N. Dowthwaite.
Binghamton University, Binghamton, NY

College students partake in variable amounts of exercise and caffeine, which may influence their sleep quality and mental health. Poor habits may set them up for a lifetime of health problems. **PURPOSE:** We evaluated associations among exercise, caffeine consumption, sleep quality, and symptoms of anxiety and depression in college students. **METHODS:** Anonymous electronic surveys assessed many variables, including exercise dose (h/wk), caffeine consumption (beverages: mg), and scores for symptoms of poor sleep quality (PSQI: Pittsburgh Sleep Quality Index), anxiety (GAD-7: generalized anxiety disorders), and depression (PHQ-9: patient health questionnaire). Mann-Whitney U tests (MWU) compared caffeine users vs. nonusers and men vs. women for key outcomes; Spearman's rho and backwards stepwise regression assessed

associations among variables of interest (α=0.05). **RESULTS:** In the main sample, anxiety and depression scores were correlated (n=412, ρ=+0.740, p=0.000); 42.1% of women (n=297) and 28.7% of men (n=115) reported no exercise. Women had worse global mental health scores than men (sum GAD-7 + PHQ-9, MWU p<0.001). In women vs. men, mean ranks were higher for caffeine, anxiety, and depression, but lower for exercise (MWU p<0.003). Doses formed rough tertiles (caffeine mg/day: 0, 6-150, 150+; exercise h/wk: 0, 0.1 to 2.1, >2.1). Female sex, lower exercise tertiles and higher caffeine tertiles predicted greater anxiety (p<0.02) and depression scores (p<0.04). Caffeine users had lower weekly exercise doses than nonusers (min/day: users= 52.7, nonusers= 67.9, MWU p=0.021). In a PSQI sub-sample (n=174), female sex and worse sleep quality predicted higher anxiety scores (regression p<0.003); lower exercise tertiles and worse sleep quality predicted higher depression scores (regression p<0.05). In caffeine users (n=116), higher caffeine intake was associated with worse sleep quality (rho= +0.260, p=0.005) and higher depression scores (rho= +0.191, p=0.040). In a subsample of exercisers, with both caffeine users and nonusers (n=114), more exercise was linked with fewer symptoms of anxiety (rho= -0.199, p<0.05), depression (rho= -0.286, p<0.05), and poor sleep (rho= -0.203, p<0.05). **CONCLUSION:** For college students, exercise promotion may be key to improving sleep quality and mental health.

Supported, in part, by grants to Binghamton University from the following: Howard Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, New York State Regional Economic Development Council, and SUNY Investment & Performance program.

Opioid Receptor Blockade Alters Heart Rate Variability When Combined with Exercise

Jessica Homitz[1], Evan L. Matthews[2], Candace Longoria[3], Sara C. Campbell[3], John J. Guers[1]
[1] Rider University, Lawrenceville, NJ, [2] Montclair State University, Montclair, NJ, [3] Rutgers University, New Brunswick, NJ

Opioid receptor blockade (Naltrexone; NTX) has been shown to alter cardiovascular (CV) reactivity in individuals who perform regular aerobic exercise. Certain opioid receptors blockers have been used to help individuals lose weight. Being that exercise is commonly prescribed as a therapy for weight loss understanding the acute interaction of exercise and NTX administration would be important. **PURPOSE:** To study if opioid blockade alters the acute cardiovascular effects of acute exercise. **METHODS:** Male 24 wk. C57-BL6 mice were divided into 4 groups: control (CON), exercise (EX), naltrexone (NTX), exercise with naltrexone (EX+NTX). Mice that underwent EX performed 50 mins of forced swimming following a week of familiarization. NTX or saline was given (i.p.;4 mg/kg), 15 min prior to EX or 65 min prior to echocardiography (ECHO). Mice were anesthetized using isoflurane (4-5% for induction; 0.5-2.0% for maintenance of anesthesia). Fur was removed from the anesthetized animal with nair and echo gel was applied. Peak/peak (RR) interval was recorded during a 5 min period using the ECG platform of the ECHO (Visual Sonics Vevo 2100). HRV was analyzed in the time-domain. HRV was analyzed using the standard deviation of the inter beat intervals of normal sinus beats (SDNN). A 2x2 ANOVA was used to assess difference between groups with a P <0.05 being used to detect significant differences. Data is represented by mean ± SEM. **RESULTS:** Heart rate (BPM) was elevated following EX (CON=276 ± 11.9 vs. EX = 360 ± 22; P<0.05). This effect as attenuated with the

addition of NTX. SDNN was unchanged following EX (CON = 51 ± 4.6 ms vs. EX = 71 ± 6 ms) and NTX (52 ms ± 5.1 ms). However, there was a significant interaction between EX and NTX ($p<0.05$). HRV in the EX+NTX was different when compared to all three groups (17.9 ms ± 1.5 ms; $p<0.05$). **CONCLUSION:** The addition of NTX may alter mouse autonomic response to exercise by lowering both HRV and HR.

Associations Between Rest-Activity Rhythms and Nocturnal Blood Pressure are Sex-Dependent in Healthy Emerging Adults

Elissa K. Hoopes, Freda Patterson, Felicia R. Berube, Michele N. D'Agata, William B. Farquhar, Melissa A.H. Witman. University of Delaware, Newark, DE

Blood pressure (BP) exhibits a diurnal rhythm that is partly regulated by circadian mechanisms. High nocturnal systolic BP (SBP) and less-pronounced nocturnal SBP dipping (i.e., % decline in nighttime SBP relative to daytime SBP) are independent predictors of cardiovascular disease (CVD) morbidity and mortality. Daily patterns of rest and activity (i.e., "rest-activity rhythms" [RAR]) are a proxy for estimating circadian disruption in free-living settings, with irregular RAR also linked to excess CVD risk. However, the relation between RAR and nocturnal BP characteristics are not well-elucidated. **PURPOSE**: To quantify the associations between RAR and nocturnal BP characteristics in male and female emerging adults (18-25y). **METHODS**: 50 healthy emerging adults (24±1y; 20M/30F) underwent 24h ambulatory BP monitoring following 14 consecutive days of 24/7 wrist actigraphy. Nonparametric RAR variables of interdaily stability (IS; day-to-day consistency in RAR), intradaily variability (IV; within-day fragmentation of RAR), and relative amplitude (RA; difference in lowest vs highest activity levels) were computed from actigraphy data. Bivariate correlations were used to quantify associations between RAR variables and nocturnal SBP characteristics for all participants, and separately for males and females. Potential confounders of body mass index, moderate-vigorous physical activity, sleep duration, and alcohol and caffeine consumption were also assessed and included in partial correlation analyses if associated with nocturnal BP characteristics at $p<0.10$. **RESULTS:** For all participants, IS and RA positively correlated with % SBP dipping (IS: $r=0.33$, $p=0.02$; RA: $r=0.35$, $p=0.01$). When stratified by sex, these correlations strengthened for females (IS: $r=0.50$, $p<0.01$; RA: $r=0.52$, $p<0.01$) and an inverse association between RA and mean nocturnal SBP emerged ($r=-0.46$, $p=0.01$). Further, in females, these associations remained significant after controlling for appropriate confounders. Conversely, in males, no associations between RAR variables and nocturnal BP characteristics were apparent. **CONCLUSION:** Preliminary findings suggest that inconsistent and low-amplitude rest-activity patterns associate with unfavorable nocturnal BP characteristics, particularly in emerging female adults.

Supported in part by NIH P20-GM113125.

Variable Height Step Test Provides Reliable Heart Rate Response: Virtual Cardiorespiratory Testing During COVID-19 Pandemic

Fiona M. Horvat, David A. Phillips, Evan L. Matthews. Montclair State University, Montclair, NJ

Heart rate (HR) responses to aerobic step tests are widely used to estimate cardiorespiratory fitness. However, all available step tests require a prescribed step height, and cannot be done in the home without a standardized aerobic step. Amid the COVID-19 pandemic, it has been difficult for fitness professionals to provide standard aerobic steps to their clients. **PURPOSE:** To examine a modification on a standard step test allowing for the use of pre-existing in-home steps of variable height for cardiorespiratory fitness testing. **METHODS:** 15 healthy subjects (age 26±6yrs; M 6, W 9) met with researchers using virtual conferencing software to perform step tests on three occasions (1 familiarization visit, and 2 randomized data collection visits). Subjects identified and measured two steps/objects within the home that they could use for step testing. Subjects were asked to pick one small and one large object in their residence. Once the step was measured, the step frequency for each object was determined so that estimated exercising VO2 would be matched between the step tests using the different objects. During each exercise visit subjects were asked to count their radial pulse manually for 1 min before and after a 3 min step test at an estimated intensity of 26 mL/kg/min. **RESULTS:** Post exercise HR's from the small step test 1 (familiarization visit) and small step test 2 (randomized visit) were highly correlated ($r=0.887$, $p<0.001$). The trend line slope ($m=1.031$) and y intercept ($b=0.540$) further suggest high interday repeatability. Post exercise HR from the small step test 2 vs large step test (randomized visits) were also highly correlated ($r=0.891$, $p<0.001$). The trend line slope ($m=0.960$) and y intercept ($b=1.095$) further suggest high repeatability of the exercise HR response despite different step heights and step frequencies between the tests. **CONCLUSION:** These preliminary results suggest that modifying step frequency to account for the varying heights of in-home steps will permit the use of previously developed step tests without the need for standardized steps. This study provides the first evidence that fitness professionals can use virtual step tests without specialized equipment to test cardiorespiratory fitness of their clients when close proximity is not possible.

Age of First Exposure Does Not Affect Quality of Life in Rugby Players Over 50

Katherine J. Hunzinger, Katelyn M. Costantini, C. Buz Swanik, Thomas A. Buckley.
University of Delaware, Newark, DE

It is suggested that early adolescence (i.e., ages 10-12 years) is an important stage for brain development. As such, many studies have investigated the effects of repetitive head impacts (RHI) incurred before age 12, as measured by age of first exposure (AFE) to contact/collision sports, and their relationship with later in life neurological impairments which may diminish quality of life (QoL) and well-being. However, the research is mixed and limited to college-aged athletes or symptomatic middle-aged or older adults. **PURPOSE:** To determine the relationship between AFE to contact sports and measures of QoL in community rugby players over 50 years old. **METHODS:** Individuals who have played contact rugby completed an online questionnaire to ascertain self-reported AFE to contact sports and three measures of QoL and their subcomponents: the Brief-Symptoms Inventory 18 (BSI-18: Somatization, Depression, Anxiety), Short Form 12 (SF-12: Physical and Mental Component Scores (PCS & MCS)), and Satisfaction with Life Survey (SWLS). Participants were dichotomized into two AFE groups (<12 or ≥ 12). Data were not normally distributed so a Mann-Whitney U test was performed to compare QoL outcomes between AFE groups. **RESULTS:** 99 rugby players older than 50 (57.9 ± 5.7 years, range: 50-74 years,

88.8% male) participated in this study. There were no significant differences between AFE <12 and AFE ≥12 groups on all outcomes: BSI-18 Somatization (AFE ≤12: 1.88 ± 2.26; AFE>12: 1.81 ± 1.77, U=1,034, *p*=.770), BSI-18 Depression (AFE ≤12: 2.16 ± 3.41; AFE>12: 2.38 ± 3.06, U=985, *p*=.497), BSI-18 Anxiety (AFE ≤12: 1.93 ± 2.38; AFE>12: 1.81 ± 2.26, U=1,058, *p*=.917), SF-12 Physical (AFE ≤12: 48.20 ± 8.66; AFE>12: 46.57 ± 10.40, U=998, *p*=.580), SF-12 Mental (AFE ≤12: 51.78 ± 8.86; AFE>12: 54.21 ± 8.79, U=888, *p*=.169), SWLS (AFE ≤12: 26.13 ± 5.09; AFE>12: 26.75 ± 5.74, U=986, *p*=.518). **CONCLUSION:** Consistent with recent cohort studies in collegiate athletes, there was no observed difference on three common measures of psychological well-being and QoL in community rugby players over 50 based upon AFE to contact sports. However, later life potential consequences of RHI in rugby players remains to be elucidated.

Supported by the University of Delaware's Unidel Distinguished Graduate Scholars Fellowship.

Impact of Acute Supraventilation Breathing Technique on Anaerobic Swim Performance in Collegiate Swimmers

Denali M. Hutzelmann, Makenzie A. King, Adam D. Atwell, Silas C. Stevens,
Grove City College, Grove City, PA

Research indicates that pre-activity breathing exercises such as breath holds, or hyperventilation may improve performance. Supraventilation (SVB) is a breathing technique that combines hyperventilation periods with subsequent breath holds. It is unknown if such a technique performed prior to an event could enhance performance. **PURPOSE:** The purpose of this study is to examine the effects of a pre-exercise SVB breathing protocol on swim sprint performance. **METHODS:** Ten NCAA DIII collegiate swimmers (7 males, 3 females; age 20.30 ± 1.25 yrs; weight 162.40 ± 24.57 lbs.; height 69.04 ± 3.86 in.) completed a randomized, crossover study consisting of 2 trials with at least 48 hours in between. For each trial subjects completed a standardized warmup followed by the assigned breathing condition: 1) SVB (3 sets of 30 rapid deep breaths followed by a max breath hold) or 2) normal breathing (NB) prior to a 100-yd swim trial. Heart rate was measured immediately after warm-up, continuously during the breathing protocol, prior to the swim trial, immediately, 1.5-, 3- and 5-minutes post swim trial. Blood lactate (BLA) was recorded prior to the warmup, immediately and 5-minutes post swim. Performance measures included time to completion, number of strokes, number of breaths taken, and ratio of strokes per breath. Arterial oxygen saturation and dizziness were measured during and after the breathing protocols. During the SVB protocol, breath hold times were recorded. **RESULTS:** There were no significant differences (*p*'s > 0.05) between NB and SVB in trial time (58.01 ± 6.17 s. ; 57.74 ± 5.11 s.), total breaths (21.70 ± 5.79; 20.3 ± 5.72), strokes per breath (2.99 ± 0.62; 3.15 ± 0.72), and total strokes (62.2 ± 6.32; 61.4 ± 8.66). Additionally, there were no significant difference (p's > 0.05) in BLA between conditions at pre-trial (1.00 ± 0.66 mmol/L; 1.03 ± 0.37 mmol/L) immediately post-trial (9.48 ± 2.43 and 9.55 ± 2.78) and 5-minutes post (10.3 ± 1.71 and 10.15 ± 2.86). **CONCLUSION:** Our pilot data revealed no significant differences in performance or physiological measures between conditions, however, data trends favored SVB. These findings warrant further exploration of the SVB technique for performance enhancement.

Supported by Grove City College Exercise Science Department.

Dose Response of a Novel Exogenous Ketone Supplement on Physiological, Perceptual and Performance Parameters

Dalton W. Jones, Philip J. Prins, Dominic P. D'Agostino, Christopher Q. Rogers, Dana L. Ault, Gary L. Welton, Samuel R. Henson, Tyler J. Rothfuss, Kylie G. Aiken, Jantzen L. Hose, Emilia L. England, Adam D. Atwell, Jeffrey D. Buxton, Andrew P. Koutnik. Grove City College, Grove City, PA, University of South Florida, Tampa, FL

Interest into the health, disease, and performance impact of exogenous ketone bodies has rapidly expanded due to their multifaceted physiological and signaling properties but limiting our understanding is the isolated analyses of individual types and dose/dosing protocols. **PURPOSE**: To explore both the administration and dose response of βHB+MCT on metabolic, physiological, perceptual, physical performance and cognitive performance parameters. **METHODS:** Thirteen recreational male distance runners (24.8±9.6y, 72.5±8.3kg, VO_{2max} 60.1±5.4ml/kg/min) participated in this randomized, double-blind, crossover design study. The first two sessions consisted of a 5-km running time trial (TT) familiarization and a VO_2max test. During subsequent trials, subjects were randomly assigned to one (KS1:22.1g) or two (KS2:44.2g) doses of beta-hydroxybutyrate (βHB) and medium chain triglycerides (MCTs) or flavor matched placebo (PLA). Blood *R*-βHB, glucose, and lactate concentrations were measured at baseline (0-min), post-supplement (30 & 60mins), post-exercise (+0min, +15mins). Time, heart rate (HR), rating of perceived exertion (RPE), affect, respiratory exchange ratio (RER), oxygen consumption (VO_2), carbon dioxide production (VCO_2), and ventilation (VE) were measured during exercise. Cognitive performance was evaluated prior to and post-exercise. **RESULTS:** KS significantly increased *R*-βHB, with more potent (60min post-KS; KS1: 0.73±0.2mM; KS2: 0.60±0.2mM) and prolonged (+15min post-exercise; KS1: 0.28±0.1mM; KS2: 0.59±0.3mM) elevations in KS2. *R*-βHB was significantly decreased in KS1 compared to KS2. Blood lactate significantly increased post-exercise but was augmented by KS administration (PLA: 6.1±2.2mM; KS1: 7.2±2.5mM; KS2: 7.1±2.5mM). Gaseous exchange, respiration, HR, affect, RPE, and exercise performance was unaltered with KS administration. KS2 significantly augmented cognitive function in pre-exercise conditions (Reaction Time; PLA: 728.3±143.3ms; KS1: 707.9±156.7ms; KS2: 622.6 ± 98.8ms). **CONCLUSION:** Novel βHB+MCT formulation had a dosing effect on *R*-βHB and cognitive performance, an administrative response on blood lactate, while not influencing gaseous exchange, respiration, HR, affect, RPE, and exercise performance.

Supported by the Grove City College Jewell, Moore, & McKenzie Fund.

The Effect of Relative Intensity on the Magnitude and Duration of Analgesia Following Acute Exercise

Lauren S. Kerner[1], Evan L. Matthews[2], Drue T. Stapleton[1], John J. Guers[1] [1]Rider University, Lawrenceville, NJ, [2]Montclair State University, Montclair, NJ

Exercise (EX) induced analgesia has been previously identified. However, the EX prescription necessary to elicit analgesia is not consistent. Additionally, the duration of the analgesic effect following EX bouts is unknown. **PURPOSE**: To determine the effect of EX intensity on the duration of EX induced analgesia. Secondly, to quantify the duration of EX induced analgesia

following an acute bout of cycling. **METHODS**: Ten college aged students (4 men; 6 women; age = 20.1 ± 3.1 years) underwent 30 minutes of EX on a cycle ergometer. Following 5 minutes of light cycling (3-4 METS) each subject underwent 20 minutes of cycling at 8 METS followed by a 5-minute cooldown. Workload was titrated to ensure each subject can finish the EX session. Following the EX, each subject remained seated on the cycle for an additional 15 minutes. Oxygen consumption (VO_2) was measured throughout the EX and recovery period. Minimal pain threshold (MPT) was measured using a pain pressure threshold algometer placed on the extensor carpi radialis of each subject at baseline (BSL) 0min, 5min, and 15-mins post EX. Blood lactate (BL) was also measured at these same time points. Change in MPT (Pre vs 0min Post EX) was quantified using a two-tailed Student's T-Test. The effect of sex on MPT over time was quantified using a 2 x 2 ANOVA. A Pearson's correlation was used to evaluate the relationship between MPT vs. BL, respiratory exchange ratio (RER), and VO_2 following exercise. **RESULTS**: For all subjects, MPT was greater 0min post-EX (53.3 ± 5.5 N) compared with BSL (31.8 ± 6.1 N) ($P<0.05$). Females had a greater increase in MPT (29.6 ± 3 ΔN) relative to males (15.7 ± 8.6 ΔN; $p<0.05$). Further, MPT increased in a linear fashion when compared with RER ($R^2 = 0.43$) and BL ($R^2 =0.56$; $P <0.05$). MPT remained higher than BSL at 5mins (48 ± 6.3 N) and 15mins (44.4 ± 5.7N) post-EX relative to BSL. Sex differences in MPT remained at both 5 and 15mins ($P<0.05$). The correlation between MPT vs. BL and RER at 5 (BL, $R^2 = 0.59$; RER, $R^2 = 0.47$; $P<0.05$) and 15 minutes (BL, $R^2 = 0.67$; RER, $R^2 = 0.52$; $P<0.05$) remained. **CONCLUSION**: Twenty minutes of vigorous EX induces analgesia for at least 15 minutes following exercise. This effect seems the be sensitive to relative EX intensity. These findings may be useful in reducing patient pain levels without the need for pharmaceuticals.

The Effect of Exercise and Different Exercise Intensities on Executive Function in College-Aged Individuals

Makenzie A. King, Dana L. Ault, Maddison L. Reapsome, Philip J. Prins, Jeff D. Buxton. Grove City College, Grove City, PA

An acute bout of exercise improves executive function by facilitating exercise-induced arousal that helps the brain process and store information. There has been very little research on how long the improvements in executive function persist after exercise. **PURPOSE:** The aim of this study was to compare if different exercise intensities effected how long executive function remained elevated after exercise. **METHODS:** Thirteen subjects (11 females and 2 males; age 20.23 ± 1.3 years; height 166.7 ± 3.2 cm; weight 65.0 ± 13.0 kg) completed a randomized, cross-over study that consisted of three sessions exercising on a motorized treadmill and a control session. Before each session and immediately, 20 minutes, and 40 minutes after each session subjects completed the incongruent Stroop test and task switching on a computer. Each exercise session consisted of a 5-minute warm-up and then 20 minutes of exercise at either low (20-39% of heart rate reserve [HRR]), moderate (40-59% of HRR), or vigorous (60-85% of HRR) intensity. The control session consisted of subjects sitting quietly in the laboratory for 20 minutes. **RESULTS:** Independent of exercise intensity, one bout of aerobic exercise significantly increased the number of correct responses for incongruent Stroop test from pre (62.56 ± 2.53) exercise to immediately (66.19 ± 2.31; p=.047), 20 (66.44 ± 2.34; p=.011) and 40 (66.81 ± 2.54; p=.002) minutes post exercise. There was a significant decrease in mean reaction time for incongruent Stroop test from pre (.63

± .37 s) exercise to 20 (.58 ± .31 s; p=.017) and 40 (.58 ± .29 s; p=.007) minutes post exercise. There was a significant decrease in mean reaction time for correct responses in incongruent Stroop test from pre (.63 ± .37 s) exercise to 20 (.57 ± .32 s; p=.008) and 40 (.58 ± .29 s; p=.009) minutes post exercise. There was a significant decrease in mean reaction time for task switching from pre (.14 ± .10 s) exercise to 20 (.13 ± .95 s; p=.016) and 40 (.12 ± .98 s; p=.015) minutes post exercise. There was a significant decrease in mean reaction time for correct responses in task switching from pre (.15 ± .18 s) exercise to 20 (.14 ± .17 s; p=.042) minutes post exercise. **CONCLUSION:** An acute bout of aerobic exercise on a motorized treadmill significantly improved executive function for 20 minutes and 40 minutes post exercise in college-aged individuals.

Supported by Grove City College Jewell, Moore, & McKenzie Fund

Assessing Acute Muscle Changes Using Ultrasound

Alexander Laurel[1], Dakota T. Siok[1], Nicholas Reveille[1], Ibukun Lawal[1], Ian Imery[2], Hannah Zabriskie[1], Devon A. Dobrosielski[1], Kathleen Dondero[1], Odessa Addison[3,4], Rian Q. Landers-Ramos[1]

[1]Towson University, Towson, MD, [2]Johns Hopkins University, Baltimore, MD, [3]University of Maryland School of Medicine, Baltimore, MD, [4]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center, Baltimore, MD

Ultrasound imaging of skeletal muscle is a noninvasive and inexpensive technique that can be used to assess changes in muscle thickness (MT) in response to high impact acute exercise. **PURPOSE**: To assess ultrasound-derived measures of MT of the rectus femoris (RF) quadriceps muscle in response to an acute bout of dynamic body weight exercise in recreationally active young adults. **METHODS**: Ultrasound was used in twenty one healthy adults (24.8 ± 2 yrs; 10 men/11 women) to capture images of the RF while relaxed and during isometric contraction before, 10-min after, and 24 hrs after an exercise session. The exercise consisted of four rounds of dynamic body weight exercise that emphasized eccentric muscle contractions. Images were analyzed using ImageJ, and passive MT and % change in MT from passive to isometric contraction were calculated. Thigh circumference and knee extensor strength were also assessed. **RESULTS:** Passive RF thickness increased significantly 10-min post exercise compared to baseline (2.64 ± 0.17 cm vs. 2.38 ± 0.16 cm; P<0.001) and was significantly lower 24-hr post exercise (2.39 ± 0.15 cm) compared to 10-min post-exercise values (P<0.001). There was a significant decrease in % change in MT from baseline (16.80 ± 2.50%) to 10-min post exercise (12.60 ± 2.65%; P=0.02) that returned to baseline values 24-hrs later (16.56 ± 2.4%). Thigh circumference increased from 54.98 ± 1 cm at baseline to 55.5 ± 0.97 cm 10-min post-exercise (P=0.005) and was unchanged from 10-min post- to 24-hrs- after exercise (55.5 ± 1 cm; P=0.63 vs. post and P=0.03 vs. baseline). Knee extensor strength was significantly reduced from baseline to 10-min post exercise (102.58 ± 30.88 lb vs. 85.51 ± 27.17 lb; P<0.001). 24-hr knee extensor strength was greater compared to 10-min post exercise (95.02 ± 33.01 lb; P=0.01) but remained lower than baseline (P=0.005). **CONCLUSION:** Passive MT was greater and % change MT was reduced following the acute bout of exercise and returned to baseline 24-hrs post exercise. Additionally, we observed increased total thigh swelling and reductions in knee extensor strength that persisted 24-hrs post exercise. These findings support the use of ultrasound to detect acute changes in MT following dynamic eccentric exercise and are accompanied by short-term reductions in force-production capabilities.

Sex Differences in Augmentation Index in Response to Acute Dynamic Exercise

Ibukun Lawal[1], Dakota T. Siok[1], Nicholas Reveille[1], Alexander Laurel[1], Ian Imery[2], Hannah Zabriskie[1], Devon A. Dobrosielski[1], Kathleen Dondero[1], Odessa Addison[3,4], Rian Q. Landers-Ramos[1]

[1]Towson University, Towson, MD, [2]Johns Hopkins University, Baltimore, MD, [3]University of Maryland School of Medicine, Baltimore, MD, [4]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center, Baltimore, MD

Augmentation index (AIx) is derived from pressures imposed on the left ventricle as a result of systolic peripheral wave reflection. Differences in AIx in response to an acute stress, such as exercise, may prove useful for predicting future cardiovascular risk in younger adults, but less is known about whether this response differs between men and women. **PURPOSE:** To examine whether there are sex differences in AIx in response to an acute bout of exercise in healthy individuals. **METHODS:** Apparently healthy recreationally active individuals (18-42 yrs old; 10 men and 11 women) arrived at the lab 12 hrs fasted. Baseline measurements for AIx were taken using cuff-based applanation tonometry on the dominant arm. Participants underwent four rounds of dynamic body weight exercises. AIx measures were repeated at 5-, 10-, and 15-minutes post exercise and again 24-hrs post exercise. All AIx values were normalized to a heart rate of 75 bpm (AIx75). **RESULTS:** AIx75 was significantly higher in women (5.9 ± 3.6%) compared to men (-3.9 ± 2.6%) at baseline (P=0.04). Compared to baseline there was a significant increase in AIx75 in men (13.6 ± 3%; P<0.001) and women (26.2 ± 3.9%; P<0.001) 5-min post exercise with women exhibiting a significantly greater response (P=0.02). Compared to values at 5-min post exercise, there was a significant drop in AIx75 at both 10-min (18.6 ± 3.6%; P<0.001) and 15-min (15 ± 3.6%; P<0.001) post-exercise in women. However, AIx75 remained elevated in men at both 10-min (16 ± 3.4%; P=0.33) and 15-min post exercise (12 ± 3.2%; P=0.1). Differences between sexes were not evident at either 10- or 15-min post exercise (P=0.58 and P=0.51, respectively). AIx75 returned to baseline levels at the 24-hr visit (P=0.57 for both men and women) and resting sex differences were again apparent (-5.5 ± 3.5% in men vs. 7.2 ± 3.5% in women; P=0.01). **CONCLUSIONS:** This study demonstrates sex differences in resting and post-exercise induced increases in AIx75. These findings suggest potential physiological or structural differences in women that are influencing arterial and left ventricular pressures at rest and in response to exercise.

Estrogen Deficiency and Diet Differentially Regulate Goblet Cell Count and Inflammation in Gut

Candace R Longoria, Laurie B Joseph, Ke Sui, Diane Roopchand, Troy Roepke, Sara C Campbell, FACSM

Rutgers, The State University of New Jersey, New Brunswick, NJ

Estrogen is known to regulate many processes in women that protect them from inflammation prior to menopause. Upon menopause and estrogen deficiency, many women experience increased risk for inflammatory-based chronic diseases that can be comorbid with weight gain. Our lab has previously shown increased weight gain in ovariectomized (OVX) animals, gut microbiota alterations like obese models, and increased intestinal inflammation. 4-Vinylcyclohexene dioxide (VCD) is an injectable chemical used to induce menopause and decrease estrogen production.

However, the extent to which VCD is like OVX and how VCD may interact with high-fat diets is not well understood. **PURPOSE:** The purpose of this study was to investigate the effect of estrogen deficiency, via VCD injection, in animals fed diets that contains high (22.5%) and low (1%) amounts of omega-6 fatty acids (LA). **METHODS:** Forty 4-month old C57BL/6J female mice were fed a chow diet and injected with either VCD or oil (control). After 4 weeks of injections, mice were fed either 22.5% or 1% LA diets for an additional 4 weeks until sacrifice; estrous stage was noted at time of sacrifice. Colon samples were collected and preserved in 3% paraformaldehyde 2% sucrose solution for immunohistochemistry. Tissue staining included (1) Periodic acid–Schiff (PAS) to observe goblet cells and (2) the inflammatory marker cyclooxygenase-2 (COX-2). **RESULTS:** Unlike OVX, VCD-injections did not cause significant weight gain in either 22.5% (35.9±6.4 vs 34.5±4.7, oil vs VCD) or 1% (34.5±5.9 vs 33.4±4.7, oil vs VCD) LA groups. Control animals had higher numbers of goblet cells, the highest noted in 22.5% LA fed animals. Contrary to this, VCD-injected animals had less goblet cells irrespective of diet consumed. COX-2 expression was highest in control animals fed 22.5% LA diet. VCD-injected animals on either diet had a similar expression of COX-2 but appears less than control animals fed 22.5% LA diet. **CONCLUSION:** VCD did not increase weight gain as normally seen with OVX, however it did reduce the number of goblet cells present in gut which could not be rescued with 22.5% LA. VCD-injected animals on either diet did not express the same amount of inflammation as control animals fed 22.5% LA diet. Our data indicate that high-fat diets combined with VCD injections may not behave the same as OVX procedures.

Funded by Rutgers Institute of Food, Nutrition and Health Pilot Grant Program

Effects of Capsaicin on the Hemodynamic Responses to Handgrip Exercise: Potential Influence of Race

Brian Lora, Tawn Tomasi, Meaghan Lynch, Gaia Giuriato, Jack Schickler, Emma Finegan, Emma Basso, Robert Restaino, and Stephen J. Ives. Skidmore College, Saratoga Springs, NY

Previous work in vitro suggests that capsaicin, the spicy ingredient in peppers, attenuates the vascular response to sympathetic activity ("sympatholysis"), likely mediated through vascular transient receptor potential vanilloid type 1 (TRPV1), improving vascular function, though translational studies are needed. Further, given racial disparities in cardiovascular health, exploring the potential physiological mechanisms underpinning these differences is warranted. **Purpose:** To determine the impact of acute capsaicin ingestion on the central hemodynamic responses to sympathetic stimuli, such as lower body negative pressure (LBNP) at rest. **Methods:** In a single-blind crossover design, 23 young healthy black (n=13) and white males (n=10) were given placebo (fiber) or capsaicin (Chile pepper) capsules. Stroke volume (SV), cardiac output (CO), mean arterial pressure (MAP), and heart rate (HR), were measured continuously using a Finometer, at rest and during LBNP (-20 mmHg). **Results:** Baseline SV was significantly different between black and white males (black male capsaicin: 81±15 vs white male capsaicin: 98±17, p=0.032). Baseline CO in the capsaicin trial was trending towards a significant difference (black male capsaicin: 4.6±0.8 vs white male capsaicin: 5.4±0.9, p=0.076). The LBNP-induced changes at rest appeared larger for black males (SV -18±4ml vs. -8±11ml and MAP 4.6±6 vs. 1.3± 5mmHg, black vs. white), which were reversed with acute capsaicin (SV -10.7±13 vs. -9±16ml and MAP -2±9 vs. 1.2± 8mmHg, black vs. white). **Conclusion:** Capsaicin, and assumed activation of TRPV1 receptors in afferent neurons, seems to affect the hemodynamic response to LBNP, in a race-

specific manner. However, further work is needed to determine the mechanisms for the differences in hemodynamics at rest and in response to LBNP and acute capsaicin between races.

Disordered Eating Screen for Athletes (DESA-6): Addressing Relative Energy Deficiency in Sport (RED-S) Syndrome

Ryley P. Mancine, Catelyn M. Zuhl, Shea D. Repins, Donald W. Gusfa, Samantha F. Kennedy. Michigan State University, College of Osteopathic Medicine, East Lansing, MI

Disordered eating (DE) in adolescent athletes has been linked to stress fracture and mood disturbances and is a major component of both the Female Athlete Triad and Relative Energy Deficiency in Sport (RED-S) syndrome. Additionally, DE may progress to a clinical eating disorder (ED). DE can be treated much more easily than an ED, and athletes can return to play dramatically faster. Thus, early identification of DE is important. **PURPOSE**: To create and validate the Disordered Eating Screen for Athletes (DESA-6), a tool that would identify DE in athletes of all sports. **METHODS**: Our study consisted of two major phases. During phase one, 308 adolescent participants (ages 12-19) were recruited from 10 high schools in the Midwest. Participants took both the Eating Attitudes Test (EAT-26), along with the proposed screening tool. During phase two of the study, 82 participants who completed phase one (41 experimental group, 41 control group) were randomly selected for interview using the Eating Disorder Examination v17 (EDE-17), which is considered to be "gold standard" for diagnosis of an ED. The results of the EDE-17 were compared to the results obtained by the EAT-26 and DESA-6 screening tools. **RESULTS**: When comparing the DESA-6 to the EDE-17, it was found that the area under the ROC curve (AUC) was 0.892, with a sensitivity of 92.00% and specificity of 85.96%. Further, female athletes who reported to have a season-ending injury or greater than 3 injuries in the past season were 6.24 times more likely to show purging behavior ($p=0.04$) than ones who did not. No males in the study showed purging behavior. Males were 3.56 times more likely to demonstrate binging behavior when reporting a season-ending injury or greater than 3 injuries in the past season ($p=.01$) than ones who did not. **CONCLUSION**: The DESA-6 is an effective screening tool that can be easily implemented by various athletic departments, physicians, and sports personnel. This screening tool is efficient and can quickly identify DE before it progresses into an ED. As RED-S syndrome and the Female Athlete Triad present with DE as a major concern, identifying DE early can help prevent further complications. Purging behaviors and binging behaviors are major concerns for female and male athletes respectively and should be considered when screening for RED-S syndrome.

Funded by American Academy of Child and Adolescent Psychiatrists (AACAP) Pilot Research Award

No Sex Differences in Inflammatory Response and Vascular Function During Low Estrogen Phase

Sara E. Mascone, Catalina A. Chesney, Lauren E. Eagan, Sushant M. Ranadive. University of Maryland, College Park, Maryland.

Acute inflammation increases pro-inflammatory cytokine production and reduces nitric oxide bioavailability, resulting in impaired vascular function. Estrogen has both anti-inflammatory and pro-vasodilatory properties. During the high estrogen, mid-luteal phase of the menstrual cycle, sex differences in vascular function and inflammatory responses to induced inflammation have been observed in premenopausal women as compared with age-matched men. **PURPOSE:** To evaluate sex differences in vascular responses to induced inflammation- with a reduced influence of estrogen concentration. **METHODS:** In a double-blind crossover sham-controlled study of 15 women (21±3y) and 15 men (21±2y), we assessed pro-inflammatory interleukin-6 concentration ([IL-6]) and vascular function via brachial artery flow mediated dilation (FMD) at baseline (BL), 24 hours (24H), and 48 hours (48H) after influenza vaccine administration. Women were studied when circulating estrogen levels are typically low (early follicular phase or placebo pill phase of oral contraceptive pills) and similar between sexes. **RESULTS:** Following induced inflammation, both sexes exhibited an increase in [IL-6] at 24H (BL v 24H: women p=0.0024; men p=0.0029) that returned to near baseline levels by 48H (BL v 48H: women p=0.64; men p=0.30; [IL-6] (pg/mL): women BL: 0.54 ± 0.5, 24H: 1.12 ± 0.6, 48H: 0.57 ± 0.3; men BL: 0.39 ± 0.2, 24H: 1.07 ± 0.7, 48H: 0.58 ± 0.2). There were no sex differences in FMD or [IL-6] at any time point (FMD: sex p=0.062, time p=0.30, interaction p=0.25; FMD (%): women BL: 8.33 ± 4.8, 24H: 6.40 ± 4.4, 48H: 9.05 ± 5.5; men: BL: 5.25 ± 2.9, 24H: 6.14 ± 2.1, 48H: 6.71 ± 1.1; [IL-6]: BL: p=0.74, 24H: p=0.57, 48H: p=0.66). Though, women exhibited significantly lower resting brachial artery diameter (BL D; p<0.0001 all time points) than men (BL D (mm): women BL: 3.22 ± 0.4, 24H: 3.18 ± 0.4, 48H: 3.19 ± 0.4; men BL: 4.07 ± 0.6, 24H: 4.24 ± 0.4, 48H, 4.22 ± 0.4). However, there were no sex differences in allometrically scaled FMD (sex p=0.11, time p=0.20, interaction p= 0.072; Scaled FMD (%): women BL: 6.39 ± 3.7, 24H: 4.32 ± 3.8, 48H: 6.92 ± 3.7; men BL: 7.03 ± 3.9, 24H: 8.71 ± 4.2, 48H: 8.69 ± 4.3). **CONCLUSION:** When estrogen concentrations are low, women show similar inflammatory responses and vascular function as compared with age-matched men.

Funded by UMD Tier 1 Grant (UMD seed grant for Sushant Ranadive)

Satellite cell myogenic capacity is maintained in aged human muscles

Davi A.G. Mázala[1]*, James S. Novak[1,2,3]*†, Marie Nearing[1,4], Nayab F. Habib[1], Tessa Dickson[1], Olga B. Ioffe[5], Brent T. Harris[6], Marie N. Fidelia-Lambert[7], Christopher Rossi[8], D. Ashely Hill[8], Kathryn R. Wagner[9,10], Eric P. Hoffman[1,11], Terence A. Partridge[1,2,3]†
[1] Children's National Hospital, Washington, DC; [2] Department of Genomics and Precision Medicine, The George Washington University School of Medicine and Health Sciences, Washington, DC; [3] Department of Pediatrics, The George Washington University School of Medicine and Health Sciences, Washington, DC; [4] Department of Medicine, University of Alabama at Birmingham, Birmingham, AL; [5] Department of Pathology, University of Maryland School of Medicine, Baltimore, MD; [6] Department of Neurology and Pathology, Georgetown University Medical Center, Washington, DC; [7] Department of Pathology, Howard University Hospital, Washington, DC; [8] Department of Pathology and Laboratory Medicine, Children's National Hospital, Washington, DC; [9] The Hugo W. Moser Research Institute, Kennedy Krieger Institute, Baltimore, MD; [10] Departments of Neurology and Neuroscience, Johns Hopkins University School of Medicine, Baltimore, MD; [11] Department of Pharmaceutical Sciences, School of Pharmacy and Pharmaceutical Sciences, Binghamton University, Binghamton, NY

***** Co-authorship: authors should be regarded as joint first authors and have contributed equally to this work.

The age-related loss of muscle mass and strength has been attributed to the limited myogenic capacity of satellite cells (SC). However, the majority of studies evaluating SC function has been performed *in vitro* and only a very limited number of studies have evaluated their function *in vivo*. **PURPOSE:** we used our established xenograft model to test whether the myogenic capacity of SC from muscles isolated from human cadavers, across a range of different ages, is maintained after being transplanted to mice. **METHODS:** Strips of human muscles derived from different donors were transplanted into the anterior compartment of the mouse leg (after removal of the tibialis anterior and extensor digitorum longus muscles), followed by closure of the skin with surgical glue and stainless-steel wound clips. At 3- and 6-weeks post-surgery, animals were euthanized and muscles were quickly dissected and snap frozen. Frozen muscles were then immunostained and imaged using specific antibodies. Statistical analyses performed by one-way ANOVA with multiple comparisons. **RESULTS:** all human muscle samples that successfully regenerated showed a similar regenerative capacity regardless of the age of the donor (from 36 to 78 years of age). Additionally, we found no apparent decline in the regenerative capacity of human SCs with extended postmortem intervals (from 4 to 11 days postmortem). Our results also showed that muscle fiber sizes were similar between all regenerated muscles at 3 weeks post post-transplant. **CONCLUSION:** Our findings demonstrate that the age-related loss in muscle mass is not attributed to ineffective satellite cell myogenic function but is potentially due to an inimical environment that does not favor the myogenicity of these cells.
Supported by the National Institutes of Health NIAMS (R21AG051260 | TAP, EPH; T32AR056993 | JSN, DAGM), Foundation to Eradicate Duchenne (JSN, DAGM), Muscular Dystrophy Association (MDA295203 | TAP; MDA480160 | JSN), Parent Project Muscular Dystrophy (TAP), and Duchenne Parent Project Netherlands (JSN).

Associations between BMI, Body Composition, Sleep and Physical Activity in College Students

Traci A. McCarthy, Emily E. Glavin, Kirsten M. Sutterlin, and Andrea M. Spaeth. Department of Kinesiology & Health, Division of Life Sciences, School of Arts and Sciences, Rutgers University, New Brunswick, NJ

Body Mass Index (BMI) is a universal method for weight classification, but is limited by its inability to assess body composition and may lead to improper weight classification especially for muscular individuals. Obesity is associated with poorer sleep and decreased physical activity but many evaluations rely on BMI rather than body composition classification. **Purpose:** We aimed to compare classification of weight status based on BMI and body composition and to evaluate associations between these measures and sleep and physical activity. **Methods:** College age subjects (N=28, 19.9±1.7 y, n=19 females) were recruited to participate in a two-week study. Participants completed a demographic survey, physical activity questionnaire, the Pittsburg Sleep Quality Index (PSQI), anthropometric measurements, two weeks of wrist-worn actigraphy, and a dual-Energy X-Ray Absorptiometry scan. Participants were classified as normal weight, overweight or obese based on WHO BMI classification and ACSM Body Composition

classification. Cohen's Kappa was used for interrater reliability and Pearson correlations were used for associations. **Results**: There was poor interrater reliability (0.049±.05 p>0.05) between BMI and body composition for weight classification. Increased body fat percentage was not associated with subjective (PSQI) sleep outcomes, but was correlated with less sleep fragmentation (r(28)=-0.45, p=0.017) and lower sleep efficiency (r(28)=0.332 p=0.085), and decreased frequency of cardiovascular (r(28)=-0.49 p=0.007) and resistance (r(28)=-.44 p=0.003) exercise. Increased BMI was not associated with objective sleep outcomes or physical activity measures, but was correlated with increased subjective sleep disturbances (r(28)=0.442 p=0.018). **Conclusion:** There is particularly poor agreement between BMI and body composition classification for young adults. Body composition classification may be more useful for examining relationships between weight status and other health behaviors. In this sample, we found that participants with higher body fat percentages performed less exercise but exhibited better measures of sleep continuity. Data collection is ongoing to enlarge the sample size and examine comparisons between weight status groups.

Physiological Responses of Thoracic Load Carriage During Walking in Men and Women

Jordan L. Miller, Ashley Y. Lesniak, Curt B. Dixon, FACSM.
Lock Haven University, Lock Haven, PA

Tactical occupations regularly require load carriage (LC). **PURPOSE:** To investigate the physiological responses of thoracic LC during walking between men and women. **METHODS:** Eight men (age: 21.0 ± 0.5yr; height: 180.1± 1.7cm; mass: 87.9 ± 4.5kg; body fat: 19.2 ± 2.5%) and eight women (age: 19.8 ± 0.3yr; height: 164.1 ± 2.5cm; mass: 64.0 ± 4.4kg; body fat: 23.5 ± 2.6%) participated in the study. On separate days, each subject completed four 10 min walking trials on a motorized treadmill at a predetermined unloaded intensity equal to 4 METs. Testing sessions included an unloaded (UL) trial, which served as the control, and wearing a light load (LL; 24lb = 10.9kg), moderate load (ML; 48lb = 21.8kg) and heavy load (HL; 80lb = 36.4kg) weighted vest. The testing order of the weighted vest trials was determined by counterbalanced assignment. Vest weights were selected to approximate common gear of tactical populations: law enforcement (LL), firefighter (ML), and military personnel (HL). Oxygen consumption (VO_2), heart rate (HR) and ratings of perceived exertion (RPE) were assessed during all trials. An average value from the last 2 min of exercise was calculated for VO_2, and HR for statistical analysis. Independent samples t-tests were used to compare variables. **RESULTS:** For all LC conditions, men had a higher absolute VO_2 (UL = 1.08 ± 0.13, LL = 1.18 ± 0.17, ML = 1.28 ± 0.19, HL = 1.45 ± 0.14 $L \cdot min^{-1}$) than women (UL = 0.81 ± 0.14, LL = 0.85 ± 0.14, ML = 1.00 ± 0.17, HL = 1.20 ± 0.19 $L \cdot min^{-1}$; $p \leq 0.008$). When normalized to body mass, only the HL condition showed a significant difference in relative VO_2 (men = 16.69 ± 1.88, women = 18.90 ± 1.94 $ml \cdot kg^{-1} \cdot min^{-1}$; p = .036). When expressed relative to fat free mass (FFM), significant differences occurred in the ML (men = 18.22 ± 2.43, women = 20.57 ± 1.53 $ml \cdot kgFFM^{-1} \cdot min^{-1}$; p = .036) and HL (men = 20.67 ± 1.88, women = 24.71 ± 1.35 $ml \cdot kgFFM^{-1} \cdot min^{-1}$; $p \leq 0.001$) conditions. A significantly higher HR was observed in women during ML (114 ± 13 bpm; p = .014) and HL (126 ± 4 bpm; p ≤ 0.001) compared to the men (ML: 97 ± 13 bpm, HL: 107 ± 11 bpm). RPE only differed between men (13.13 ± 3.27) and women (16.38 ± 1.77; p = .031) during the HL condition.

CONCLUSION: During ML and HL, relative VO_2 in women exceeded men. Possible explanations include body composition and biomechanical differences.

Supported by Lock Haven University's Small Campus Grant

COMPARISON OF SPRINT INTERVAL TRAINING AND MODERATE INTENSITY CONTINUOUS TRAINING TO MAXIMIZE NEUROMUSCULAR ADAPTATIONS

Masoud Moghaddam[1], Carlos A. Estrada[2], Tyler W.D. Muddle[3], & Bert H. Jacobson, FACSM[4]
[1]Salisbury University, Salisbury, MD; [2]Aurora University, Aurora, IL; [3]Mississippi University for Women, Columbus, MS; [4]Oklahoma State University, Stillwater, OK

Sprint interval training (SIT) refers to a group of sprint bouts separated by rest periods. SIT is a time-efficient strategy to improve aerobic performance similar to moderate intensity continuous training (MICT). There has been a relative absence of studies on neuromuscular adaptations of SIT. **PURPOSE:** To compare the effects of stationary air biking, utilizing high-volume MICT and low-volume SIT (i.e., ultrashort-SIT [US], short-SIT [SS]) on neuromuscular system. **METHODS:** Thirty recreationally active females were randomly assigned to MICT (n = 10), US (n = 10), and SS (n = 10) groups. The intervention consisted of 3 d/wk for 4 wks. MICT was performed by 30 min of cycling at 75% of maximal heart rate reserve, while SIT (i.e., US, SS) consisted of 3 sets of 8 intervals at maximal effort intensity. SS and US were performed with 20s:10s and 10s:5s work-to-rest ratios and provided with 5- and 2.5-min recovery periods between sets, respectively. Muscle cross-sectional area (mCSA) and echo intensity (EI) of rectus femoris (RF) and vastus lateralis (VL) were measured by ultrasound system. Isometric strength testing protocol consisted of 3 maximal voluntary isometric contractions (MVIC). During each contraction, surface electromyography (sEMG) and torque signals were recorded to assess sEMG amplitude (RMS) of RF and VL as well as peak torque (PT). All variables were measured before and after intervention and were analyzed with 2-way mixed factorial ANOVAs. Moreover, average total work (TW) during 12 sessions was recorded and analyzed with one-way ANOVA. **RESULTS:** There were significant ($p < 0.05$) differences in TW (MICT: 142.7 ± 31.5 cal., US: 52.6 ± 10.0 cal., SS: 92.3 ± 7.8 cal.) between groups. All groups significantly ($p < 0.05$) improved mCSA of RF (MICT: 9.0 ± 1.0 to 9.5 ± 1.1 cm^2, US: 9.9 ± 3.5 to 10.6 ± 3.6 cm^2, SS: 9.0 ± 1.9 to 9.7 ± 1.5 cm^2) and VL (MICT: 20.0 ± 2.3 to 20.6 ± 2.1 cm^2, US: 20.8 ± 5.1 to 22.5 ± 5.2 cm^2, SS: 19.6 ± 2.6 to 21.4 ± 3.8 cm^2). No significant ($p > 0.05$) differences observed in EI values as well as RMS and PT during MVIC. **CONCLUSION:** Despite no significant improvements in neural activation and isometric strength, all groups similarly improved muscular morphology of RF and VL by performing SIT on a stationary air bike. These findings suggest that SIT can elicit muscular morphological adaptations with a shorter time commitment.

Structured Resistance Training Improves Self-Esteem and Strength in Previously Untrained College Females

Katheryn R. Morrow, Nicholas A. Bowman, Matthew T. Cramer, Andrea Magallanes, Isabella Mendiola, Caitlin A. Lamm-Ortega, Megan Schlesinger, Jennifer A. McKenzie, and Richard H. Laird.
McDaniel College, Westminster, MD

In addition to regular exercise's physical benefits, research has recognized its potential psychological benefits. **PURPOSE**: To determine structured resistance training's effect on strength, self-esteem, stress, and body composition in untrained college females. **METHODS**: Healthy, untrained college females (n=38) completed barbell back squat, bench press, and deadlift 5-repetition maximum (5-RM) testing, the Rosenberg Self-Esteem Scale (RSES), the Perceived Stress Scale (PSS), and bioelectrical impedance analysis of body composition, before and after 8 weeks of supervised, twice weekly resistance (n=22) or aerobic (n=16) training. Resistance training consisted of the barbell back squat, deadlift, and bench press with linear progression of training load, whereas aerobic sessions involved moderate intensity group exercise (primarily walking). Within and between group changes were analyzed using t-tests. A Bonferroni type adjustment was used and a p-value<0.013 was considered statistically significant. **RESULTS**: Data are reported as mean ± SD. Although the aerobic group was younger than the resistance group (18 ± 1 versus 19 ± 1 yrs, respectively; p<0.01), there were no differences in height, weight, percent fat, 5-RM squat, 5-RM bench press, 5-RM deadlift, RSES score, or PSS score between the groups before training. Participants completed over 80% of their training sessions. There were no changes in weight, percent fat, 5-RM values, RSES score, or PSS score for the aerobic group following the completion of the 8-week training intervention. In contrast, the resistance training group significantly increased percent fat (2.0 ± 2.0 %, p<0.001), 5-RM squat (52 ± 20 lbs, p<0.001), 5-RM bench press (16±7 lbs, p<0.001), 5-RM deadlift (45 ± 17 lbs, p<0.001), and RSES score (3.1±3.3, p<0.001). PSS score did not change with resistance training (p=0.10). The between group differences in 5-RM squat, bench press, deadlift, and RSES score were significant (all p<0.01). **CONCLUSION**: Although percent body fat increased slightly, structured resistance training in previously untrained college females positively impacted their physical strength and self-esteem. Further research is needed involving stress, as the college's final exam schedule may have impacted the results.

Supported by the McDaniel College Student-Faculty Summer Research Fund

Cardiometabolic, Inflammatory and Physical Inactivity Risk Factors in those with and without History of Pneumothorax

Peyton Paschell,[1] Michael Bruneau Jr.[1]
[1]Drexel University, Philadelphia, PA.

Pneumothorax (PTX), a condition where air builds within the pleural cavity, affects between 1.2 – 35.0 cases per 100,000 population. Although the exact pathophysiology of PTX is unknown, spontaneous rupture of subpleural blebs or bullae have been proposed as mechanisms. Risk factors for PTX include being male, tall, thin, a smoker or living with a preexisting condition. Other factors implicated with pulmonary function, including cardiometabolic and inflammatory biomarkers and physical activity, may heighten the risk of PTX but have not been previously compared nor explored. **PURPOSE:** To determine whether differences in cardiometabolic and inflammatory

biomarkers and physical activity exist between those with and without a history of PTX from the (2007-2012) National Health and Nutrition Examination Survey (NHANES). **METHODS:** A total of 170 participants with a history of PTX were compared to those without a history of PTX. Physical characteristics measured included cardiometabolic (blood pressure, heart rate, blood lipids, anthropometrics and body composition) and inflammatory biomarkers (white and red blood cell counts, nitric oxide, hemoglobin and platelets), and physical activity (times and minutes of moderate/vigorous/walking/cycling, and sedentary activity per day/week). T-Tests determined differences in these variables between people with and without a history of PTX. Alpha levels were set *a priori* to p<.05. **RESULTS:** Significant differences were identified between those with and without a history of PTX for average diastolic blood pressure (t=3.82, p<.001), total cholesterol (t=3.33, p<.01), heart rate (t=-4.66, p<.01), weight (t=6.40, p<.001), height (t=9.15, p<.001), lymphocytes (t=-2.20, p=.028) red blood cell counts (t=3.40, p<.01), and hemoglobin (t=5.65, p<.001). No differences were found for physical activity (p>.05). **CONCLUSION:** We found significant differences in cardiometabolic and inflammatory biomarkers in those with and without a history of PTX. Physical activity was similar between cohorts but may have been due to a small number of cases or self-reporting bias. Future studies exploring possible predictors of PTX should consider cardiometabolic and inflammatory risk factors and replicate our findings with larger samples and more objective measures of physical activity.

No Brain No Game? Altered Sensorimotor and Fronto-Limbic Circuitry in Individuals with ACL Rupture

Felix Proessl, Maria C. Canino, Alaska L. Beck, Courtenay Dunn-Lewis, Shawn D. Flanagan
University of Pittsburgh, Pittsburgh, PA.

Sensorimotor deficits and kinesiophobia are prevalent after anterior cruciate ligament ruptures (ACLR). Nevertheless, current research and rehabilitative practices generally focus on peripheral rather than central aspects of injury, leaving the cortical contributions to ACLR less understood. **PURPOSE:** To determine differences in sensorimotor and fronto-limbic circuitry between healthy individuals (CON) and those with a history of unilateral ACLR. **METHODS:** Nineteen age- and physical activity-matched women (9 ACLR, Age: 21±3yrs, BMI: 24.3±2.6kg/m^2) completed surveys of fear of movement (TSK), readiness to return to sport (ACL-RSI), and knee function (IKDC-S). Participants completed brain imaging with T1-weighted and diffusion sequences. Voxel-based cortical thickness and quantitative anisotropy (QA) were derived using cortical morphometry and diffusion connectometry, respectively. Between-group comparisons were made using a one-way ANOVA and bootstrapped permutation tests with FDR-correction (diffusion MRI). Associations between brain imaging outcomes and questionnaires were made using Pearson correlations. **RESULTS:** Mean duration since ACLR was 3.2±2.6yrs. ACLR reported greater TSK (ACLR:0.46±0.06, CON:0.39±0.07, p=0.04), worse ACL-RSI *(*ACL:61.92±22.01, CON:91.37±7.30, p<0.001) and lower IKDC-S *(*ACLR:0.90±0.06, CON:0.99±0.02, p<0.001). Voxel-based analysis revealed reduced cortical thickness in the pre- and postcentral gyrus in ACLR. RSI positively correlated with cortical thickness in sensorimotor and fronto-limbic areas (r range: 0.47-0.80, p<0.05). In alignment, ACLR demonstrated reduced QA in the corticospinal tract, cerebellar peduncle, anterior corpus callous, cingulum, and inferior-fronto-occipital fasciculus. **DISCUSSION:** Years after injury, individuals with ACLR reported worse knee

function, readiness, and fear of movement, which corresponded to alterations in sensorimotor and fronto-limbic circuitry. These findings further support the involvement of the central nervous system in ACLR and encourage the consideration of brain structure and function in the rehabilitation process.

Associations of Anxiety and Depressive Symptomology on Subclinical Cardiovascular Disease Risk in Young Women

Isabel N. Reedy, Jacob P. DeBlois, Alaina C. Glasgow, Kevin S. Heffernan. Syracuse University, Syracuse, NY.

Chronic elevations in anxiety (AS) and depression symptomology (DS) contribute to cardiovascular disease (CVD) development. Women have a higher prevalence of elevated AS and DS than men. While elevated AS and DS increase the risk of hypertension and obesity, both traditional risk factors for CVD, their influence on subclinical CVD risk factors are less explored, especially in young women. Physical activity (PA) decreases subclinical CVD risk and may be protective against AS and DS. **PURPOSE:** To investigate the association between AS and DS with CVD risk in young women and to investigate the association of PA with AS, DS and CVD risk. **METHODS:** Ten young women (21 ± 1 yrs) participated in this study. Augmentation index (AIx), a measure of systemic vascular function and cardiac load, was obtained from 24-hr ambulatory hemodynamic assessment and used to measure CVD risk. PA was measured using a triaxial accelerometer as minutes per day of moderate-vigorous physical activity (MVPA) over 7 days. Participants completed the General Anxiety Disorder-7 (GAD-7) and Beck Anxiety Inventory (BAI) to measure AS and the Beck Depression Inventory (BDI) and Center of Epidemiologic Studies Depression Scale (CES-D) to measure DS. Pearson correlation coefficients explored univariate associations between AS and DS with subclinical CVD risk. Partial correlations explored MVPA as a possible mediator of the relationship between measures of AS, DS, and subclinical CVD risk. **RESULTS:** Nocturnal AIx was associated with CES-D ($r = 0.75$, $p = 0.01$) and BDI ($r = 0.65$, $p = 0.04$) scores, but not GAD-7 ($r = 0.49$, $p = 0.15$) or BAI ($r = 0.39$, $p = 0.27$). MVPA was inversely related to GAD-7 ($r = -0.78$, $p < 0.01$), BAI ($r = -0.55$, $p = 0.050$), BDI ($r = -0.65$, $p=0.022$), and CES-D ($r = -0.69$, $p = 0.013$). MVPA was inversely associated with nocturnal AIx ($r = -0.60$, $p = 0.03$). Adjusting for MVPA caused the relationship between nocturnal AIx and BDI ($r = 0.43$, $p = 0.44$), as well as nocturnal AIx and CES-D ($r = 0.58$, $p = 0.10$), to no longer be significant. **CONCLUSION:** DS is associated with increased nocturnal cardiac load in young women. PA potentially mediates this relationship, with increases in MVPA contributing to decreased AS, DS, and cardiac load. PA has a favorable effect on both cardiovascular and mental health in young women.

Supported by the Syracuse University Honors Program Crown Award

Comparison of Portable to Laboratory-based Near Infrared Spectroscopy Sensors for Assessing Muscle Health During Exercise

Julie S. Rekant, April J. Chambers
University of Pittsburgh, Pittsburgh, PA

A cost-effective and non-invasive way to monitor muscle health is with near infrared spectroscopy (NIRS). NIRS uses the concepts of light scattering to assess muscle blood flow continuously during functional activities to provide information on muscle nutrition and oxygenation. How newly developed, commercially available, portable NIRS sensors perform compared to the gold standard laboratory-based NIRS technology is unknown. **PURPOSE:** To determine the validity of a wireless NIRS sensor in monitoring changes in vascular muscle health during an exercise protocol. **METHODS:** Nine healthy adults (age: 25 ± 3 yrs, BMI: 27 ± 3 kg/m^2) completed a structured exercise routine while equipped with a portable NIRS sensor and a gold standard laboratory-based NIRS sensor on either medial gastrocnemius. Percentage of oxygenated haemoglobin in the muscle tissue (SmO2) was calculated for both systems. Agreement between the signals was quantified with root mean square error (RMSE) for each subject over the whole trial and during each activity (walking, brisk walking, and stair stepping). The effect of activity on signal agreement was evaluated with a repeated measures ANOVA with RMSE as the dependent variable and activity type as the independent variable. **RESULTS:** Over the whole trial, RMSE of SmO2 across all subjects was 21.5% ± 14.4% indicating poor overall agreement of the portable NIRS signal to the laboratory NIRS signal. RMSE during walking, brisk walking, and stair stepping were 20.2% ± 18.6%, 19.1% ± 12.8%, and 21.0% ± 14.8%, respectively. Signal agreement was not affected by activity type ($F=0.18$, $p=0.84$). **CONCLUSION:** Direct comparisons between the portable and laboratory NIRS devices should be done with caution due poor agreement between the two signals. Differences between system estimates are likely due to different light emitter and detector technologies, different assumptions made for the SmO2 calculations, and differences in fit of the sensors and skin contact. The validity of the portable NIRS device is not activity-dependent. Future work should explore how to best compare data between the two devices so the portable NIRS sensors can be reliability implemented for at-home monitoring of muscle health.

Supported by University of Pittsburgh Healthy Lifestyle Institute Pilot & Feasibility Funding Program

Role of Morning versus Evening Chronotype on Insulin Sensitivity and Central Hemodynamics in Adults with Metabolic Syndrome

M. Remchak[1], E. M. Heiston[2], A. Ballantyne[2], N.R. Stewart[1,2], U. Cheema[2], A. Spaeth[1], S.K. Malin[1,2] (FACSM) Rutgers University, New Brunswick, NJ 08901; University of Virginia, Charlottesville, VA 22904

Chronotype represents an individual's preferred time of day to perform daily activities. Late chronotypes (i.e. "evening people") tend to have higher risk for obesity, hypertension and type 2 diabetes than morning chronotypes. However, to what extent insulin sensitivity or central hemodynamics relates to chronic disease risk per chronotype remains unclear in people with metabolic syndrome (MetS). **PURPOSE**: To understand whether chronotype has relationships with insulin sensitivity and central hemodynamics in patients with MetS. **METHODS**: Chronotype was defined by self-reported Morning-Eveningness Questionnaire (MEQ) of 39 adults with MetS (median age 54 yr, 36 kg/m^2 BMI, 3 ATP III criteria, 82.1% Female) per ATP III criteria. Population was divided at the 50% to compare morning (n=20) versus evening (n=19)

chronotype. The Epworth questionnaire was provided to determine daytime sleepiness. A 120 min euglycemic clamp (40 mU/m^2/min, 90 mg/dl) was performed to test metabolic insulin sensitivity (glucose infusion rate). Central hemodynamics were characterized (augmentation index (AIx75bpm), augmentation pressure (AP), forward (Pf) and backward (Pb) pulse wave, pulse pressure (PP)) before and after the clamp. VO2peak (indirect calorimetry) and body composition (DEXA) were also measured. **RESULTS**: There was no difference in age, BMI, ATP III criteria or daytime sleepiness between groups. Morning chronotype though tended to have higher VO_{2peak} (ml/kg/min) (p=0.09) and metabolic insulin sensitivity (p=0.065), as well as lower AIx75 (p=0.09), AP (p=0.054), and Pf (p=0.06) after insulin infusion than evening chronotype. MEQ was significantly linked to fasting glucose (r= -0.32, p=0.04), HDL (r= -0.34, p=0.03) and Pf 120 min (p=0.058, r=-0.32). BMI was also significantly correlated with AP (r= 0.32, p=0.054), PP (r= 0.44, p= 0.007) and Pb (r=0.45, p= 0.006) and Pf (r=0.39, p=0.02) 120 min after insulin infusion. **CONCLUSIONS**: Despite classification of MetS, morning chronotype appears to confer more favorable cardiometabolic health than self-identified "evening people".

Funded by NIH RO1-HL130296

Dynamic Verification of a Linear Model Approach for Estimating Scapular Kinematics during Baseball Pitching

R. Tyler Richardson, Pennsylvania State University Harrisburg, Middletown, PA

Biomechanical analyses of pitching possess limitations in accurately measuring scapular kinematics and distinguishing between glenohumeral and scapulothoracic (ST) contributions to shoulder motion. An individualized linear model (LM) approach using measurable humerothoracic (HT) orientation to estimate ST orientation has been validated for static postures within a pitching motion, but dynamic HT external rotation angles during a pitch go beyond static HT limits used for LM creation potentially resulting in the LM estimating non-physiological ST orientations. Dynamic validation is needed but is not feasible as dynamic gold standard references either prohibit a natural throwing motion (bone pins) or have inadequate sampling rates for a dynamic pitch (fluoroscopy). In lieu of a gold standard dynamic validation, LM estimates of dynamic ST range of motion (ROM) during a pitch can still provide insights beyond those of a static validation. **PURPOSE:** To provide dynamic verification of the LM by assessing its ability to estimate ST kinematics throughout a full speed throwing motion by comparing against published cadaveric ST ROMs found during an abbreviated throwing motion. It was hypothesized that LM estimated ST ROMs would be within physiological limits. **METHODS:** Trunk and upper extremity segment orientations of 14 collegiate pitchers were measured with motion capture during a pitch. Each subject's arm was placed in six calibration positions representing the extremes of HT orientations throughout his pitching motion while ST orientations were found by palpation. The LM used multiple linear regression on the static position data to create equations that estimated ST angles from HT angle inputs. The LM was applied to predict ST kinematics during the dynamic pitch trial. **RESULTS:** The dynamic LM ST ROMs regularly went beyond cadaveric limits determined from an abbreviated throwing motion, however, mean and (max) LM ROMs reported were plausible for a full throwing motion at 36.9° (63.3°), 46.9° (55.9°), and 23.0° (45.8°) on ST upward/downward rotation, internal/external rotation, and anterior/posterior tilt, respectively. **CONCLUSION:** This study shows that LM estimates of ST ROM throughout a throwing motion

are physiologically plausible and provides a rudimentary dynamic verification of the LM during pitching.

THE EFFECT OF A 7-WEEK PROGRESSIVE YOGA INTERVENTION ON HAMSTRINGS FLEXIBILITY

T. Run-Kowzun, TT. LaSala, M. Figueroa. William Paterson University, Wayne, NJ

Purpose: To determine the effect of a 7-week progressive yoga intervention on hamstrings flexibility using a digital goniometer. It was hypothesized that hamstring flexibility will increase in as healthy young adult population. ***Methods:*** Thirty-one college-aged males and females (M= 21 ± 2.62) years participated in 110 minutes twice per week for a 7-week progressive yoga intervention. Pre and post-test measurements were taken to determine hamstring flexibility on the right and left leg using a digital goniometer. ***Results:*** A paired samples t-test indicated a significant difference in the pre and post-test on hamstring flexibility ($p < .000$). Results for the right leg pre-test (M= 78.29 ± 7.98) and post-test (M= 82.99 ± 6.92) and from the left leg pre-test (M= 77.41 ± 8.64) and post-test (M= 81.67 ± 7.74) indicated an improvement after the intervention. Average range of motion increase was 4 degrees in both legs. ***Conclusion:*** Hamstring flexibility can be improved with a progressive 7-week Hatha yoga session and may be used as a modality to improve flexibility and function in activities of daily living as well and athletic performance.

Association Between DXA and HR-pQCT Measurements of Bone Characteristics in Recreationally Active, Recruit-Aged Men

Nicole M. Sekel[1], Adam Sterczala[1], Kellen T. Krajewski[1], Brian Martin[1], Nizam Ahamed[1], Qi Mi[1], Sophie L. Wardle[2], Thomas J. O'Leary[2], Julie P. Greeves[2], Shawn Flanagan[1], Chris Connaboy[1], Bradley C. Nindl, FACSM[1]
[1]Neuromuscular Research Laboratory, University of Pittsburgh, Pittsburgh, PA, USA
[2]Department of Occupational Medicine, Ministry of Defence, UK

Dual-energy x-ray absorptiometry (DXA) two-dimensional areal bone mineral density (aBMD) measurements are commonly employed to evaluate fracture risk but lack the resolution to distinguish between cortical and trabecular bone. In contrast, high-resolution peripheral quantitative computed tomography (HR-pQCT) provides three-dimensional volumetric BMD (vBMD) measurements of total, trabecular, and cortical bone. It is unclear whether aBMD accurately reflects vBMD of specific bone compartments in the distal tibia, a common injury site for military personnel. **Purpose:** To determine if lower leg aBMD correlates with distal total (Tt), trabecular (Tb) and cortical (Ct) vBMD in healthy, recruit-aged men. **Methods:** Forty-three recreationally active men (26.4±0.8 yrs.), free of any musculoskeletal conditions that could influence BMD, completed two HR-pQCT (XtremeCT; Scanco Medical, Brüttisellen, Switzerland) and a total body DXA (Lunar iDXA; GE Healthcare, Illinois, US) scan.Total body DXA excluding the head (Lunar iDXA; GE Healthcare, Illinois, US) and non-dominant tibial HR-pQCT (XtremeCTII; Scanco Medical, Brüttisellen, Switzerland) scans at the metaphysis (4% site)

and diaphysis (30% site) were obtained. Lower leg aBMD was assessed in DXA scans with custom region of interest (ROI) analysis between the ultradistal tibia and the tibial plateau. Associations between variables were analyzed with Pearson's correlations; alpha was set at $p \leq 0.05$. **Results:** aBMD positively correlated with Tt vBMD at both the 4% ($r^2=0.42$; $p<0.0001$) and 30% site ($r^2=0.16$; $p=0.0078$). aBMD positively correlated with Tb vBMD at the 4% site ($r^2=0.35$; $p<0.0001$), but not at the 30% site ($r^2=0.0002$; $p=0.9369$). aBMD was not correlated with Ct vBMD at the 4% site ($r^2=0.05$; $p=0.1680$) but was negatively correlated with Ct vBMD at the 30% site ($r^2=-0.12$; $p=0.0315$). **Conclusions:** There is poor to moderate association between lower limb aBMD and tibial vBMD at both metaphyseal and diaphyseal sites. Regional aBMD is unlikely to provide a suitable assessment of lower leg bone health. aBMD and tibial vBMD should, therefore, not be used interchangeably to examine the bone response to interventions or for the prediction of fracture risk.

Supported by UK Ministry of Defence (WGCC 5.5.6-Task 0107).

Exercise Barriers and Attitudes in Prostate Cancer Survivors Receiving Androgen Deprivation Therapy

Alex J. Sipolino, Kristofer S. Wisniewski, Saint Francis University, Loretto Pennsylvania

Exercise intervention barriers and attitudes for prostate cancer (PCa) survivors on androgen deprivation therapy (ADT) have not been discussed primarily in the exercise oncology literature. In addition, it is difficult to determine whether these barriers and attitudes exist due to treatment related side effects, or lack of physician guideline. **PURPOSE:** The primary research aims of the study were to examine barriers and attitudes of exercise in Pca survivors on ADT. The secondary aim of the study was to assess differences between Pca ADT survivors and those Pca survivors not on ADT. The third aim of the study was to assess physician and oncologist referrals for all Pca survivors. **METHODS:** Ten men aged 18-75 (68.22 ± 6.3) years old were recruited for the study. **RESULTS:** Frequency of reported scores for the Pca ADT survivor group found highest reported barriers for aerobic exercise being fatigue (50%) and that aerobic exercise is hard work (50%). Resistance training (RT) barriers included fatigue (50%) and that RT is hard work (75%). Overall attitudes showed higher positive feelings towards RT for the ADT group. Independent samples *t* tests showed significance for two individual questions on the Modified Exercise Benefit and Barrier Scale (one attitude question, one barrier question) for RT exercise lets me have contact with friends I enjoy (ADT: $3.3 \pm .50$, Non-ADT: $1.8 \pm .45$; $p=0.003$) and places for RT are too far away ($2.3 \pm .50$, $1.2 \pm .45$; $p=0.013$). Independent samples *t* tests also showed significance in time since diagnosis (4.8 ± 2.1, 10.6 ± 3.6; $p=.023$) and moderate intensity days per week (6.0 ± 1.0, $4.2 \pm .45$; $p=.011$). No statistical significance was seen for any other measure. **CONCLUSIONS:** Barriers exist for Pca survivors undergoing ADT for exercise. Fatigue and exercise being hard were present barriers for the ADT group, yet, cost and locations were not. The exercise professional needs to be heavily involved in education to both the survivor and physician and oncologist in order to better rehabilitate these survivors and achieve higher referral percentages. The results from this study can help Pca survivors undergoing ADT to begin structured exercise interventions, possibly having a positive effect in morbidity and mortality for these individuals.

Prior Exercise Does Not Prevent Increases in Vascular-Related Circulating MicroRNAs During Postprandial Lipemia

Catherine B. Springer, Ryan M. Sapp, William S. Evans, James M. Hagberg, FACSM, Steven J. Prior. Department of Kinesiology, University of Maryland School of Public Health, College Park, MD

Repeated exposure to a high-fat meal triggers inflammation and oxidative stress, contributing to the onset of cardiometabolic diseases. Regular exercise prevents cardiometabolic diseases and a prior bout of acute endurance exercise can counteract the detrimental cardiovascular effects of a subsequent high-fat meal. Circulating microRNAs (ci-miRs) are potential mediators of both cardiometabolic diseases and exercise responses through regulation of gene expression at the post-transcriptional level. **PURPOSE:** To determine whether an acute endurance exercise bout prior to a high-fat meal test alters the responses of ci-miRs related to vascular function. **METHODS:** Eight healthy, recreationally to highly active adult men underwent high-fat meal tests either with (EX) or without (CON) a bout of cycling exercise prior to the meal. Using real-time quantitative PCR, we measured the relative expression ($2^{-\Delta\Delta Ct}$) of vascular-related ci-miRs (miR-21, miR-92a, miR-126, miR-146a, miR-150, miR-155, miR-181b, miR-221, miR-222) before (baseline), as well as 2 and 4 hours after the high-fat meal. Repeated measures ANOVAs were used to analyze ci-miR changes with the high-fat meal and prior exercise as factors. **RESULTS:** Ci-miR-155 was the only ci-miR for which there was a significant interaction effect of the high-fat meal and exercise ($P = 0.05$). In the CON condition, ci-miR-155 increased 94% from baseline at 2 hours (0.55 ± 0.08 vs. 1.08 ± 0.24, $P < 0.01$) and remained elevated at 4 hours (1.04 ± 0.23, $P = 0.01$) after the high-fat meal. Conversely, in the EX condition ci-miR-155 increased from baseline only at 4 hours (110%, 0.68 ± 0.18 vs. 1.43 ± 0.29, $P < 0.01$), and these levels were greater than those in CON ($P = 0.03$). There were significant main effects of the high-fat meal, but no interaction effects, on ci-miR-21 ($P = 0.01$), ci-miR-126 ($P = 0.02$), ci-miR-146a ($P = 0.02$), ci-miR-181b ($P = 0.02$), and ci-miR-221 ($P < 0.01$), with increases of 29-242% at either 2 or 4 hours. **CONCLUSION:** Collectively, our results suggest that changes in ci-miR levels could contribute to high-fat meal induced changes in vascular function, but prior exercise does not prevent postprandial changes in the expression of these vascular-related ci-miRs.

Funding: ACSM Foundation Grant & University of Maryland Department of Kinesiology

The Effect of Carbon Composite Dynamic Response Ankle Foot Orthotics on Collegiate Athlete's Sprint Performance

Elizabeth A. Starns. Gannon University, Erie, PA

Carbon composite dynamic response ankle foot orthotics (CCDRAFOs) are lightweight ankle braces originally made to help pathologically involved legs walk more efficiently by helping increase walking speed. No known literature exists evaluating CCDRAFOs effects on healthy athletes' running performance. Therefore, no evidence exists to determine if CCDRAFOs help or hinder able-bodied individuals. **PURPOSE:** The purpose of this study was to evaluate the effects of CCDRAFOs on collegiate athlete sprinting performance. **METHODS:** Twenty-eight Gannon University baseball (N=19; M=19.11 ± 1.05 years) and softball (N=9; M=20.11 ±1.27 years)

players participated in this study with coaches' permission. Each athlete ran four, 20-yard sprints in an indoor fieldhouse. The athletes sprinted under the following four conditions: 1) no CCDRAFOs on, 2) a left leg CCDRAFO on, 3) a right leg CCDRAFO on, and 4) both left leg and right leg CCDRAFOs on. The variables measured included sprint time, number of strides, stride lengths, average sprint velocity, and ankle and knee joint angles. Multi- and univariate ANOVA's were used to analyze the interactions between variables. A post hoc analysis using Tukey test was completed, as well. **RESULTS:** Wearing bilateral CCDRAFOs significantly increased sprint times by 7% compared to not wearing CCDRAFOs ($F(3,93) = 2.82$, $\rho = 0.04$). Wearing a right CCDRAFO only and wearing bilateral CCDRAFOs both significantly decreased average sprinting velocities compared to not wearing CCDRAFOs ($M = 0.258$, $p = 0.039$, 95% CI [0.009, 0.507] and $M = 0.365$, $p = 0.001$, 95% CI [0.116, 0.614]) respectively. **CONCLUSION:** Wearing CCDRAFOs hindered able-bodied athletes' sprinting performance by increasing their sprinting times and decreasing their average sprinting velocities. Therefore, short-term use of CCDRAFOs do not help able-bodied individuals sprint performance.

Nocturnal Blood Pressure Dipping Relates to Insulin Sensitivity but not Vascular Function in Metabolic Syndrome

N.R. Stewart[1,2], E.M. Heiston[2], S.L. Miller[2], A.C. Ballantyne[2], U.S. Cheema[2], S.K. Malin (FACSM)[1,2] Rutgers University, New Brunswick, NJ 08901; University of Virginia, Charlottesville, VA 22904

Blunted dips in nocturnal systolic blood pressure (sBP) are independently related to cardiovascular disease. However, the role of metabolic and/or vascular insulin sensitivity in explaining nocturnal sBP regulation is unclear. **PURPOSE:** To test the hypothesis that nocturnal sBP dipping relates to metabolic insulin sensitivity as well as endothelial function. **METHODS:** Twenty-eight adults with metabolic syndrome (MetS) (53.2 ± 6.5y; 35.8 ± 4.5kg/m^2) according to ATP III criteria were categorized as "dippers" (>10% change in sBP; n=11; 6F) or "non-dippers" (<10%; n=18; 13F). Twenty-four hour ambulatory blood pressure monitoring was recorded to assess percent sBP dipping status. A 2-hr euglycemic-hyperinsulinemic clamp (40 mU/m^2/min, 90 mg/dl) was performed to test metabolic (glucose infusion rate/insulin) and vascular (brachial artery FMD) insulin sensitivity. Augmentation index (AIx; arterial waveforms), VO2max (indirect calorimetry) and body composition (DEXA) were also measured. **RESULTS:** Dippers had a significantly higher drop in sBP than non-dippers (17.82±5.25 vs. 1.78±6.17 %, $P<.001$). There were no significant differences in ATP III criteria, age, or body composition between dippers and non-dippers, but VO2max tended to be higher in dippers (24.23±4.44 vs. 21.17±3.52 mL/kg/min, $P=0.059$). Although fasted FMD (6.85±0.94% vs 7.39±1.05%, $P=0.28$), insulin-stimulated FMD 2-hr (6.94±0.85% vs 6.76±0.66%, $P=0.63$), AIx fasted (26.7±8.0% vs 26.3±8.6, $P=0.90$), and AIx 2-hr (21.4±10.8% vs 21.5±9.5, $P=0.97$) did not differ between groups, non-dippers had higher metabolic insulin sensitivity (0.035±0.017 vs 0.020±0.008, $P=0.04$) and LDL concentrations (146.39±28.56 vs. 110.20±21.11 mg/dL, $P=0.002$) than dippers. sBP dipping correlated with lean body mass (r=0.44, $P<0.001$), LDL (r=-0.59, $P=0.001$), fasting insulin levels (r=0.57, $P=0.01$), and metabolic insulin sensitivity (r=-0.49, $P=0.04$). **CONCLUSION:** There are no differences in endothelial function between dippers and non-dippers with MetS. However, metabolic insulin

sensitivity, LDL and lean body mass appear to be important factors contributing to nocturnal SBP regulation.

Funding by NIH RO1-HL130296.

Association Between Organ System Impairments and Fatigue in Adolescent Cancer Survivors

Nicole M. Svendsen, Stephen M. LoRusso, Tara M. Brinkman, Kirsten K. Ness, Saint Francis University, Loretto, PA, St. Jude Children's Research Hospital, Memphis, TN

Fatigue is commonly reported in adolescent cancer survivors with some adolescents experiencing fatigue into adult life[1]. Fatigue is associated with impaired quality of life[2,3], lowered social function scores, and impaired physical function across all cancer types[4-7]. **Purpose:** To determine the relationship of fatigue and chronic health conditions on peer relationships and adapted physical functioning in adolescent cancer survivors. **Methods:** 371 adolescent cancer survivors age (14.9 ± 2.0yrs) enrolled in the St. Jude Lifetime Cohort, completed the Patient-Reported Outcomes Measurement Information System (PROMIS) Peer Relationships and Fatigue questionnaires, and physical functioning assessments Bruininks- Oseretsky Test of Motor Proficiency, Second Edition (BOT2) and Timed Up & Go (TUG) in the St. Jude's Human Performance Laboratory. **Results:** Higher, but not clinically significant fatigue scores were reported with pulmonary (44.35 ±13.14 vs. 41.16 ±11.53, p=0.047) and neurological impairments (44.45 ±12.57 vs 40.75 ±11.49, p=0.0078), and those with four impairments reported more fatigue (47.69±2.63 vs. 40.93±1.27, p=0.0215). Physical functioning scores were significantly different with two or more impairments: TUG: 2 (5.25s±0.16, p=0.0378), 3 (5.64s±0.22, p=0.0018), and 4 (6.39s±0.33, p<0.0001) versus no impairment (4.78s±0.16). BOT2 percentage was also lower with 2 (39.42±3.18, p=0.287), 3 (23.98±4.53, p<0.0001) and 4 impairments (12.95±6.65, p<0.0001), versus no impairments (49.27±3.16). Fatigued participants had lower BOT2 percentile rank scores (24.17±22.14) than non-fatigued participant's (41.91±30.73, p=0.0003), while TUG scores were not significantly different between fatigued (5.53±1.63) and non-fatigued (5.12±1.57, p=0.1810). Fatigued participants had significantly lower Peer Relationships (45.17±10.43) compared to non fatigued (53.65±9.84, p<0.0001). **Conclusion:** Chronic health conditions and non-clinically significant fatigue can produce significant effects in physical function and peer relationships. These results suggest the long term impacts on adolescent survivor's quality of life can be reduced as a result of low levels of fatigue that may more commonly not be intervened on at the low levels reported.

Habitual Aerobic Exercise and Blood Pressure Responses in Postmenopausal Women

Laura M. Welti and Megan M. Wenner, University of Delaware, Newark, DE

Exaggerated blood pressure (BP) responses to sympathoexcitatory stimuli predict future risk of cardiovascular disease (CVD). Postmenopausal women (PMW) are at an increased risk of CVD, and exhibit exaggerated BP responses to acute laboratory stressors, such as handgrip exercise, compared to premenopausal women. Some evidence suggests an exaggerated BP response in older men who are sedentary compared to long-term habitual exercisers. However, it is unknown whether regular aerobic exercise (Ex) attenuates BP responses in PMW. **PURPOSE:** To test the hypothesis that PMW reporting regular aerobic exercise (+Ex) demonstrate attenuated BP

reactivity compared to sedentary (-Ex) PMW. **METHODS:** We retrospectively analyzed beat-by-beat mean arterial pressure (MAP; Finometer) in 12 PMW during three sympathoexcitatory maneuvers: cold pressor test (CPT) and isometric handgrip exercise at 30% of maximal voluntary contraction (HG), and post-exercise ischemia (PEI). Women who reported >3 days of exercise per week were considered +Ex (n=6, 56±4 years, 25±1 kg/m^2), and ≤3 days per week were -Ex (n=6, 63±7 years, 24±4 kg/m^2). Exercise data were self-reported on a standard medical history questionnaire. BP responses were averaged during the second (final) minute of CPT and HG, and for the entire three minutes of PEI. Data presented are mean ± SD. **RESULTS:** Resting MAP (+Ex: 87±6 vs. -Ex: 85±3 mmHg, P=0.35) and heart rate (HR) (+Ex: 56±5 vs. -Ex: 57±13 bpm, P=0.78) were similar between groups. BP reactivity (ΔMAP) during the CPT (+Ex: Δ18±11 vs. -Ex: Δ18±9 mmHg, P=0.99), HG (+Ex: Δ14±5 vs. -Ex: Δ15±9 mmHg, P=0.93), and PEI (+Ex Δ11±4 vs. -Ex Δ11±5 mmHg, P=0.94) were not different between groups. Additionally, HR responses during the CPT (+Ex: Δ-2±3 vs. -Ex: Δ5±8 bpm, P=0.11), HG (+Ex: Δ9±4 vs. -Ex Δ10±1 bpm, P=0.40) and PEI (+Ex: Δ1±5 vs. -Ex: Δ2±5 bpm, P=0.94) were not different between groups. **CONCLUSION:** These preliminary data suggest habitual aerobic exercise (self-reported) may not modulate BP responses to sympathoexcitatory stimuli in PMW. Future prospective examination of different aerobic exercise protocols (e.g., modality, intensity) on the pressor response are warranted.

Supported in part by DE- CTR Accel Program (U54- GM104941), the DE- INBRE Program (5 P20 GM103446-13) & NIH P20 GM113125

The Impact of COVID-19 on Physical Activity and Sedentary Behavior in Children: A Pilot Study

Lindsey E. White, Tiago V. Barreira, Michael L. Norris, Syracuse University. Syracuse, NY

The coronavirus pandemic (COVID-19) has interrupted the daily lives of many children. Transitioning to at-home learning as a result of stay-at-home orders and mandated school closures may reduce physical activity and increase sedentary behaviors. **PURPOSE:** To examine the impact of COVID-19 on physical activity (PA) and sedentary behavior (SB) in children (age < 18 years). **METHODS:** Parents of school-aged children were surveyed about their child's PA and SB prior to and during the COVID-19 pandemic. The survey was designed to gather demographic information, assess PA (days per week that children were physically active for at least 60 minutes) and SB (hours spent watching TV on weekdays and weekend days). Wilcoxon signed-rank test was used to examine differences in PA and SB prior to and during mandated school closures. **RESULTS**: Participants (n = 42) were mostly white (88%) and non-Hispanic or LatinX (95%). 57% of participants resided in Central New York and the youngest child in the household was 7 ± 4 yrs. Children engaged in 60+ minutes of physical activity on more days per week during COVID-19 when compared to days prior (3.8 days vs. 5.1 days; Z = -3.241, p < .01). Additionally, children spent more hours per weekday viewing TV during the pandemic (Z = -2.233, p = .026) whereas no change was seen in hours spent viewing TV on a weekend day (Z = -.187, p = .851). **CONCLUSION:** Our results revealed that children are meeting PA recommendations on more days per week during the pandemic when compared to before. Despite increased PA, a significant increase in weekday TV time was also observed. These findings are likely a result of stay-at-home orders and mandated school closures consequently affording children more time to be physically

active at home while also viewing more TV on weekdays. The positive health implications of PA are well understood and suggest that parents should aim to maintain (or increase) their child's current level of PA while also being vigilant about reducing screen time when engaging in (and potentially transitioning away from) remote learning.

Body Self-perceptions of Students in Exercise Science Major

Leigh D. Wolfrum, Jeffrey E. Harris, and Selen Razon. West Chester University, West Chester, PA

College aged students can be particularly vulnerable to body image issues, eating disorders and exercise dependency. **PURPOSE** The purpose of this study was to explore body self-perceptions of students majoring in exercise science. **METHODS** Twenty-two junior and senior students (13 females, 9 males) took part in this study. Participants responded to a 12-item Qualtrics survey that gauged their body self-perceptions, eating and exercise behaviors. **RESULTS** Descriptive analyses indicated that close to 91% of the participants felt self-conscious about their body image. Over 95% of the participants indicated that their body weight is a relatively important topic as compared to other things in their life. Close to 72% of the participants indicated feeling fat at least sometime. Over 68% of the participants reported the need to engage in excessive exercise meaning feeling compelled to exercise no matter what, even when sick and injured. Finally, 50% of the participants indicated that some of the exercise labs made them think more about the way they looked. Additional qualitative data revealed that some respondents felt insecure at the beginning of some exercise labs (i.e., BMI, weight, waist circumference measurements and skinfold assessments). However, these participants also indicated that the labs helped them become more aware of their own personal health and take proper measures to improve it. **CONCLUSION** Despite their presence in the field, students in exercise science major can be vulnerable to unhealthy self-perceptions and dysfunctional eating and exercise behaviors. Exercise labs can help students attain realistic expectations about themselves and take measures to improve their health.

The Effect of Succinic Acid on Metabolic Profile in High-Fat Diet-Induced Obesity and Insulin Resistance

Kendall S. Zaleski, Cheyanne Slocum, Daniella Escudero, Caty Sheridan, Saada Legesse, Kavey Vidal, Sarita Lagalwar, T.H. Reynolds, Stephen J. Ives. Skidmore College, Saratoga Springs, NY

Obesity, insulin resistance, and poor metabolic profile are hallmarks of a high fat diet (HFD), highlighting the need to understand underlying mechanisms. **PURPOSE:** To determine the effect of succinic acid (SA) on metabolism in high fat diet-induced obesity. **METHODS:** Animals were randomly assigned to either low fat diet (LFD) or a high fat diet (HFD). Mice consumed their respective diets for 4.5 months and then assigned to the following groups: LFD+vehicle, LFD+SA (0.75 mg/ml), HFD+vehicle, or HFD+SA. Body weight (BW), food and water intake, were tracked weekly. After 6 weeks, insulin, glucose, and pyruvate tolerance tests were completed, and spontaneous physical activity was assessed. Epididymal white adipose tissue (EWAT) mass and *in vitro* measurements of oxidative skeletal muscle (soleus) respiration were obtained. **RESULTS:** Expectedly, the HFD increased BW and EWAT mass, and reduced glucose and insulin tolerance.

SA significantly reduced EWAT mass, more so in HFD ($p<0.05$), but had no effect on any *in vivo* measurements (BW, insulin, glucose, or pyruvate tolerance, nor physical activity, all $p>0.05$). A significant ($p<0.05$) interaction was observed between mitochondrial respiration and treatment, where SA increased respiration, likely owed to greater mitochondrial content, as assessed by complex IV activity in both LFD and HFD. **CONCLUSION:** In HFD-induced obesity, coupled with insulin desensitization, no favorable effect of succinic acid on glucose regulation was found, but reduced adiposity was observed. In oxidative skeletal muscle, there was a tendency for increased mitochondrial respiratory capacity, owed to greater mitochondrial content, suggestive of a succinic acid-induced mitochondrial biogenesis.