2025 ACSM President's Cup

Signia By Hilton Atlanta-Room: Triumph Ballroom I
Wednesday, May 28 from 2-4:30pm

CENTRAL STATES CHAPTER

Kylie Burleson (Sears)
Oklahoma State University
Faculty Mentor: Shane Hammer, PhD

Recovery of neuromuscular efficiency after severe- and extreme-intensity knee extension exercise

Kylie N. Sears[1], Coleman Honea [1], Petra Kis[1], Colin W. Kipper[1] Taylor K. Dinyer-McNeely [1], Shane M. Hammer[1]
[1]School of Kinesiology, Applied Health, and Recreation, Oklahoma State University, Stillwater, Oklahoma, USA

The recovery of voluntary force generation after severe-intensity exercise is slower compared to extreme-intensity exercise. Whether the efficiency of converting motor unit excitation into mechanical force plays a role in these intensity-dependent recovery timelines remains unknown.
PURPOSE: To test the hypothesis that recovery of neuromuscular efficiency (NME) is faster after extreme-intensity exercise compared to severe-intensity exercise.
METHODS: Eighteen participants (10M/8F; 21 ± 1 yrs.) performed two bouts of severe-intensity knee-extension exercise (S1: 7.5 ± 1.5% 1RM and S2: 11.3 ± 3.6% 1RM) until task failure. A subset (n = 8) performed a single bout of extreme-intensity knee-extension exercise (EXT; 70% 1RM) until task failure. Baseline (BL) and post-exercise maximal voluntary contractions (MVCs) were performed at 0, 30, 60, 90, 120, and 150s after task failure. Motor unit excitation was quantified using the root mean square (RMS) of electromyography signals. NME was calculated as the ratio of force output to RMS. Comparisons to BL were made during recovery using one-way repeated-measures ANOVAs and Tukey's tests.
RESULTS: MVC was lower than BL (401 ± 148 N) at all timepoints after S1 and S2 (204 ± 70 N and 227 ± 68 N at 150s; $p < 0.0001$). Following EXT, MVC was lower than BL (375 ± 123 N) at 0s (298 ± 88; $p < 0.05$) but not at any timepoint after 30s of recovery (all, $p > 0.12$). RMS was not different than BL (0.26 ± 0.11) 0s after task failure ($p > 0.36$) but was lower than BL 30s (S1: 0.17 ± 0.10 mV; S2: 0.20 ± 0.12 mV; both $p < 0.01$) and 60s (S1: 0.17 ± 0.09 mV; S2: 0.21 ± 0.13 mV; both, $p < 0.05$) after task failure. RMS was not different than BL after 90s of recovery from S2 ($p = 0.16$) and after 120s of recovery after S1 ($p = 0.09$). Following EXT, RMS was not decreased from BL (0.31 ± 0.14 mV) at any recovery timepoint ($p = 0.40$). NME was less than BL (1.63 ± 0.83 N/V) at all timepoints after S1 (0.97 ± 0.36 N/V at 150s; $p < 0.0001$) and S2 (1.01 ± 0.46 N/V at 150s; $p < 0.0001$). Following EXT, NME was less than BL at 0s (0.79 ± 0.29 N/V; $p < 0.01$) but not at any timepoint after 30s of recovery (all, $p > 0.71$).
CONCLUSION: The recovery of NME was remarkably fast (within 30s) after extreme intensity exercise. Despite the recovery of motor unit excitation, NME did not recover within 150s after severe-intensity exercise.

GREATER NEW YORK CHAPTER

Jessie Hirsch
Hofstra University
Faculty Mentor: Amerigo Rossi, EdD, FACSM

Feasibility of an Exercise Program to Improve Well-Being in a Middle School Setting: A Pilot Study

JESSIE HIRSCH[1], YANA KOSTOVA[2], MELISSA DIMARTINO[2], ALEXANDER ROTHSTEIN[3], AMERIGO ROSSI[3] FACSM
[1]Department of Allied Health and Kinesiology; Hofstra University; Hempstead, NY
[2]Department of Psychology and Counseling; New York Institute of Technology; New York, NY
[3]Department of Interdisciplinary Health Science; New York Institute of Technology; Old Westbury, NY

Category: Graduate
Advisor / Mentor: Rossi, Amerigo (arossi01@nyit.edu)

Physical inactivity has become a major public health concern. Regular physical activity (PA) has been shown to improve health outcomes and well-being among adolescents, but more research is necessary to understand the feasibility of a physical activity program in a school setting. **PURPOSE**: This pilot study examined the effects of a two-week daily PA program compared to a stretching program and a washout period. **METHODS**: 40 middle-school students participated in this randomized counter-balanced study (Age: 12.2 $\pm$ 0.9 yrs, BMI: 20.1 $\pm$ 4.3 kg/m^2). Participants were randomized into 2 groups: two weeks of daily 40 minutes of moderate to vigorous-intensity PA or an attention-control group that mostly stretched. In between the two conditions, participants had two weeks of washout. All participants were given a Fitbit Inspire 3 to wear throughout the duration of the study. Physical Activity Questionnaire-Children (PAQ-C) was administered at baseline. One of five well-being questionnaires was administered digitally at the end of each school day, in randomized order each week. The average of two scores over two weeks was used for data analysis. Pearson correlation coefficients (r) were analyzed for correlations between baseline PA and well-being scores during the exercise condition. Paired samples t-tests were analyzed to compare activity intensity and well-being between conditions.
RESULTS: Baseline PAQ-C was significantly correlated to EPOCH Measure of Adolescent Well-Being Happiness subscale (r=0.50, p=0.004), Attentional Control Scale for Children (r=0.58, p<0.001), Rosenberg Self-Esteem Inventory (r=0.43, p=0.008), and Brief Scale of Psychological Well-Being (r=0.42, p=0.01). A negative correlation with the Generalized Anxiety and Depression Questionnaire (r=-0.28, p=0.09) was not significant. Compared to the control group, the PA condition elicited higher heart rate (difference = 11.8 bpm, p=<.001) and total intensity (difference = 21.9 units, p=<.001) during the class hour. **CONCLUSION**: Exercise interventions in school settings are a feasible way to increase PA in adolescents. More research should be done to investigate the long-term effects of in-school exercise programming on adolescent well-being and physical fitness.

MID-ATLANTIC CHAPTER

Evan Ciecko
University of Delaware
Faculty Mentor: Melissa Witman, PhD, FACSM

Exploring a Potential Relation Between Vitamin D and Blood Pressure Variability in Young Black Women

Evan C. Ciecko, Michele N. D'Agata, Alexs A. Matias, Krista M. Szymanski, Melissa A. Witman FACSM. University of Delaware, Newark, DE.

Vitamin D (VitD) deficiency and cardiovascular diseases (CVD) are both known to disproportionately affect Black women (BLW), yet BLW remain a largely understudied population. Elevated blood pressure (BP) is associated with increased CVD risk and previous studies conducted in middle-aged and older adults suggest a causal role for VitD in BP regulation. Increases in beat-to-beat and 24-hour blood pressure variability (BPV) have been shown to precede elevated BP. However, there is limited data on BPV in young BLW, and whether VitD is associated with BPV in young BLW is currently unknown. **PURPOSE:** To (1) characterize beat-to-beat and 24-hour ambulatory BPV in young BLW and (2) to explore a potential relation between VitD, traditional BP measurements, and BPV. We hypothesized that lower serum VitD concentrations would be associated with higher BPV. **METHODS:** Participants included apparently healthy young BLW ages 18-30 yrs. Serum VitD concentration was clinically quantified using a fasted venous blood sample. Morning supine, resting brachial BP was measured in triplicate and averaged. Morning supine beat-to-beat BP was collected over 5 minutes using continuous photoplethysmography on the index finger (n=32). Systolic and diastolic BP were also derived from 24-hour ambulatory BP monitoring (ABPM) on a separate day (n=42). Beat-to-beat and 24-hour BPV were calculated as standard deviation (SD) and average real variability (ARV). **RESULTS:** No significant associations between VitD and morning resting systolic or diastolic BP were observed. Associations between VitD and parameters of beat-to-beat systolic BPV were trending in the hypothesized direction [SD of BPV (r=-0.30;p=0.097) and ARV (r=-0.31;p=0.086)]. There were significant negative associations between VitD and beat-to-beat diastolic BPV [SD of BPV (r=-0.40; p=.02) and ARV (r=-0.39;p=0.032)]. Additionally, 24-hour ABPM revealed a significant negative association between VitD and nighttime systolic BPV [SD of BPV (r=- 0.3;p=0.035) and ARV (r=-0.3;p=0.035)]. Associations between VitD and all other 24-hour ABPM parameters were nonsignificant. **CONCLUSION:** Preliminary results revealed no association between VitD and peripheral BP in young BLW. However, weak-to-moderate inverse associations between VitD and parameters of morning beat-to-beat diastolic BPV and nighttime BPV derived from 24-hour ABPM were observed. **SIGNIFICANCE/NOVELTY:** BPV is an emerging biomarker of BP regulation that may precede elevations in BP, especially in young and at-risk groups. The identification of a potential relation between VitD and BPV in young BLW is important as BLW are at increased risk of developing CVD and are often VitD deficient. Further studies are needed to better understand the mechanisms behind the relation between VitD and its impact on autonomic control of CV function.

Supported by NIH 1R01HLI55764 (MW) and The University of Delaware Doctoral Fellowship for Excellence (MD)

MIDWEST CHAPTER

Emma Clarke
Taylor University
Faculty Mentor: Matthew Harber, PhD

THE ACUTE REDUCTION IN VO_{2MAX} INDUCED BY A MITOCHONDRIAL TARGETING ANTIOXIDANT (MITOQ) IS NOT ASSOCIATED WITH LOWER CARDIAC OUTPUT

Emma Clarke[1], Hunter Dieter[2], Ryan Hughes[2], Mikaela Brown[3], Bradley Fleenor[3], and Matthew Harber[1], FACSM
[1]Kinesiology, Taylor University
[2]Clinical Exercise Physiology, Ball State University
[3]DeBusk College of Medicine, Lincoln Memorial University

BACKGROUND: We have previously shown that a mitochondrial targeting antioxidant (MitoQ) acutely blunts aerobic capacity (i.e., VO_{2max}) in physically inactive individuals. **PURPOSE**: To determine if the acute effects of MitoQ on VO_{2max} occur in physically active individuals and if this effect is mediated by reductions in cardiac output (Q). **METHODS**: Sixteen (n=16) physically active, apparently healthy adults (age 25.0±3.8 years and BMI 24.6±3.3 kg/m^2) performed two trials (Placebo and MitoQ) in a double-blind randomized cross-over design. Participants consumed either a Placebo or MitoQ (80mg) one hour prior to a maximal exercise test on a cycle ergometer. VO_{2max} was assessed via indirect calorimetry and heart rate, stroke volume and cardiac output were assessed via thoracic cardiac impedance. **RESULTS**: VO_{2max} was higher (P=0.05) during Placebo (2.78±0.65 L/min) compared to MitoQ (2.67±0.67 L/min) while no differences (P>0.05) existed between trials for heart rate (180.97±8.64 vs 180.82±10.84 bpm, Placebo and MitoQ, respectively, P=0.91), stroke volume (135.24±26.54 vs 134.71±28.04 ml/beat, Placebo and MitoQ, respectively, P=0.87), or Q (23.95±4.41 vs 24.07±5.15 L/min, Placebo and MitoQ, respectively, P=0.83). Peak workload was not different (P=0.46) between Placebo (248±59 W) and MitoQ (249±59 W) but cycling efficiency was higher (P=0.02) in MitoQ (94±6 W/L O_2/min) compared to Placebo (89±4 W/L O_2/min). **CONCLUSION**: The acute reduction in VO_{2max} after supplementation with MitoQ occurs in physically active adults but is not associated with cardiac function, suggesting the reduced VO_{2max} was mediated by peripheral factors. Further, peak workload was not reduced suggesting that exercise efficiency was improved after MitoQ. Future research is warranted to explore the mechanisms by which MitoQ acutely alters oxygen utilization during exercise.

NEW ENGLAND CHAPTER

Gabrielle Brewer
University of Connecticut
Faculty Mentor: Elaine Lee, PhD

THE EFFECTS OF BLACKCURRANT SUPPLEMENTATION ON OXIDATIVE STRESS AND ANTIOXIDANT ACTIVITY SURROUNDING REPEATED EXERCISE-HEAT EXPOSURES

Gabrielle J. Brewer[1], Staci N. Thornton[1], Michael R. Szymanski[1], David G. Martin[1], Ock K. Chun[2], Katie R. Hirsch[3], Robert A. Huggins[1], Douglas J. Casa[1], FACSM, Elaine C. Lee[1]
[1]Korey Stringer Institute, Department of Kinesiology, University of Connecticut, Storrs, CT, 06296
[2]Department of Nutritional Sciences, University of Connecticut, Storrs, CT, 06268
[3]Department of Exercise Science, University of South Carolina, Columbia, SC, 29208

Heat acclimation (HA) promotes resiliency to exertional-heat stress through cellular and systems-level adaptations. Blackcurrant (BC) whole fruit and antioxidant components promote cellular maintenance, repair, and stress adaptation. **PURPOSE:** Evaluate the influence of BC on biomarkers reflective of oxidative stress and antioxidant responses surrounding exercise in the heat pre-HA and post-HA. **METHODS:** In a multi-year crossover study, 9 participants (2M,7F; mean±standard deviation [SD]: 24±3 years, 48.8±7.7ml·kg^{-1}·min^{-1}) completed 5 days of HA with no BC (CON) and again with 784 mg of BC·day^{-1} (BC). Two tests of heat tolerance (HTT1 and HTT2) were conducted pre-HA and post-HA (Ambient temperature: ~40°C). Blood biomarkers of oxidative stress (8-hydroxy 2 deoxyguanosine (8-OHdG) and malondialdehyde (MDA)), and the antioxidant response (glutathione peroxidase (GPx)) were quantified before and after exercise pre-HA and post-HA. Rectal temperature (T_{rec}) was continuously monitored during exercise. Dependent samples T-Test ($p<0.05$) were used to compare biomarker means (i.e., relative percent (%) change from baseline) and T_{rec} means between BC and CON at each timepoint. **RESULTS:** There were no significant differences in the relative % change of 8-OHdG concentrations from baseline between BC and CON at any timepoint ($p>0.05$). There were multi-directional differences in the relative % change of MDA concentrations after exercise at pre-HA HTT1 (mean±SD: BC: 14.45±48.40%, CON: -7.46±53.95%, p=0.038), pre-HA HTT2 (BC: 68.39±30.31%, CON: 24.39±47.69%, p=0.031) and post-HA HTT1 (BC: 44.59±85.38%, CON: -9.75±43.33%, p=0.041). The relative % change of GPx activity from baseline was altered after exercise at pre-HA HTT2 (BC: -10.45±3.52%, CON: 3.30±9.81%, p=0.026) and before exercise post-HA HTT1 (BC: -9.34±3.70%, CON: 3.44±4.15%, p=0.013). T_{rec} values were similar between BC and CON at all time points ($p>0.05$). **CONCLUSION:** Surrounding HA, BC supplementation corresponded with increased systemic changes in MDA concentrations after exercise and decreased GPx activity before and after exercise. BC may reduce the damaging oxidative load resulting from exertional-heat stress and future investigation of additional biomarkers is warranted for confirmation. The variability in biochemical responses to HA from baseline demonstrate the importance of personalized dietary strategies surrounding exercise in the heat for naïve and acclimated individuals to combat exertional-heat stress.

Funding Source: DoD BA200299

NORTHLAND CHAPTER

William Juckett
University of Minnesota – Twin Cities
Faculty Mentor: Donald Dengel, PhD, FACSM

RESTING PLASMA LACTATE AND ITS RELATIONSHIP WITH BIOMARKERS OF METABOLIC DYSFUNCTION

William T. Juckett[1], Julia Steinberger[2], Alan R. Sinaiko[2], David R. Jacobs[3], Donald R. Dengel[1,2], FACSM
[1]School of Kinesiology, University of Minnesota, Minneapolis, MN; [2]Department of Pediatrics, University of Minnesota Medical School, Minneapolis, MN; [3] Division of Epidemiology and Community Health, University of Minnesota School of Public Health, Minneapolis, MN

PURPOSE: Increased lactate, possibly driven by dysfunctional oxidative metabolism, has been of recent interest as a novel early clinical biomarker of metabolic dysfunction and diseases. The purpose of this study was to expand on the existing understanding of how indices of metabolic dysfunction are associated with lactate. **METHODS:** Three hundred and eighty-two (39.2±1.4 years) females (n=180) and males across normal weight, overweight, and obese BMI categories were included in this analysis. Adiposity was determined via dual X-ray absorptiometry scans. Blood pressure and blood metabolites were determined following and overnight fast. A hyperinsulinemic-euglycemic clamp was used to determine insulin resistance. Lactate was determined from plasma using an electrochemical analyzer. A metabolic syndrome (MetS) cluster score was developed using the average of standardized deviates of the main components of MetS. ANCOVA models, sex as a covariate, were used to assess significant differences in lactate between body composition tertiles, and in metabolic indices between lactate tertiles. Linear regression models, adjusting for sex and BMI, were used to understand associations between lactate and metabolic indices. **RESULTS:** Lactate was significantly ($p<0.05$) higher in those classified as obese, as well as in the high total fat and visceral adipose tissue tertiles. Those classified into the high lactate tertile were shown to have significantly greater ($p<0.05$) systolic blood pressure, insulin resistance, insulin, glucose, triglycerides, total cholesterol; and lower high-density lipoprotein (HDL). Significant ($p<0.05$) positive associations were observed between lactate and homeostatic assessment of insulin resistance, insulin, triglycerides, total cholesterol, diastolic blood pressure, and MetS cluster score; and significant ($p<0.05$) negative associations between lactate and both HDL and insulin sensitivity. No significant associations observed between lactate and systolic blood pressure, pulse pressure, mean arterial pressure, glucose, and low-density lipoprotein. **CONCLUSION:** Biomarkers of metabolic disfunction and diseases, such as hypertension, insulin resistance, and elevated blood lipids are associated with increasing lactate in a large population of adult females and males.

NORTHWEST CHAPTER

Katherine Hatch
Eastern Washington University
Faculty Mentors: Kristyne Wiegand, PhD

AGE-RELATED DIFFERENCES IN THE ACUTE EFFECTS OF MUSCLE FATIGUE ON STABILITY

K. Hatch, K. Wiegand
Eastern Washington University, Cheney, WA

Postural stability is necessary for maintaining body position, achieving coordination, and reducing fall risk. With advancing age, fall risk increases, due in part to a decreasing ability to maintain postural stability. Muscular fatigue, which results from activities of daily life or exercise, may further intensify instability and increase risk of falls. Some research indicates older individuals develop muscular fatigue sooner than younger adults, but less is known about the differences in the time to recover stability. PURPOSE: To compare the acute effects of muscular fatigue on stability and time to recover stability between older and younger adults. METHODS: Participants from two age groups (n = 30; younger, 18-28 y; and older, 55-65 y) will be recruited. Four participants, two per group, have completed the study. Limits of Stability (LOS) testing and a fatiguing protocol, comprised of sit-to-stand to volitional fatigue, were performed. LOS tests were conducted at baseline and 0, 5, 10, 15, and 20 minutes after the fatiguing protocol. The variables of interest from LOS include reaction time (RT) and maximum excursion (MXE). The effects of age and recovery time on RT and MXE were analyzed with a 2 (group) by 6 (time) ANCOVA, with time to fatigue as a covariate ($\alpha = .05$). RESULTS: Preliminary analysis indicates that after adjusting for time to fatigue for MXE, there was no significant group by time interaction ($p = .11$), and no main effect of time ($p = .07$) or group ($p = .07$). For RT there was no significant interaction ($p= .71$) or main effect of time ($p = .34$), but there was a significant group effect ($p = .002$), with younger participants exhibiting faster reaction times (0.45 ± 0.14 s) compared to older participants (0.53 ± 0.11 s) on average. CONCLUSION: Based on these early results, balance measures were not significantly affected by fatigue. However, given the low sample size currently, these results may differ as additional data are collected. Between groups, there was no difference in maximum excursion based on age, which indicates that both groups were effective in reaching their limits of stability. There was a significant difference in reaction times between groups, with younger participants having faster reaction times at all testing points. This is to be expected with changes in the neuromuscular system that occur with age.

ROCKY MOUNTAIN CHAPTER

Joshua R. Kniss
University of Colorado Anschutz Medical Campus
Faculty Mentor: David R. Howell, PhD

SMARTPHONE-ASSESSED, OVERGROUND GAIT SPEED IS ASSOCIATED WITH TANDEM GAIT COMPLETION TIME AMONG ADOLESCENTS POSTCONCUSSION

Kniss, J.1,2, Wingerson, M.1,2, Smulligan, K.3, Richardson, K.1,2, Hurlburt, K.1,2, Lugade, V.3, Wilson, J.1,2, Howell, D.1,2
1Children's Hospital Colorado, Aurora, CO, USA; 2University of Colorado School of Medicine, Aurora, CO, USA; 3Binghamton University, Binghamton, NY, USA

Tandem gait (TG) is a commonly used clinical assessment for evaluating motor-cognitive function and dynamic postural control after concussion. Self-selected over-ground, walking gait (WG) spatiotemporal metrics may provide complementary over overlapping information to TG outcomes, along with improved ecological validity. PURPOSE: To investigate associations between single-task (ST) and dual-task (DT) TG and WG among adolescents after recent concussion. METHODS: We conducted a cross-sectional study of adolescents within 21 days of concussion. Participants completed a timed TG test on a 3-meter path and WG along a 10-meter path for one-minute. Both tasks were performed under ST and DT conditions. WG spatiotemporal metrics were collected using a novel smartphone application (IMPROVE, Control One LLC). Primary outcomes were ST and DT TG completion time and ST and DT WG speed. We calculated pairwise correlation coefficients (Pearson r) between TG and WG outcomes. We used multivariate linear regression, adjusting for symptom severity, time since concussion, age, and sex to assess the adjusted relationship between TG and WG outcomes. RESULTS: We enrolled and tested 82 participants (15.6 ± 2.1 years, 49% female; 12.7 ± 4.4 days since concussion). In unadjusted and adjusted analyses, there was a significant, weak, negative correlation between ST TG completion time and ST WG speed and a significant, moderate, negative correlation between DT TG completion time and DT WG speed (Figure). CONCLUSION: TG completion time and WG speed were significantly correlated in both ST and DT conditions among adolescents with recent concussion, but the relationship was stronger under DT conditions, suggesting that WG may serve as a useful TG proxy and provide unique information for concussion care.

Funding source: Eunice Kennedy Shriver National Institute of Child Health & Human Development (R01HD108133)

SOUTHEAST CHAPTER

Annie Mulholland
Mercer University
Faculty Mentor: Jonathan Wingo, PhD, FACSM

Photoplethysmographic Heart Rate Accuracy During Exercise in Temperate and Hot Environments

Anne M. Mulholland[1], Hayley V. MacDonald[2], Elroy J. Aguiar[2], Garrett Reuben[2], Julianna Delaune[2], Jonathan E. Wingo, FACSM[2]
[1]Department of Exercise Science, Mercer University, Macon, GA
[2]Department of Kinesiology, The University of Alabama,, Tuscaloosa, AL

Increased skin blood flow (SkBF) and local sweat rate (LSR) during exercise heat stress may decrease the accuracy of heart rate (HR) from wearable devices using photoplethysmography by interfering with light reflection at the epidermis. PURPOSE: To test the hypothesis that heat stress reduces the accuracy of photoplethysmographic HR measurement during exercise. METHODS: Twenty-seven participants (52% female; mean±SD, age = 25±5 y, body mass = 76.2±14.0 kg) cycled in 22 °C (TEMP) and 35 °C (HOT) at progressively increasing intensities (50%, 60%, 70%, 80% of age-predicted maximal HR) over 40 min while wearing 3 photoplethysmographic devices (Apple Watch Series 8, Garmin vivosport 5, SlateSafety BAND V2) and a criterion device (Polar H10). HR, SkBF, and LSR were recorded during rest, exercise, and recovery. Device performance was evaluated using equivalence testing (equivalence zone, ±5 bpm), and differences in mean absolute error of HR measurement (MAE_{HR}) in TEMP vs. HOT were analyzed using a two-way (condition × intensity) analysis of variance. RESULTS: Based on 90% and 95% confidence intervals (CI), device HR was both equivalent and not different from criterion HR for Apple in both conditions at all intensities. Garmin HR was equivalent but statistically different from criterion HR only during recovery in HOT (95% CI [0.5, 2.9]). SlateSafety HR was not equivalent during HOT at rest (90% CI [-2.6, 5.3]) and very light intensity (90% CI [-6.5, 2.8]), and during TEMP at vigorous intensity (90% CI [-6.4, 2.8]) but was not different from criterion HR. MAE_{HR} was not different between conditions for Garmin (TEMP, 1.7±2.3 bpm; HOT, 1.4±0.9 bpm; P=0.13; η^2_G=0.01) or SlateSafety (TEMP, 3.8±7.2 bpm; HOT, 3.2±12.5 bpm; P=0.88; η^2_G<0.01) but was lower during HOT for Apple (TEMP, 0.9±1.5 bpm; HOT, 0.7±0.4 bpm; P=0.02; η^2_G=0.04), despite greater SkBF (TEMP, 35±36 AU; HOT, 67±46 AU; P<0.001) and LSR (TEMP, 0.13±0.17 $mg \cdot cm^{-2} \cdot min^{-1}$; HOT, 0.27±0.23 $mg \cdot cm^{-2} \cdot min^{-1}$; P<0.001) during HOT. CONCLUSION: Heat exposure did not increase error in photoplethysmographic HR measurement, although SkBF and LSR were elevated.

This study was supported by an equipment grant from SlateSafety (Atlanta, GA).

SOUTHWEST CHAPTER

Noelle Morrow
University of California, Los Angeles
Faculty Sponsor: Andrea Hevener, PhD

ERα Governs the Sexual Dimorphism in HSP72-mediated Control of Mitochondrial Function, Exercise Capacity, and Insulin Sensitivity in Mice

Noelle Morrow, Amanda Lin, Zhenqi Zhou, Hirotaka Iwasaki, Brian Drew, Mark Febbraio & Andrea Hevener

HSP72 is a chaperone protein upregulated during exercise. Levels are reduced in aging and obesity, and increased levels are correlated with improvements in metabolic health in male mice and humans. Male HSP72 knockout (KO) mice have increased body fat, decreased insulin sensitivity, and a loss of mitochondrial quality control. Male KOs have increased cytosolic Parkin levels, but the protein is unable to translocate the mitochondria, resulting in enlarged, hyperfused mitochondria associated with metabolic dysfunction. **PURPOSE**: This study investigated the role of HSP72 in female mice to better understand the sexual dimorphism involved in the heat shock response. **METHODS**: Wild-type (WT) and HSP72KO male and female mice were analyzed for insulin sensitivity, exercise capacity, gene and protein expression, and mitochondrial morphology and respiratory capacity. **RESULTS**: Overall, female HSP72KOs showed the opposite phenotype of male KOs. Female KOs had reduced body weight ($p<0.0001$) and gonadal fat ($p=0.005$), improved insulin sensitivity ($p=0.0179$), and increased voluntary wheel running compared to males and WT controls ($p=0.0079$). Like males, cytosolic Parkin was increased in female KOs, but, unlike males, maintained its ability to translocate to the mitochondria. Hence, skeletal muscle mitochondria were smaller and more spherical in the female KO mice, indicative of increased fission signaling. Frozen respirometry showed enhanced complex I, II, and IV activity in the mitochondria of female KO skeletal muscle ($p=0.0127$, 0.003, & 0.0009). The enhanced insulin sensitivity, exercise capacity, and mitochondrial fission signaling in female KOs mimic the phenotype of estrogen receptor alpha (ERα) overexpression mice, and female KOs showed increased levels of ERα and its encoding gene (Esr1), while the male KOs did not. **CONCLUSION**: This sexual dimorphism appears underpinned by a compensatory upregulation of ERα, given the fact that KO males are negatively affected by the loss of HSP72 and do not show an increase in ERα. The beneficial, and potentially therapeutic, role of HSP72, as well as the consequences associated with reduced levels, has been repeatedly demonstrated in male mice and humans. These data indicate that HSP72 plays a unique role in the regulation of metabolic and mitochondrial health in females.

TEXAS CHAPTER

Nicole Varone
Texas Woman's University
Faculty Mentor: Christopher M. Hearon Jr, PhD

Determinants of Exercise Intolerance in Patients with Idiopathic Inflammatory Myopathy

NICOLE L. VARONE, DENIS J. WAKEHAM, SALMAN BHAI & CHRISTOPHER M. HEARON JR.
Exercise Physiology and Biochemistry Laboratory, School of Health Promotion and Kinesiology, Texas Woman's University, Denton, TX
UT Southwestern Medical Center, Institute for Exercise and Environmental Medicine, Dallas, TX

Category: Doctoral
Advisor / Mentor: Hearon, Christopher (Christopher.hearon@utsouthwestern.edu)

Idiopathic inflammatory myopathy (IIM) is an inflammatory muscle disease in which patients experience severe exercise intolerance. There is evidence of vasculopathy in patients with IIM, however it is currently unknown whether vascular dysfunction contributes to exercise intolerance in IIM. **PURPOSE**: This study aims to compare leg hemodynamics and muscle oxygen utilization during isolated single leg knee extension exercise (SLKE) between patients with IIM and healthy controls. **METHODS:** Ten patients with IIM (age: 52 ± 14 yrs; 4 females; BMI: 32 ± 9 kg/m^2) and seven healthy control participants (CON; age: 48 ± 13 yrs; 3 females; BMI: 25 ± 6 kg/m^2) performed a SLKE protocol designed to elicit fatigue in 30-minutes. Leg blood flow (LBF; doppler ultrasound), mean arterial pressure (MAP; brachial electro-sphygmomanometry), and venous blood gasses (VBG; femoral venous catheter) were measured at fatigue. We calculated leg arterial-venous oxygen difference (Δa-vO_2; calculated from hemoglobin concentration and arterial oxygen saturation [pulse oximetry] and femoral venous oxygen saturation), leg VO_2 (LVO_2; LBF x Δa-vO_2), and leg vascular conductance (LVC; LBF/MAP). All data between groups were compared using independent samples t-test and are presented as mean ± standard deviation. **RESULTS:** At fatigue, external work-rate (CON: 34 ± 15 vs. IIM: 25 ± 9 Watts, p = 0.112) and LVO_2 (CON: 313 ± 112 vs IIM: 329 ± 111 ml/min, p = 0.776) were not different between groups. LBF (CON: 2451 ± 773 vs IIM: 3016 ± 997 ml/min, p = 0.229) and MAP (CON: 118 ± 15 vs. IIM: 107 ± 14 mmHg, p = 0.123) were not different between groups at fatigue, but LVC was higher in IIM (CON: 20.9 ± 7.1 vs. IIM: 28.6.0 ± 7.2 ml/min/mmHg, p = 0.044). Also, Δa-vO2 at fatigue tended to be lower in IIM than controls (CON: 12.8 ± 1.7 vs. IIM: 11.0 ± 1.9 ml/dl, p = 0.058). **CONCLUSION:** Peripheral vascular dysfunction is not a primary contributor to exercise intolerance in patients with IIM. In contrast, the lower Δa-vO2 at fatigue indicates that impaired oxygen extraction is the primary factor limiting exercise tolerance in patients with IIM.