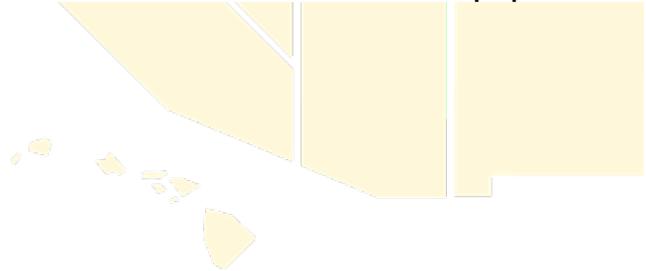


# **SWACSM 2021 UNDERGRADUATE STUDENT RESEARCH COMPETITION: ORAL PRESENTATIONS**

Friday October 29<sup>th</sup> 2021, 10:45am-12:15pm

1. Jacob L. Coleman (*Brigham Young University, Provo*), Landon Deru, Hunter Chamberlain (*Brigham Young University, Provo*), Bruce W. Bailey (*Brigham Young University - Provo*)  
**The Effects of Exercise on Hunger and Satiety Hormone Concentrations Over a 36-Hour Fast: A Randomized Crossover Study**
2. Shalis Danayan (*California State Polytechnic University, Pomona*), Zakkoyya Lewis (*California State Polytechnic University, Pomona*)  
**Do it for the gram: results from the physical activity and social media support (PASS) study**
3. Brenna E. Knapp (*Occidental College*), Marcella Raney (*Occidental College*)  
**COVID-19 Induced Changes in Physical Activity at Public Parks in Los Angeles County**
4. Isabel Munoz Orozco (*California State University, Northridge*), Kimberly Hernandez (*California State University, Northridge*), Joevanie Mata (*California State University, Northridge*), Teri Todd (*California State University, Northridge*), Melissa Mache (*California State University, Chico*), Danielle Jarvis (*California State University, Northridge*)  
**Evaluation of Skipping in College Students With and Without Autism Spectrum Disorder**
5. Suhas Rao Velichala (*University of California, San Diego*), Ryan Kassel (*University of California, San Diego*), Alan Hargens (*University of California, San Diego*), Victoria Ly (*University of California, San Diego*)  
**Self-Generated Lower Body Negative Pressure as a No-Power Countermeasure for Deep Space**

**AMERICAN COLLEGE  
of SPORTS MEDICINE®**  
**Southwest Chapter**



# **SWACSM 2021 GRADUATE STUDENT RESEARCH COMPETITION: ORAL PRESENTATIONS**

Friday October 29<sup>th</sup> 2021, 1:45pm-3:15pm

1. Gustavo Aldama (*San Jose State University*), Allison Bui (*San Jose State University*), Areum K. Jensen (*San Jose State University*)  
**Differential Cardiovascular Responses to Acute Exercise in Adults with Cerebral Palsy**
2. Dustin W. Davis (*University of Nevada, Las Vegas*), Bryson Carrier (*University of Nevada, Las Vegas*), Kyle Cruz (*University of Nevada, Las Vegas*), Brenna Barrios (*University of Nevada, Las Vegas*), James W. Navalta FACSM (*University of Nevada, Las Vegas*)  
**The Effects of Meditative and Mindful Walking on Mental and Cardiovascular Health**
3. Jeremy B. Ducharme (*University of New Mexico*), Zachary J. McKenna (*University of New Mexico*), Christine M. Mermier (*University of New Mexico*), Ann L. Gibson FACSM (*University of New Mexico*)  
**Efficacy of a Regression Method to Confirm VO<sub>2</sub>max in Middle-Aged and Older Adults: A Pilot Study**
4. Jamie P. Kaluhiokalani (*Brigham Young University - Provo*), Jack Mehling, Brandon Pfeifer, Mohadeseh Ahmadi  
**A Comparison of Heat Treatment-Induced Skeletal Muscle Adaptations Relative to Exercise Training**
5. Michael A. Kantor (*Rocky Mountain University of Health Professions*), Dane Bartz (*Rocky Mountain University of Health Professions*), William Lewinski (*Force Science Institute*), Robert Pettitt FACSM (*Rocky Mountain University of Health Professions*)  
**Kinematics and Motor Responses of Law Enforcement Officers in a Spontaneous Lethal Threat Scenario**
6. Alexander R. Strumwasser (*University California, Los Angeles*)  
**Genetic drivers of cardiac remodeling in health and disease in female mice**

**American College of Sports Medicine**  
**Southwest Chapter**



# FRIDAY POSTER SESSION

## 1. SWACSM Abstract

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### Arch Characteristics among Habitual Users of Minimalist Footwear

KALEB M. BARKER, KIRK E. BASSETT, SPENCER G. STRADDECK, SARAH T. RIDGE

Foot and Ankle Research Group; Department of Exercise Science; Brigham Young University; Provo, UTAH

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*Category: Undergraduate*

*Advisor / Mentor: Ridge, Sarah (sarah\_ridge@byu.edu)*

#### ABSTRACT

Purported to mimic the benefits of barefoot walking, minimalist footwear (MF) has recently become popular among the general public. Though evidence suggests that MF may have a positive effect on foot health, further investigation is required to determine the mechanisms which contribute to these observed effects.

**PURPOSE:** The purpose of the study was to measure differences in arch characteristics between Habitual users of Minimalist shoes (HM) and Habitual users of Cushioned shoes (HC). This information may provide insight regarding the causes of MF benefits. **METHODS:** Arch height data was collected from twelve healthy HC (9m, 3f, 22.4±2.4 y) and twelve healthy HM (9 m, 3 f, 24.7±4.2 y) using an Arch Height Index (AHI) Measurement System (JAKTOOL LLC.) HM subjects used MF as their primary walking footwear for a minimum of 6 months. AHI was measured on the right foot, in both the sitting and standing positions. AHI, Arch Drop (sitting dorsum height – standing dorsum height, AD) and Arch Flexibility (AF) were calculated from the data. Subjects were then categorized based on AF: stiff (AF<13.54), normal (13.54<AF<16), and flexible (AF>16). **RESULTS:** HM have a significantly larger AD than the HC (HM: .49±.10 cm; HC: .37±.13 cm; p=.02). However, there was no significant difference in AF (HM: 16.5±4.0; HC: 13.4±5.0; p=.10), standing AHI (HM: .33±.01; HC: .34±.02; p=.75), or sitting AHI (HM: .39±.07; HC: .36±.02; p=.17). There were 6/1 stiff, 3/2 normal, and 3/9 flexible subjects in the HC/HM groups, respectively. **CONCLUSION:** The results suggest that the use of MF has a significant effect on arch drop. The number of flexible HM vs. flexible HC also suggest that the use of MF significantly increases arch flexibility. This may be because the minimal arch support in MF allows HM to be accustomed to a greater amplitude of arch motion during walking, which could lead to the development of larger AD and a more flexible arch over time. Differences in foot strike preference (forefoot vs heel) in HM could also influence the development of a more flexible arch over time. Further investigation with a larger sample size could provide additional evidence to the significance of these arch metrics.

## 2. SWACSM Abstract

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### College Student Self-Efficacy for Exercise in Relation to Reported Physical Activity Levels during COVID-19 Pandemic

ANGELEZ BECERRA, ANDREA HUGHES, SARAH L. DUNN, PH.D

Kinesiology; California State University, San Bernardino; Palm Desert Campus, CA

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*Category: Undergraduate*

*Advisor / Mentor: Dunn, Sarah (sarah.dunn@csusb.edu)*

#### ABSTRACT

The global COVID-19 pandemic may be detrimental to a college student's motivation to exercise with less physical activity (PA) levels recorded, possibly due to the closure of gyms or home isolation. While little is known about self-efficacy for exercise (SEE) in college students, how it relates to age in this population during a pandemic needs further investigation. **PURPOSE:** The aim of this study was to analyze the relationship between SEE and PA levels in college students and if age was a factor. It was hypothesized that SEE would be positively associated with PA status and negatively to college student age, especially with many engaging in remote learning. **METHODS:** Individuals enrolled in college (N=84, male, n= 32, female, n= 49, age range, 19-47 years) were asked to complete an IRB approved Qualtrics survey mid-semester (Spring 2021) which included demographic information along with the total minutes spent in PA at various intensity levels (vigorous, moderate or walking), using the International Physical Activity Questionnaire Short Form (IPAQ-SF) and SEE (Resnick et al., 2000) scale. The SEE scale gauges motivation to exercise using a Likert scale from 0 -10 (0=low and 10=high SEE levels). All data was analyzed using a Spearman Rank Order Correlation with a p-value of 0.05 for significance (SPSSv27). **RESULTS:** No significant correlation was found between age and SEE although significant and trending relationships were found between total minutes spent in PA during 7 days,  $\rho=0.327$ ,  $p=0.011$ ; vigorous intensity PA,  $\rho=0.409$ ,  $p=0.000$ , moderate intensity PA,  $\rho=0.221$ ,  $p=0.066$ , or walking/low intensity PA,  $\rho=0.243$ ,  $p=0.043$  and SEE. **CONCLUSION:** A college student's motivation to be physically active may lead to more time spent in PA and is not related to age of the individual. Health and wellness professionals should consider motivational factors when prescribing PA for health benefits during a pandemic.

### 3. SWACSM Abstract

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## Autonomic and Cardiovascular Responses to Acute Exercise in Children with Autism Spectrum Disorder

Allison T. Bui, Gustavo Aldama, Kauionalani P. Kekuawela, Jacob A. Manriquez, Areum K. Jensen

Human Neural Control Laboratory; Department of Kinesiology; San Jose State University; San Jose, CA

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*Category: Masters*

*Advisor / Mentor: Jensen, Areum K. (areum.jensen@sjsu.edu)*

#### ABSTRACT

Autism Spectrum Disorder (ASD) is a complex neurological disorder identified in early childhood and is characterized by impaired social interaction and atypical behaviors. Limited studies reported that children with ASD tend to have higher heart rate (HR) and blood pressure (BP) at rest compared to typically developing children (TDC). Previously, we reported that HR and blood flow (BF) did not alter during exercise while BP significantly increased in ASD. Thus, we thought that ASD may have impaired autonomic control of cardiac output via differential contribution of HR and stroke volume (SV) to regulate BP during acute exercise. **PURPOSE:** To determine autonomic and cardiovascular responses to acute dynamic exercise in children with ASD. **METHODS:** A total of 36 adults, TDC and children with ASD participated in the study. HR from ECG, beat to beat arterial BP from Finapres and brachial BP, and SV from Modelflow, were continuously measured before, during and after 2 minutes of dynamic handgrip exercise at 35% and 50% of maximal voluntary contraction. Diameter, blood velocity, and flow of the brachial artery were measured using Doppler ultrasound on the contracting arm throughout the experiment. Time and frequency domains of HR variability indexes were used for autonomic function. **RESULTS:** Mean BP was significantly increased to exercise from rest in all groups with no group differences ( $\Delta 9.8 \pm 1.8$  adults,  $\Delta 8.3 \pm 1.2$  TDC, and  $\Delta 6.9 \pm 1.8$  ASD, mmHg). HR was significantly increased to exercise from rest in adults and TDC; however, there was no change in HR to exercise from rest in ASD ( $\Delta 11 \pm 1$  adults,  $\Delta 7 \pm 1$  TDC, and  $\Delta 1 \pm 1$  ASD, bpm). SV was unaltered from rest to exercise in all groups. Both adults and TDC had similar increase in BF during exercise compared to rest ( $\Delta 17 \pm 3$  adults vs.  $\Delta 14 \pm 2$  TDC cm/s); however, BF did not change from rest to exercise ( $\Delta 0.6 \pm 2.2$  ASD cm/s) in ASD. The rMSSD and high frequency of HRV were similar in all groups while very low frequency HRV was significantly lower in ASD. **CONCLUSION:** While HR and BF were altered to exercise in both control adults and TDC groups in similar fashion, HR and BF did not change in ASD children indicating impaired autonomic and vascular function. Higher total peripheral resistance may contribute to increase BP during exercise in ASD children without a significant contribution of cardiac output.

Supported by CASA RSCA Infusion, Central RSCA, and Undergraduate Research Grant, SJSU

#### 4. SWACSM Abstract

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### Qualitative Analysis of a Novel Approach by Kinesiology Students to Increase Population Physical Activity in Underserved Communities

JOSHUA CARLOS, LISA CHAUDHARI, RACHEL LANG-BALDE, STEVEN LOY, FACSM

Kinesiology: California State University, Northridge; Northridge, CA

Health Sciences: California State University, Northridge; Northridge CA

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*Category: Professional*

#### ABSTRACT

3 WINS Fitness (3W) is a free exercise program delivered by kinesiology students to underserved communities. Without external funding it has grown and been sustained since 2011. **PURPOSE:** With an intention of developing students' professional skills, 3W also aims to reduce health disparities and increase community health by increasing physical activity. With 74% of the US population failing the Physical Activity Guidelines for cardiovascular/strength training, programs like 3W are needed. There has been no qualitative analysis of 3W to determine benefits for students/participants until now. **METHODS:** The analysis of 3W involved nine on-line focus groups (FG). The FG captured students and participants of 3W across ten years and accounted for the program's pivot from in-person to virtual (COVID-19). Thematic analysis determined codes and major emerging themes. **RESULTS:** Validation of the successful in-person reach of 3W to Los Angeles individuals and communities and virtual reach state-wide showed six major themes: value, health, challenges, social connection, organization framework, and partnerships. This provides evidence for the three goals of 3W: personal health, community health, and student professional development. Specifically for this presentation, *health* addressed personal and professional aspects of health for participants, community, and students. *Value* comprised four aspects for students, participants, and the community. **CONCLUSION:** The broad reach of 3W was highlighted by improving health and being a program valued in multitudinous ways to individuals and the community noting the challenge(s) of identifying value through traditional quantitative research. As a free program, 3W reached a diverse community who mentioned physical, social, and emotional value, while students valued personal and professional skills gained and experiential learning different from their college peers. This study illustrates 3W ability to reduce health disparities and increase overall positive health outcomes, reinforcing its potential as a sustainable, scalable, accessible, and affordable solution to the physical inactivity pandemic. This study suggests the 3W student-led model can be replicated in kinesiology departments and contribute to the continuum of improving the public's health.

## 5. SWACSM Abstract

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### Step It Up: A Pilot Study of the Physical Demands of Division I Team's Soccer Matches Versus Semi-Professional and Collegiate Competition

MADALYN CARRASCO†, ROBERT G. LOCKIE, Ph.D. ‡

Department of Kinesiology, California State University-Fullerton, Fullerton, CA, USA

†Denotes graduate student author, ‡Denotes professional author

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*Category: Graduate*

#### ABSTRACT

In spring, Division I (DI) men's soccer teams have the opportunity to play collegiate and semi-professional (SP) teams. It could be expected that players on a collegiate team express higher workloads in a match against better competition. GPS data could be used to measure these workloads. However, at the collegiate level some coaches may take away GPS use in matches from some players as disciplinary action. This could impact data recorded by team sport scientists. **PURPOSE:** To compare physical demands measured by GPS metrics of a DI team in matches versus collegiate and SP competition in a real-world environment. **METHODS:** GPS data was collected on 3-12 starters from a DI men's soccer team during 2 matches with DI competition and 2 matches with SP competition (Game 1=12, Game 2=5, Game 3=3, Game 4=5). Coaching staff dictated how many players wore GPS units per match. GPS metrics included: total distance (TD), sprint distance (running at speeds above 5 m/s; SD), top speed (TS), player load (PL), and number of accelerations (athlete increases speed above 3 m/s). Data was combined across the two matches against the different levels of competitions, with the mean of all players in the match used for data analysis. Paired samples t-tests derived any differences in the GPS metrics from collegiate and SP competition. Effect sizes ( $d$ ) were also calculated. **RESULTS:** There were no statistically significant difference among means ( $p=0.525-0.841$ ). There were large effect sizes for TD, SD, and PL ( $d=1.15-1.56$ ). TS and accelerations had small effect sizes ( $d=0.48-0.56$ ). All metrics were higher in the SP matches compared to the collegiate matches. **CONCLUSION:** The effect size analysis suggested that more work was performed when playing SP teams, as measured by TD, SD, and PL. Even with this increase in overall effort, the team was not successful in these games. Players may not have had the physical capacity to play successfully against the SP teams. This information could be used to emphasize the need for specific conditioning of a collegiate team so they are physically prepared to compete with better competition. It should be noted the number of players analyzed per game impacted the team average as coaches removed GPS use for some players. Ideally, there should be better communication between coaches and support staff regarding the importance of GPS data.

## 6. SWACSM Abstract

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### Assessing the Validity of Several Heart Rate Monitors in Wearable Technology While Mountain Biking

BRYSON CARRIER, R. W. SALATTO, DUSTIN W. DAVIS, BRENNA BARRIOS, JACQUELYN V.L. SERTIC, PEYTON CATER, JAMES W. NAVALTA

Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV

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*Category: Doctoral*

*Advisor / Mentor: Navalta, James, james.navalta@unlv.edu*

#### ABSTRACT

The development of fitness trackers and other wearable technology designed for health and fitness purposes is growing in popularity and sophistication every day. These devices have the ability to measure or estimate a variety of physiological and physical variables, such as step count, energy expenditure, VO<sub>2</sub>max, lactate threshold, heart rate, stride length, vertical oscillation, ground contact time, blood oxygen saturation (via pulse oximetry), and many others. **PURPOSE:** In order to properly use these devices, independent validation needs to take place to determine the device's accuracy and ability to properly measure or estimate each variable. Therefore, the purpose of this study was to determine the validity of several HR monitors while mountain biking outdoors. **METHODS:** Twenty apparently healthy participants (10 male, 10 female, 26.3 ± 6.6yrs, 171.8 ± 8.0cm, 73.9 ± 19.0kg) volunteered to mountain bike (MTB) while wearing 6 heart rate monitors (HRMs), (5 test devices, 1 criterion). Each participant completed 2 MTB trials while wearing the HRMs. Data was recorded on a second-by-second basis for all devices and compared against the criterion (Polar H7). Data analysis included determining the mean, standard deviation (SD), mean absolute percentage error (MAPE), Pearson's correlation coefficient (R), and Lin's Concordance Correlation Coefficient (CCC). Pre-determined validity thresholds are as follows: MAPE<10%, CCC>0.7. **RESULTS:** The validity measures for the criterion Polar H7 Chest HRM, and test devices Suunto Chest HRM, Schosche Rhythm+ HRM, Garmin fenix 5x watch, Polar A360 watch, and Jabra Sport Earbuds, respectively, are as follows: Mean±SD (bpm): 161.79±19.43, 162.11±19.51, 144.50±43.62, 143.94±37.00, 142.14±30.23, and 140.12±41.15. MAPE: 0.66%, 10.90%, 11.12% , 13.20%, 26.56%. R: 0.99, 0.29, 0.31, 0.41, -0.32. CCC: 0.99, 0.19, 0.22, 0.29, -0.20. **CONCLUSION:** There was only one device that met the pre-established validity criteria, which was the Suunto Spartan Sport Watch with Chest HRM. This device may be considered valid in producing measures of HR while mountain biking.

## 7. SWACSM Abstract

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### Moderate Intensity Arm Cycling as a Viable Exercise Alternative for Overfat and Obese Individuals with Poor Cardiorespiratory Fitness

NICOLAS W. CLARK<sup>1</sup>, VALERIA L. G. PANISSA<sup>2</sup>, JEFFREY R. STOUT<sup>4</sup>, FACSM, ADAM J. WELLS<sup>4</sup>, DALE R. WAGNER<sup>3</sup>, & DAVID H. FUKUDA<sup>4</sup>

<sup>1</sup>Applied Human Performance Laboratory; Department of Exercise Science and Outdoor Recreation; Utah Valley University, UT; <sup>2</sup>Department of Sport, School of Physical Education and Sport; University of São Paulo, Brazil; <sup>3</sup>Kinesiology and Health Science Department; Utah State University, UT; <sup>4</sup>Division of Kinesiology; University of Central Florida; Orlando, FL

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*Category: Professional*

#### ABSTRACT

The prescription of aerobic exercise engaging the arms may extend the reach of physical activity and improve cardiorespiratory fitness in individuals with obesity. **PURPOSE:** This study compared the acute cardiopulmonary responses obtained during isocaloric arm and leg cycling trials performed at different intensities among individual's with and without excess body fat. **METHODS:** Participants were 37 young adults divided into two groups based on their fat mass index, lean and average (LA) and overfat and obese (OFO). They were tested for mode-specific work rate at the ventilatory threshold (VT) and volitional fatigue (VF) during two randomized ramp tests. The main experiments consisted of four randomized constant work rate isocaloric trials for arm and leg cycling performed at moderate (i.e., work rate equivalent to 80% of VT obtained during the ramp tests) and heavy (i.e., work rate equivalent to 30% of the difference between VT and VF obtained during the ramp tests). The time to expend 100 kcal ( $T_{kcal100}$ ) was recorded, and oxygen uptake ( $\dot{V}O_2$ ) was averaged for the duration of the tests. A two-way mixed factorial ANCOVA with physical activity level as a covariate determined work rate at VT, and  $\dot{V}O_2$  peak responses to the ramp tests. A three-way mixed factorial ANCOVA with the mode-specific fitness difference and physical activity level as covariates were run for  $T_{kcal100}$  and  $\dot{V}O_2$  obtained during isocaloric trials. Effect sizes (Cohen's  $d$ ) were calculated and interpreted with magnitude thresholds and significance level was set at  $p \leq 0.05$ . **RESULTS:** Significantly lower work rates at VT and  $\dot{V}O_2$  peak were shown for the OFO during ramp tests.  $T_{kcal100}$  was significantly longer for OFO in comparison to LA during isocaloric trials ( $d=0.36$ ). The  $\dot{V}O_2$  responses relative to body mass were significantly greater in leg cycling than arm cycling, while effect sizes were larger during heavy exercise ( $d=1.45$ ) compared to moderate ( $d=1.13$ ). **CONCLUSION:** Arm cycling performed at moderate intensity could be an alternative for young adults with excess body fat and poor cardiorespiratory fitness since this exercise modality elicited a sufficient metabolic response above three metabolic equivalents, which is within the moderate intensity domain suggested by current guidelines.

## 8. SWACSM Abstract

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### Impact of High Intensity Interval Training Versus Moderate Intensity Continuous Training on Critical Power

JESSICA COLLINS, OLIVIA LEACH, ABIGAIL DORFF, JESSICA LINDE, JASON KOFOED, MEGAN SHERMAN, MEAGAN PROFFIT, JARON QUIRANTE, KIESE MPONGO, JAYSON R. GIFFORD

Cardiovascular Lab, Exercise Sciences, Brigham Young University, Provo, UTAH

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Category: Masters

Advisor / Mentor: Gifford, Jayson (jaysongifford@byu.edu)

#### ABSTRACT

Critical Power ( $P_{CRIT}$ ) is the greatest power that a person can sustain for prolonged periods of time while maintaining steady-state, submaximal aerobic conditions. Work-prime ( $W'$ ) is the amount of work that can be tolerated when exercising in non-steady-state conditions above  $P_{CRIT}$ . **PURPOSE:** Compare the effect of equal amounts of moderate intensity continuous training (MICT) and high intensity interval training (HIIT) on  $P_{CRIT}$  and  $W'$ . **METHODS:** Twenty-two (10 female) untrained, young adults completed 8 weeks of cycling training (40 minutes, 3x per week) administered as either MICT (44% max power achieved during a graded exercise test;  $P_{GXT}$ ) or HIIT (4 bouts at 80%  $P_{GXT}$  for 4 minutes with recovery intervals between).  $P_{CRIT}$ ,  $W'$  and other physiological variables were determined before and after training. **RESULTS:**  $P_{CRIT}$  significantly increased in both groups, but to a greater extent in the HIIT group (MICT:  $15.7 \pm 3.1\%$  vs. HIIT:  $27.5 \pm 4.3\%$ ;  $P=0.04$ ).  $W'$  was not consistently impacted by training ( $P=0.76$ ). The training-induced change in  $P_{CRIT}$  was not significantly related to the training-induced change in  $\dot{V}O_{2MAX}$ . The training-induced increase in  $P_{CRIT}$  was related to how intense the training was relative to  $P_{CRIT}$ , with those performing the same workout at a greater %  $P_{CRIT}$  exhibiting greater training-induced increases in  $P_{CRIT}$  ( $R^2=0.49$ ,  $P<0.01$ ). **CONCLUSION:** HIIT elicits approximately twice the increase in  $P_{CRIT}$  than an equal amount of MICT in untrained young adults. Training-induced increases in  $P_{CRIT}$  are not dependent upon changes in  $\dot{V}O_{2MAX}$ . Exercise may be more effectively prescribed and described relative to  $P_{CRIT}$ , rather than  $\dot{V}O_{2MAX}$  or  $P_{GXT}$ .

## 9. SWACSM Abstract

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### Coordination of Ankle, Knee, and Hip Joint Torques During an American Football Long Snap

FAITH COTTAM, TRAVIS PETERSON, Ph.D.

Swenson Science Center; Exercise Science; California Lutheran University; Thousand Oaks, CA

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*Category: Undergraduate*

*Advisor / Mentor:* Peterson, Travis [tpeterson@callutheran.edu](mailto:tpeterson@callutheran.edu)

#### ABSTRACT

Research has studied upper-body kinematics (Balentine 2020) and whole-body kinetics during the American Football long snap (Goldstein 2020). There are no studies describing lower extremity (LE) joint kinetics during this movement. **PURPOSE:** This study aimed to understand how players coordinate LE torques while completing a long snap. We hypothesized there would be plantarflexor torques at the ankle and extensor torques at the knee and hip. **METHODS:** Subjects included college-aged football players (n=5) and high school football (n=5) players with  $\geq 2$  years experience. All subjects provided informed consent per local IRB. Average age of participants was  $18.9 \pm 1.3$  years, average mass was  $99.57 \pm 7.49$  kg, and average experience was  $9.0 \pm 2.57$  years. Sagittal plane video (30 Hz) was collected and digitized on the left side. Force data was collected with one foot on each force plate (Kistler, 1200 Hz). Torques at the ankle, knee, and hip were calculated using inverse dynamics. **RESULTS:** The group average extensor torques were generated at the hip ( $203.3 \pm 60.9$  Nm) and plantar flexor torques were generated at the ankle ( $173.1 \pm 40.9$  Nm) for all subjects. However, flexor knee torques were found for college athletes ( $55.4 \pm 50.2$  Nm), while an extensor knee torques were generated by high school athletes ( $-28.9 \pm 22.7$  Nm). Knee joint torque magnitude was relatively small compared to the ankle and hip torques. This may occur because the posterior two-jointed muscles that cross flex the knee also work to extend the hip (e.g. biceps femoris) and plantarflex the ankle (e.g. gastrocnemius). The extension/plantarflexion at the hip and ankle may prioritize these posterior two-jointed muscles, while sacrificing extension torque at the knee in the college athletes. Whereas high school athletes may rely on more extension torque at the knee to successfully complete the long snap. **CONCLUSIONS:** Identifying LE torques provides information in determining joint coordination strategies of college and high school athletes during a long snap. This information can be helpful for athletes to target specific muscle sets and joint coordination strategies during training for better long snap performance.

## 10. SWACSM Abstract

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### Validity of the K5 Wearable Metabolic System during the YMCA Bench Press Test - A Pilot Study

KYLE CRUZ, DUSTIN DAVIS, BRYSON CARRIER, JAMES W. NAVALTA, FACSM

Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences;  
University of Nevada, Las Vegas; Las Vegas, NV

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Category: Masters

Advisor / Mentor: Navalta, James (james.navalta@unlv.edu)

#### ABSTRACT

The accelerated advancements in exercise technology have resulted in the development of wearable metabolic units, allowing measurements to occur outside traditional laboratories. The validation of new equipment is essential in various applications. **PURPOSE:** The pilot study's purpose was to validate the metabolic measurements of the COSMED K5 wearable metabolic system against the criterion Parvo Medics TrueOne 2400 during a modified YMCA Bench Press Test. **METHODS:** Nine resistance weight-trained participants (six male, three female, age  $29.3 \pm 8.0$  yrs,  $78.1 \pm 13.8$  kg,  $173.3 \pm 11.5$  cm) performed two identical tests on the same day. Because of equipment warm-up times, the first test was conducted on the Parvo and the second on the K5. Upon being equipped, the participant laid supine on the bench, and five minutes of resting data were obtained. Then, the metronome was set to 60 beats per minute, and the barbell was placed into the starting position. The subject then performed ten repetitions in time with the metronome. Upon completion of ten repetitions, the barbell was racked, and recovery data was recorded for five minutes. Metabolic data included the average pre, during, and post-exercise breath-by-breath volume of oxygen consumed ( $\text{VO}_2$ , L/min), the volume of carbon dioxide produced ( $\text{VCO}_2$ , L/min), and the ventilatory equivalent (VE, L/min). Data analysis for validity was determined via mean absolute percentage error (MAPE,  $<5\%$ ) and Lin's Concordance Correlation Coefficient (CCC,  $>0.7$ ). **RESULTS:** CCC values were met for pre-exercise  $\text{VO}_2$ ,  $\text{VCO}_2$ , VE, and during exercise VE at 0.79, 0.79, 0.84, 0.72, respectively. No MAPE measurements were met. Therefore, no sections were considered valid. **CONCLUSION:** In the context and protocol of this study, the COSMED K5 did not provide comparable metabolic data to the Parvo Medics TrueOne 2400. However, averages from different time intervals may support in favor of this study and future studies.

## 11. SWACSM Abstract

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### Maximum Aerobic Exercise Induces Common Carotid Vasoconstriction and Increased Vascular Resistance

MICHAEL DIAZ, ZARIA OPARA, HEYSEL MORALES, ALLAN KNOX PH.D.

Integrative Human Physiology Laboratory, Exercise Science Department, California Lutheran University, CA

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*Category: Undergraduate*

*Advisor / Mentor: Knox, Allan (aknox@callutheran.edu)*

#### ABSTRACT

**PURPOSE:** Low-to-moderate intensity aerobic exercise has been reported to elicit changes in systemic hemodynamics. Recent evidence suggests that the cerebral circulation reacts independently to systemic circulations to the same physiological stimuli. The aim of this is to determine the influence of high-intensity aerobic exercise on common carotid artery (CCA) hemodynamics. **METHODS:** Hemodynamic measurements were recorded before and following the cessation of a maximum oxygen uptake test ( $VO_{2max}$ ). One minute video of the CCA by Doppler ultrasound were recorded and used to determine peak systolic velocity (PSV), end diastolic velocity (EDV), time averaged mean blood velocity (TAMEAN), timed average maximum velocity (TAMAX), pulsatility index (PI), and resistance index (RI). CCA diameters were calculated by commercially available vessel tracking software. **RESULTS:** A total of 29 individuals, 14 male and 15 females, participated in this study. Following the cessation of exercise, PSV ( $p < 0.001$ ), TAMAX ( $p = 0.0085$ ), RI ( $p < 0.001$ ), and PI ( $p = 0.0032$ ) significantly increased whilst the minimum diameter ( $p = 0.005$ ), and maximum diameter ( $p = 0.020$ ) decreased. **CONCLUSION:** The results show hemodynamic changes in the CCA following  $VO_{2max}$  exercise. Specifically, increases in vascular resistance are may be due to the reductions in arterial diameter, which may be evident downstream of the CCA.

## 12. SWACSM Abstract

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### Are Age-Related Differences in Critical Power and Work-Prime Simply Due to Differences in Muscle Mass?

ABIGAIL DORFF, CHRISTY BRADFORD, ASHLEY HUNSAKER, JAKE ATKINSON,  
OLIVIA LEACH & JAYSON GIFFORD

BYU Cardiovascular Lab; Exercise Science; Brigham Young University; Provo, UT

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*Category: Masters*

*Advisor / Mentor: Gifford, Jay (jaysongifford@byu.edu)*

#### ABSTRACT

Critical Power (CP) represents the threshold between sustainable, steady-state and unsustainable, non-steady-state exercise while Work Prime (W') represents tolerable work above CP. The combination of CP and W' potentially influence exercise tolerance. We recently observed age-related reductions in both CP and W' in active adults. Age-related decreases in muscle mass, which was not measured, could account for the reduction in CP and W'. **PURPOSE:** The aim of this study was to determine if CP and W' are decreased in active, older adults when normalizing for muscle mass. **METHODS:** Single leg knee extension exercise was used to determine CP and W' on both young (18-35 years, N=10) and older (60-67 years, N=7) participants. Six tests to failure were performed on a modified cycle ergometer across multiple visits. Failure occurred when the subject was no longer able to maintain 80 rpm. CP and W' were determined by time of failure and total work performed. Participants received a DEXA scan to determine muscle mass of the right leg. **RESULTS:** Average CP for the young was  $39 \pm 10$  Watts and for the old, it was  $33 \pm 9$  Watts ( $p = 0.29$ ). Average W' for the young was  $2868 \pm 1507$  Joules and for the old was  $1523 \pm 788$  Joules ( $p = 0.01$ ). Average leg muscle mass was not different between young and old ( $p = 0.49$ ). When divided by muscle mass of the active leg (Kg), CP for the young was  $4 \pm 1.5$  Watts/Kg and for the old was  $4 \pm 1.3$  Watts/Kg. W' for the young was  $2868 \pm 1507$  Joules/Kg and for the old was  $1494 \pm 723$  Joules/Kg. Critical Power, when normalized for muscle mass, was not significantly different ( $P = 0.547$ ) with age, while W', when normalized for muscle mass was down 52% in older people ( $P = 0.033$ ). **CONCLUSION:** Active older individuals have the same CP as the young, even when normalizing for muscle mass but W' is half for the old participants as the young, even when normalizing for muscle mass. The decrease in W' could represent the lower tolerance to fatigue previously reported for older adults.

### 13. SWACSM Abstract

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#### The Effects of Exercise on Inflammatory Biomarkers over a 36-h Fast

AUSTIN F. DUERSCH, HUNTER CHAMBERLAIN, JACOB COLEMAN, LANDON S. DERU, AND BRUCE W. BAILEY

BYU Lifestyle Medicine Lab; Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Bailey, Bruce (bailey.bruce@gmail.com)*

#### ABSTRACT

Postprandial and diet-induced chronic inflammation has become a popular point of discussion over recent years in lifestyle medicine as studies have uncovered the effects that various inflammation markers have on chronic diseases including heart disease, diabetes mellitus, and arthritis. Interventions to help lower inflammation could help promote longevity and decrease risk of chronic diseases. **PURPOSE:** While previous research has shown various effects of fasting on inflammatory biomarkers, this study assessed the impact of an acute 36h fast with or without exercise at the beginning on inflammatory biomarkers (IL-6, C-peptide, GIP, MCP-1, and TNF-alpha). **METHODS:** Twenty healthy subjects (11 male, 9 female) completed two 36h fasts, with one protocol requiring the subject to complete a treadmill exercise session prior to fasting. Venipuncture was performed every 12 h and samples were later analyzed for inflammatory biomarkers. **RESULTS:** GIP decreased over the first 12 hours of the fast ( $p < 0.0001$ ) and then remained low at 24 and 36 hours. Both MCP-1 and C-Peptide decreased over the first 24 hours ( $p < .0001$  for both) of the fast and then leveled off from 24 to 36 hours ( $p = 0.1883$ ,  $p = 0.2798$ , respectively). There was a significant difference in area under the curve between conditions for both C-Peptide and MCP-1. The difference in area under the curve for MCP-1 was  $173 \pm 61$  pg/ml ( $F = 7.97$ ,  $p < .012$ ) and  $1809 \pm 791$  pg/ml ( $F = 5.23$ ,  $p < .035$ ) for C-Peptide. There was no significant difference between conditions for IL-6, TNF-  $\alpha$ , and GIP. **CONCLUSION:** Acute fasting reduces GIP, MCP-1 and C-peptide but most of the changes occurred during the first 24 hours of the fast. When exercise was combined with the 36h fast, levels of both C-Peptide and MCP-1 are significantly altered.

## 14. SWACSM Abstract

### Validity of Average Heart Rate and Energy Expenditure in Polar Armband Devices While Self-Paced Biking

WYATT B. FULLMER<sup>1</sup>, BRYSON CARRIER<sup>2</sup>, DAMIAN GIL<sup>3</sup>, KYLE CRUZ<sup>2</sup>, CHARLI AGUILAR<sup>2</sup>, DUSTIN DAVIS<sup>2</sup>, ELIAS MALEK<sup>2</sup>, NATHANIEL BODELL<sup>3</sup>, JEFF MONTES<sup>4</sup>, JAKE MANNING<sup>1</sup>, MARK DEBELISO, FACSM<sup>1</sup>, JAMES W. NAVALTA, FACSM<sup>2</sup>, MARCUS M. LAWRENCE<sup>1</sup>

<sup>1</sup>Department of Kinesiology and Outdoor Recreation, Southern Utah University, Cedar City, UT; <sup>2</sup>Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas, Las Vegas, NV; <sup>3</sup>Department of Kinesiology, California State University San Bernardino, San Bernardino, CA; <sup>4</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

Category: Undergraduate

Advisor / Mentor: Lawrence, Marcus (marcuslawrence@suu.edu)

#### ABSTRACT

Wearable technology has become an increasingly utilized tool to track various aspects of physical activity amongst fitness enthusiasts and the general public. Polar is a common brand that is utilized, and many use the devices for a variety of modalities, like walking, running, or biking. However, the validity of Polar's armband optical devices in estimating average heart rate (HR) and energy expenditure (EE) while biking is unknown. **PURPOSE:** The purpose of this study was to determine if two devices, the Polar OH1 and Polar Verity Sense, record valid measures of average HR and EE while self-paced biking. **METHODS:** Twenty participants (n=10 female, n=10 male; 23.5 ± 6.48 years) were tested individually. The Polar OH1 and Polar Verity Sense were worn around separate biceps (placement was randomly selected). Following a ~5 min. self-paced walking warm-up outdoors, participants were fitted to a road bicycle and asked to perform a ~5 min. self-paced bike ride on a flat paved surface outdoors. Mean absolute percent error (MAPE, ≤10%) and Lin's Concordance ( $\rho \geq 0.7$ ) were used to validate the device's average HR (in bpm) and estimated EE (in kcals) compared to criterion reference devices of the Polar H10 heart rate strap and Cosmed K5 portable metabolic unit, respectively. Dependent T-tests determined differences ( $p \leq 0.05$ ). **RESULTS:** Average HR was considered valid for both devices, but estimated EE was not valid while self-paced biking using the Polar OH1 or Polar Verity Smart (see table below). **CONCLUSION:** Individuals who bike ride and use these devices should consider the implications of these findings.

	Criterion Reference	Devices Being Tested	
<b>Average HR (bpm)</b>	Polar H10	Polar Verity Sense	Polar OH1
Mean ± SD (bpm)	110 ± 16.83	113.74 ± 17.61	112.35 ± 18.85
MAPE		4.68%	4.12%
Lin's Concordance		0.83	0.88
t-test		0.15	0.42
<b>Estimated EE (kcal)</b>	Cosmed K5	Polar Verity Sense	Polar OH1
Mean ± SD (kcal)	37.16 ± 8.72	40.95 ± 18.85	39.59 ± 19.31
MAPE		30.76%	30.93%
Lin's Concordance		0.52	0.53
t-test		0.26	0.49

## 15. SWACSM Abstract

### Validity of Average Heart Rate and Energy Expenditure in Polar OH1 and Verity Sense While Self-Paced Running

DAMIAN GIL<sup>3</sup>, BRYSON CARRIER<sup>2</sup>, WYATT B. FULLMER<sup>1</sup>, KYLE CRUZ<sup>2</sup>, CHARLI AGUILAR<sup>2</sup>, DUSTIN W. DAVIS<sup>2</sup>, ELIAS MALEK<sup>2</sup>, NATHANIEL BODELL<sup>3</sup>, JEFF MONTES<sup>4</sup>, JAKE MANNING<sup>1</sup>, JAMES W. NAVALTA, FACSM<sup>2</sup>, MARCUS M. LAWRENCE<sup>1</sup>, MARK DEBELISO, FACSM<sup>1</sup>

<sup>1</sup>Department of Kinesiology and Outdoor Recreation, Southern Utah University, Cedar City, UT; <sup>2</sup>Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas, Las Vegas, NV; <sup>3</sup>Department of Kinesiology, California State University San Bernardino, San Bernardino, CA; <sup>4</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

Category: Undergraduate

Advisor / Mentor: Bodell Nathaniel ([nathaniel.bodell@csusb.edu](mailto:nathaniel.bodell@csusb.edu))

#### ABSTRACT

Running is one of the most common forms of exercise in the world today. Technological advancements have contributed to the rise in the usage of wearable technology. Polar is a household name leading this amelioration of wearable technology. The Polar OH1 and Verity Sense are two of the typical models used to measure heart rate and energy expenditure, however, the validity of these devices have yet to be investigated. **PURPOSE:** The purpose of this study was to determine the validity of the Polar OH1 and the Verity Sense during self-paced running. **METHODS:** Twenty participants (n=10 female, n=10 male; 23.5±6.48 years) participated in the study. The Polar OH1 and the Polar Verity Sense were affixed to alternate biceps. The Polar H10 heart rate strap, in conjunction with the COSMED K5 portable metabolic cart, was used as the criterion reference. Participants proceeded to run at a self-paced rate for approximately 10-15 minutes. Data collection commenced upon reaching 70% of their estimated max heart rate and was observed for a period of 5 minutes. Mean absolute percent error (MAPE, ≤10%) and Lin's Concordance ( $\rho \geq 0.7$ ) were used to validate the device's average HR (in bpm) and estimated EE (in kcals) compared to criterion reference. Dependent T-tests were run to determine any possible differences ( $p \leq 0.05$ ). **RESULTS:** The Polar Verity Sense is a valid measure of HR (MAPE 6.83%, Lin's=0.68) when measured against the Polar H10 criterion. The Polar OH1 nears validity (MAPE= 6.01%, Lin's=**0.72**). The Polar Verity Sense and OH1 were not valid measures for estimated energy expenditure (see table 1). **CONCLUSION:** The Polar Verity Sense is a valid measure of HR for self-paced running. Both the Polar Verity Sense and OH1 are not valid for the estimation of EE.

Table 1

	Polar H10	Verity Sense	Polar OH1
Mean HR (bpm)	162±23.49	166.37±19.75	167±22.49
MAPE		6.83%	6.01%
Lin's Concordance		0.68	0.72
t-test		0.28	0.21
Estimated EE (Kcal)	173.05±53.06	194.84±67.69	190.47±66.57
MAPE		22.88%	22.77%
Lin's Concordance		0.67	0.72
t-test		0.05	0.09

## 16. SWACSM Abstract

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### Time Course of Supine Assessment of Bioelectrical Variables: An Evaluation of Resistance, Reactance, and Phase Angle

HOLLY HALL, JEREMY B. DUCHARME, JONATHAN HOUCK, AVADNEY GERARD-OSBOURNE, CHLOE CLARK, & ANN L. GIBSON, FACSM

Exercise Physiology Laboratory; Department of Health, Exercise, and Sports Sciences; University of New Mexico; Albuquerque, NM

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*Category: Undergraduate*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

To minimize the effect of shifts in bodily water compartments, assessments of resistance (R) and reactance (Xc) via bioelectrical impedance analysis (BIA) is recommended to occur after the individual has been supine for 15 minutes. While changes in bodily water compartments within 15 minutes of laying in the supine position may affect values for R and Xc, it's unknown how these body water shifts affect phase angle (PhA). **PURPOSE:** Investigate the effect of time for stabilization of supine measurements of R, Xc, and PhA obtained via the RJL Quantum Legacy BIA analyzer. **METHODS:** Thirty-eight men (n=16) and women (n=22) were deemed hydrated (urine specific gravity  $\leq 1.020$ ) and were prepped for standard tetrapolar electrode placement. In the supine position, R, Xc, and PhA at 50kHz were measured on the right side of the body immediately after laying down (baseline) and every 5 minutes for 15 minutes. Participants remained motionless throughout the duration of the test. Separate one-way repeated measures ANOVA were used to assess the effect of time on R, Xc, and PhA. For repeated measures ANOVA comparisons, generalized eta squared ( $\eta^2_G$ ) was reported to quantify the observed effect size, where small = .01; medium = .06; large = .14. An alpha of .05 was used to determine statistical significance. **RESULTS:** There was a small but significant effect of time on R,  $F(1.76, 65.16) = 74.091, p < .001, \eta^2_G < .001$ . Average values for R increased from  $553.2 \pm 90.1\Omega$  at baseline to  $560.4 \pm 93.3\Omega$  post-15 minutes. A small but significant effect for time on Xc was also observed,  $F(1.34, 46.01) = 20.958, p < .001, \eta^2_G = .004$ . Average values for Xc increased from  $68.2 \pm 7.8\Omega$  at baseline to  $69.6 \pm 8.1\Omega$  post-15 minutes. Laying in the supine position for 15 minutes had no significant effect on PhA,  $F(1.2, 44.51) = 3.401, p = .065, \eta^2_G < .001$ . Average PhA values went from  $7.13 \pm .90^\circ$  at baseline to  $7.18 \pm .86^\circ$  post-15 minutes. **CONCLUSION:** While time to allow for bodily water compartment stabilization has a small but significant effect on R and Xc, this study demonstrates that PhA is likely unaffected. PhA can be accurately assessed immediately upon assuming the supine position without allowing for bodily water compartment stabilization via the RJL Quantum Legacy.

## 17. SWACSM Abstract

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### Validation of the Garmin Fenix 6S Maximal Oxygen Consumption (VO<sub>2max</sub>) Estimate

MACY M. HELM, BRYSON CARRIER, DUSTIN W. DAVIS, KYLE CRUZ, BRENNA BARRIOS, JAMES W. NAVALTA FACSM

Exercise Physiology Lab; Department of Kinesiology and Nutrition Science; University Nevada Las Vegas; Las Vegas, NV

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*Category: Undergraduate*

*Advisor / Mentor: Navalta, James (james.navalta@unlv.edu)*

#### ABSTRACT

Commercially available fitness watches provide recreational athletes insight into aerobic fitness. The Garmin fenix® 6S (GF) is a recently released multisport watch that provides estimations related to aerobic and endurance performance, including maximal oxygen consumption (VO<sub>2max</sub>). VO<sub>2max</sub> is an important physiological metric to determine aerobic capacity, structure training, and anticipate race performance. **PURPOSE:** Therefore, the purpose of this study was to determine the validity and accuracy of the GF's prediction of VO<sub>2max</sub> in the general population compared to lab-based measurements. **METHODS:** 20 healthy participants (9 male, 11 female, 24 ± 5.4 years, 30.45 ± 21.79 km run/wk) participated in two testing sessions; a graded exercise test to exhaustion (GXT) on a treadmill and a 10 to 15-minute submaximal outdoor running session. During the treadmill GXT, the volume of expired carbon dioxide and inspired oxygen were collected and analyzed using a ParvoMedics metabolic cart. The highest average values of inspired oxygen were recorded as VO<sub>2max</sub>, at the 4-breath, 15-second, 30-second, and 1-minute average. Participants then returned within 2 to 7 days after the GXT to complete a 10 to 15-minute outdoor run with the Garmin heart rate monitor and GF. The watch was reset to factory settings prior to inputting participant information. The watch generated a VO<sub>2max</sub> estimate based on heart rate and pace during the outdoor run. Validity of the wearable device was determined by comparing the GF to the lab data via a 2-tailed paired t-test, mean absolute percentage error (MAPE), Pearson Correlation (r), and Lin's Concordance Correlation Coefficient (CCC). **RESULTS:** The GF produced a valid 30-second VO<sub>2max</sub> estimation, as determined by a non-significant t-test ( $p = 0.891$ ), MAPE value of 5.64%, and CCC value of 0.72. The 15-second and 1-minute VO<sub>2max</sub> estimation met secondary validation criteria using Pearson's Correlation (0.77 and 0.76, respectively). The GF did not provide a valid 4-breath VO<sub>2max</sub> estimation ( $p = 0.00$ ). **CONCLUSION:** Using the validation criteria established in the literature, the GF demonstrated a valid 30-second VO<sub>2max</sub> estimate compared to lab testing. These results suggest that the GF, when paired with the Garmin heart rate monitor, generates an accurate assessment of aerobic capacity for the general population and can be used to determine VO<sub>2max</sub> when lab-based methods are not available.

## 18. SWACSM Abstract

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### Systematic Observation of Mask Adherence and Physical Distancing in a Public Recreational Setting in Response to Public Policy

ANDREA HUGHES, JASON NG

Human Performance Lab; Department of Kinesiology; California State University, San Bernardino; San Bernardino, CA

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*Category: Undergraduate*

*Advisor / Mentor: Ng, Jason (jason.ng@csusb.edu)*

#### ABSTRACT

During the COVID-19 pandemic, regular physical activity (PA) remained an important recommendation to prevent hypokinetic diseases. At the same time, changes in policies on mask wearing and physical distancing may have increased confusion about engaging in PA. Public outdoor recreation spaces are potentially valuable resources to address these challenges, however there is limited knowledge of mask and distancing behaviors in outdoor recreational areas. **PURPOSE:** The aim of this study was to observe mask and distancing behaviors of individuals performing PA at a public outdoor recreational setting. **METHODS:** We used a modified version of the Systematic Observation of Mask Adherence and Distancing (SOMAD) tool to record mask wearing and physical distancing behavior of individuals at a public outdoor recreational area. Data collection took place twice per week for 13 weeks between March 2021 to June 2021 at a public park located in a Southern California (CA) desert city. The CDC announced mask and distancing guidelines on April 27 and May 13. California announced statewide guidelines on May 3. **RESULTS:** Out of the total observations (n=711 individuals), 11.4% wore a mask properly and 29.5% maintained a physical distance of  $\geq 6$  ft from other individuals. In regard to CDC policy announcements, proper mask wearing decreased from 13.4% (initial policy) to 6.3% (4/27/21 policy) to 4.2% (5/13/21 policy). During the same time periods, proper 6-ft physical distancing slightly decreased from 28.9% (initial policy) to 27.1% (4/27/21 policy) then increased to 33.6% (5/13/21 policy). Following the CA guideline change, mask wearing decreased from 13.1% (initial policy) to 4.3% (5/03/21). Physical distancing in the same policy periods increased from 29.1% to 31.4%. **CONCLUSION:** Mask wearing and physical distancing remained low at the public outdoor recreational park. These findings warrant further examination to discern those who wore masks in groups from those who did not wear masks while exercising alone. Furthermore, continued systematic observations of mask wearing, distancing, and physical activity behaviors analyzed alongside data related to COVID-19 cases would provide insight to public health researchers when creating infection prevention guidelines whilst promoting physical activity to enhance immunity.

## 19. SWACSM Abstract

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### The Effects of a Fitness and Wellness Course on Physical Activity Behavior and Intentions: Comparing In-Person Learning to Remote Learning.

CALIA A. HUNTER, CARSON G. CROEL, SHANNON R. SIEGEL, FACSM, & STEPHANIE L. COOPER

Department of Kinesiology; University of San Francisco; San Francisco, CA

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*Category: Undergraduate*

*Advisor / Mentor: Cooper, Stephanie (slcooper@usfca.edu), Siegel, Shannon (ssiegel@usfca.edu)*

#### ABSTRACT

College students are often at-risk for physical inactivity. Many higher education institutions do not require physical activity courses, thus limiting the opportunity to promote physical activity. Of particular interest is the relationship between physical activity, mental health, and perceived barriers (e.g., access to resources, school-related responsibilities). Decreasing physical inactivity in college students by embedding a mandatory fitness and wellness course into the curriculum could be a viable option. **PURPOSE:** The purpose of this study was to distinguish if a fitness and wellness course delivered through an in-person or remote modality would affect students' physical activity behavior and intention throughout a semester. **METHODS:** To retrieve information on physical activity behavior, sedentary behavior, and physical activity intention at three time points in the semester, the International Physical Activity Questionnaire was utilized, as was a questionnaire assessing physical activity intentions. **RESULTS:** The in-person group (n = 25) engaged in significantly more walking than the remote group (n=17; p=.04); no significant differences were found between groups for other physical activity behaviors. There was no difference between groups in physical activity behavior even though the remote group had greater intentions of being physically active (p = .02). Findings from the physical activity intentions questionnaire highlighted that the remote group scored higher in the instrumental and injunctive (p = .001) domains. There was also a significant reduction in perceived opportunity to engage in physical activity by both groups (p = .04), despite reporting greater access to resources, as the semester progressed (p = .05). Personal testimonies disclosed that low levels of physical activity were associated with increased stress due to school, lack of time, and lack of motivation. **CONCLUSION:** The comparison between in-person and online modalities, and their influence on physical activity and behavior is limited in the literature. Studies should further explore if incorporating a fitness and wellness course in higher education would benefit students' physical activity intentions, behaviors, awareness of physical activity resources, and overall well-being.

## 20. SWACSM Abstract

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### **Kinesiology Student Led 3 WINS Fitness; Free Exercise Program Pivots Virtual and Emerges from Pandemic as Hybrid Park-Based Program for Underserved Communities**

DAVID JIMENEZ, ARLENE FLORES, GABRIELLE VILLAGRA, JOSHUA CARLOS, STEVEN LOY, FACSM

Kinesiology; California State University Northridge; Northridge, California

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*Category: Undergraduate/Masters*

Loy, Steven (steven.loy@csun.edu)

#### ABSTRACT

3 WINS Fitness is a FREE program delivered by Kinesiology students from Cal State University, Northridge focused on underserved communities in the San Fernando Valley. **PURPOSE:** The program aims to increase the health and fitness of participants, build healthier communities, and reduce population physical inactivity through exercise while developing students' professional skills. **METHODS:** The structure of the program gives students an opportunity to apply in-class knowledge in a real-life setting. This translates to engaging participants of all fitness levels in 60 minutes of moderate-to-vigorous physical activity 3 days/week. Many students had no prior in-park experience before this fall and had only experienced the virtual setting the program converted to in March of 2020. In the summer of 2021, combining the virtual program with a park program created a hybrid opportunity. However, the in-park opportunity could not replicate the prior program due to pandemic precautions including an equipment-less program. Thus, methods to convert the program to hybrid, re-design exercise programming, train instructors who had less experience in prior years due to their virtual education, and recruit students and participants hesitant to return to an in-park face-to-face interaction were required. **RESULTS:** There is an opportunity for kinesiology departments to work towards increasing population physical activity levels throughout the country while concomitantly providing students a deeper understanding of classroom knowledge through application. Another significant experience for many is the opportunity to work with a population they are not familiar with and acquire a socio-cultural awareness and exposure not provided in the university setting. Students gained knowledge and leadership experiences required to re-open and modify a program to accommodate pandemic requirements. To date, the program re-started from nothing and presently has built the program to over 70 participants and growing. **CONCLUSION:** 3 WINS Fitness has taken an in-person program through a successful conversion to a virtual program and through critical analysis and strong leadership evolved the program into a hybrid model to enhance the program's 3 WINS, student professional development, participant health, and community health.

## 21. SWACSM Abstract

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### Estrogen Receptor Alpha Controls Mitochondrial Function and Metabolic Homeostasis, and is Critical for Exercise-Induced Improvements in Metabolism

ALEXIA M. JOSEPH, ZHENQI ZHOU, TIMOTHY M. MOORE, ALEXANDER R. STRUMWASSER, & ANDREA L. HEVENER

Hevener Laboratory; Department of Medicine; University of California, Los Angeles; Los Angeles, CA

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Category: Professional

Advisor / Mentor: Hevener, Andrea (ahevener@mednet.ucla.edu)

#### ABSTRACT

Skeletal muscle is an important tissue responsible for locomotion, oxidative metabolism, and insulin-stimulated glucose disposal. Because exercise is the most effective means to combat metabolic dysfunction and prevent the progression of type 2 diabetes, our laboratory is interested in understanding the molecular transducers underlying the health benefits of exercise. Previous work by our group has shown that muscle *ESR1/ER $\alpha$*  expression is correlated with indices of metabolic health, and *Esr1* expression in muscle is induced following exercise training. **PURPOSE:** Determine whether genetic overexpression of *Esr1* to mimic transcript induction by physical activity is sufficient to produce favorable metabolic changes comparable to exercise training. **METHODS:** We generated a conditional gain of *Esr1* expression mouse model (mERaTg) using a muscle-specific tamoxifen-inducible promoter. By design, we achieved *Esr1* expression levels in skeletal muscle of adult mice comparable to that of age-matched wildtype animals following 30 days of training. To determine whether the induction of muscle *Esr1* was protective against metabolic dysfunction, we challenged mERaTg mice with a high fat diet (HFD) for 8 weeks. mERaTg mice were provided with cage running wheels (for 30 days) to determine whether *Esr1* induction by genetic means produces synergistic outcomes on metabolism when coupled with exercise training. **RESULTS:** mERaTg mice were protected against HFD-induced obesity and insulin resistance compared with control animals. Protection of metabolic health during HFD-challenge was associated with improved mitochondrial function and oxidative capacity. In sedentary animals, *Esr1*-driven improvements in mitochondrial function over control were further enhanced following exercise training. Specifically, *Esr1* overexpression coupled with exercise training produced a synergistic effect to increase the expression of *TFAM*, *MTCO3*, and mtDNA copy number. **CONCLUSION:** The data suggests that *Esr1* overexpression produces favorable changes in metabolism and protects against metabolic perturbations that contribute to chronic disease. Our research indicates that *Esr1* could be targeted by therapeutic means to enhance the effectiveness of exercise and combat chronic diseases associated with metabolic dysfunction.

## 22. SWACSM Abstract

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### Analysis of Comparative Enjoyment Following High to Moderate Intensity Upper Body Cycling and Lower Body Cycling in Lean and Obese

KYLE M. LARSEN<sup>1</sup>, DAVID H. FUKUDA<sup>2</sup>, ANTHONY CICCONE<sup>1</sup>, & NICOLAS W. CLARK<sup>1</sup>

<sup>1</sup>Applied Human Performance Laboratory; Department of Exercise Science and Outdoor Recreation; Utah Valley University, UT; <sup>2</sup>Division of Kinesiology; University of Central Florida; Orlando, FL

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*Category: Undergraduate*

*Mentor: Clark, Nicolas (nicolas.clark@uvu.edu)*

#### ABSTRACT

The combination of utilizing differing aerobic exercise prescriptions such as arm cycling and traditional leg cycling at varying exercise intensities may affect an individual's enjoyment of exercise. **PURPOSE:** This study compared levels of perceived enjoyment obtained following isocaloric arm and leg cycling trials performed at heavy and moderate intensities among lean and average (LA) and overfat and obese individuals (OFO). **METHODS:** Participants included 36 young adults divided into two groups based on their Fat Mass Index (FMI) (LA=4.6±1.7 FM kg/m<sup>2</sup>, OFO=9.9±3.5 FM kg/m<sup>2</sup>). They completed a combination of four arm and leg cycling isocaloric trials at moderate and heavy intensities based on their mode-specific ventilatory threshold and maximal power output attained during maximal ramp tests. Participants remained seated for 10 minutes following each 100 kcal isocaloric trial before completing the Physical Activity Enjoyment Scale questionnaire (PACES). A higher PACES score indicates greater enjoyment (range=18–126). To determine the effect of mode (arm x leg cycling), intensity (heavy x moderate), and FMI (LA x OFO) on PACES score, likelihood linear mixed-effects models were fitted. Assumptions of residual normality and homoscedasticity were visually verified using q-q plots and model predicted scores vs. residuals plots, respectively. PACES score was modeled using participant as a random effect, and mode, intensity, and FMI as fixed effects. Fixed effects were analyzed for significant main effects and interactions via F tests. Alpha was set at 0.05. **RESULTS:** No significant interactions were found between mode, intensity, and FMI ( $p>0.05$ ). PACES scores following arm cycling at heavy intensity (104±16), arm cycling at moderate intensity (100±18), leg cycling at heavy intensity (102±13), and leg cycling at moderate intensity (103±20) had no significant interaction. No main effects were found between LA (103±17) and OFO (102±17) groups. **CONCLUSION:** In conclusion, neither mode nor intensity or FMI affected PACES scores for LA or OFO groups. Therefore, individuals should explore a variety of aerobic exercise options to identify individual preferences. Future research should investigate the chronic effects of body composition on exercise mode and intensity on enjoyment levels.

## 23. SWACSM Abstract

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### Kinetic and Kinematic Analysis of the Split Jerk and the Split Jerk from the Rack

ADRINA LAZAR & KEVIN VALENZUELA

Movement Science Lab; Kinesiology; California State University, Long Beach; Long Beach, CALIFORNIA

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*Category: Masters*

*Advisor / Mentor: Valenzuela, Kevin (kevin.valenzuela@csulb.edu)*

#### ABSTRACT

The clean and jerk is one of the movements in the sport of weightlifting. Research has broken down the movement of the power clean and hang power clean, which is what seems to be primarily used in the field of strength and conditioning. However, by looking at the split jerk we could gain new insight into increasing power outputs in athletes by utilizing the split jerk in training. **PURPOSE:** Therefore, the purpose of this research is to analyze the power output and knee joint angles of the split jerk from two different positions, taken off the rack (SJ) and the split jerk lifted after the squat clean (C&J). **METHODS:** Five weightlifters who have competed in an USAW sanctioned weightlifting meet within the last 2 years, between 18-35 years, training 3-5 days a week and had no previous injuries within the last 6-months participated. After performing the specific warm-up, markers were placed on the athletes. The athletes then began to warm up to their working weight at 80% of 1RM by gradually performing 1 rep of their clean & jerk at 55%, 60%, 65%, 75% of their 1RM. Once the athlete had warmed up, four trials were recorded for the full clean & jerk and split jerk from the rack. The order of the movements was randomly selected for each athlete. Sagittal knee joint angles and peak power were assessed for each movement. **RESULTS:** When comparing the joint angles of the split jerk taken off the rack to the split jerk lifted after the squat clean, average peak knee flexion and average peak knee extension were similar when comparing within subjects. Average peak knee flexion for the C&J and SJ were -70.09 (+/- 12.56) degrees, and -70.70(+/-10.60) degrees, respectively, with a 0.006% difference. Average peak knee extension for both the C&J and SJ were -6.01(+/-9.40) degrees, and -6.05(+/-10.36) degrees, respectively, with a 0.0004% difference. Average peak power outputs for the C&J and SJ were 932.30(+/-278.85) watts, and 963.24(+/-267.64) watts, respectively, with a 0.31% difference between the groups. **CONCLUSION:** In conclusion the split jerk taken from the rack had a slightly greater peak power output than the split jerk performed after the clean. Interestingly, average peak knee extension values do not dictate an increase in power outputs. More research needs to be done to determine if average peak knee flexion values could determine a higher power.

## 24. SWACSM Abstract

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### Rapid Onset Vasodilation with Lower Body Positive and Negative Pressure

OLIVIA K. LEACH, GARY W. MACK, JAYSON R. GIFFORD

Human Performance Laboratory; Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Masters*

*Advisor / Mentor: Gifford, Jayson (jaysongifford@byu.edu)*

#### ABSTRACT

**PURPOSE:** Investigate the impact of muscle sympathetic activity changes on the hyperemic response to single muscle contraction (*i.e.*, rapid-onset vasodilation, ROV). **METHODS:** Muscle sympathetic activity was altered in 14 healthy young subjects (8 male, 6 female) through randomized application of lower body negative pressure (-10, -20, and -40 mmHg) and lower body positive pressure (+10, +20 mmHg). A 1-s hand grip contraction at 50% MVC was performed at each pressure and control (0 mmHg). Blood flow and vascular conductance were quantified with muscle blood flow being measured in the brachial artery using Doppler ultrasound and blood pressure being determined beat-by-beat using a Finometer finger blood pressure monitor. The ROV response was described by the area under the  $\Delta$ VC-time curve (AUC, ml • min) and was normalized as a percentage of the AUC value of the control condition. **RESULTS:** Baseline muscle vascular conductance was significantly reduced from a baseline of  $1.20 \pm 0.75$  ml•min<sup>-1</sup>•mmHg to  $0.97 \pm 0.35$ ,  $0.91 \pm 0.45$ , and  $0.75 \pm 0.28$  ml•min<sup>-1</sup>•mmHg during -10, -20, and -40 mmHg LBNP, respectively ( $p < 0.05$ ). The AUC was reduced to  $65.6 \pm 23.6\%$  of control during -40 mmHg LBNP ( $p = 0.0004$ ) and increased  $132.6 \pm 39.0\%$  of control ( $p = 0.0108$ ) during +20 mmHg LBPP. **CONCLUSION:** In healthy young individuals, changes in sympathetic muscle activity through LBNP/LBPP show a significant linear relationship with increases in sympathetic activity decreasing ROV and inhibition of sympathetic activity increasing ROV. A similar trend is observed with resting vascular conductance.

## 25. SWACSM Abstract

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### Fitness and body composition in older adults after lifelong exercise: a systematic review and meta-analysis

ERIC LESLIE, ANN L. GIBSON

Exercise Physiology Lab; Department of Health, Exercise, and Sport Sciences; University of New Mexico, Albuquerque, NEW MEXICO

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*Category: Doctoral*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

**PURPOSE:** exercise is recommended for older adults ( $\geq 65$  years) to suppress age-related changes in fitness and body composition that compromise health. The literature is equivocal regarding the volume of exercise required to achieve health benefits as well as a standardized definition of lifelong exercise. This meta-analysis is an analysis of the effects of lifelong (20+ years) exercise training on fitness (cardiorespiratory or muscular) in older adults that meet the American College of Sport Medicine's guidelines for minimum weekly training volume. **METHODS:** a systematic literature review was conducted using the Web of Science database in accordance with the PRISMA 2020 guidelines. The inclusion criteria required peer-reviewed, full-text articles to include both fitness and body composition measurements and at least one older adult group that performed cardiorespiratory or resistance exercise for 20+ years. A random effects model was used to evaluate the mean differences in  $\dot{V}O_2\text{max}$  and percent body fat, from five and four of the seven included studies, respectively, using Review Manager 5.4.1. These variables represented the most common fitness and body composition measurements that directly compared trained and sedentary older adults. **RESULTS:** in total, there were seven resistance-trained, 72 endurance-trained, and 103 sedentary total older adults for comparison. Trained older adults showed both significantly lower percent body fat (-5.8%, 95% CI: -8.5 – 3.0%,  $p < 0.01$ ) and higher  $\dot{V}O_2\text{max}$  (+11.36 mL/kg/min, 95% CI: 5.6 – 17.1 mL/kg/min,  $p < 0.01$ ). Descriptive analysis also revealed that older adults who completed lifelong resistance training exercise had 30% greater muscular strength than their sedentary counterparts. **CONCLUSION:** these findings indicate that older adults who achieve the minimum weekly training volume by the American College of Sports Medicine can preserve fitness and achieve higher quality of life while reducing cardiometabolic disease and mortality risk.

## 26. SWACSM Abstract

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### Investigation of Swimming Economy while Wearing Different Triathlon Wetsuit Styles at Submaximal Front Crawl Swimming

BORAM LIM<sup>1</sup>, ALEJANDRO VILLALOBOS<sup>2</sup>, GEORGE CROCKER<sup>2</sup>, JOHN MERCER<sup>1</sup>, FACSM

<sup>1</sup>Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas, NV;

<sup>2</sup>Swimming Performance Laboratory, School of Kinesiology, Nutrition & Food Science, California State University, Los Angeles, CA

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*Category: Doctoral*

*Advisor / Mentor: John A. Mercer (john.mercer@unlv.edu)*

#### ABSTRACT

Triathlon wetsuits commonly use for the potential benefits of swimming performance and thermoregulation. Triathletes may select different wetsuit styles depending on many factors (e.g., temperature regulation swimming technique, body type, and training purpose). However, there is a lack of empirical evidence of how different wetsuit styles affect the physiological responses to swimming. **PURPOSE:** The purpose of this study was to investigate the physiological responses during submaximal intensity front crawl swimming using different wetsuit styles. **METHODS:** Fourteen participants (n=6 men, n=8 women; all recreational triathletes or swimmers) completed a swimming graded exercise test wearing a swimsuit only to determine maximal oxygen consumption ( $VO_{2max}$ ). A test speed was calculated from these data to represent 80%  $VO_{2max}$ . Participants then completed four 4-min submaximal swimming conditions at this speed: regular swimsuit (NWS), buoyancy short (BS), sleeveless (SLW), and full sleeve wetsuit (FSW). The order of the conditions was randomized. All conditions were conducted in a swimming flume and metabolic measurements were made using a metabolic cart with a mixing chamber. The rate of  $O_2$  consumption ( $VO_2$ ), rate of  $CO_2$  production ( $VCO_2$ ), ventilation ( $V_E$ ), heart rate (HR), and respiratory exchange ratio (RER) were determined as the average for the last minute of each condition. Rating of perceived exertion (RPE) was assessed after each condition. **RESULTS:**  $VO_2$  and HR were statistically different by wetsuit conditions ( $p < 0.01$ ; NWS:  $37.5 \pm 5.9$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, 148±12 bpm, BS:  $34.0 \pm 6.4$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, 141±14 bpm, SLW:  $31.4 \pm 4.9$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, 137±12 bpm, and FSW:  $32.2 \pm 5.3$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, 139±12 bpm). In addition,  $VCO_2$ ,  $V_E$ , RER, and RPE were significantly influenced by wetsuit conditions ( $VCO_2$  and  $V_E$ :  $p < 0.01$ , RER and RPE:  $p < 0.05$ ). Swimming without a wetsuit significantly increased  $VO_2$ , HR,  $VCO_2$ , and  $V_E$  relative to the other conditions ( $p < 0.05$ ). Furthermore, all dependent variables were not statistically different between SLW and FSW ( $p > 0.05$ ). **CONCLUSION:** Swimming with a regular swimsuit is the least economical at the test speed. Additionally, it seems that either SLW or FSW can be used without significant physiological changes when swimming at the intensity of the triathlon race.

## 27. SWACSM Abstract

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### Electromyographic Examination of Hip and Knee Extension Hex Bar Exercises Varied by Starting Knee and Torso Angles

MEGHAN MCCAULEY, JENNIFER RIVERA, WHITNEY D. LEYVA, KALIN A. TOMLINSON, KEVIN A. VALENZUELA, ELISABETH ZEITZ, AND EDWARD JO

Human Performance Research Laboratory; Department of Kinesiology and Health Promotion; California State Polytechnic University Pomona; Pomona, CA

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*Category: Masters*

*Advisor / Mentor: Jo, Edward (ejo@cpp.edu)*

#### ABSTRACT

Variations of the deadlift can be executed using the hexagonal (hex) bar by altering, for instance, the knee and torso angles while maintaining a constant hip angle at the start position. **PURPOSE:** To examine muscle activation patterns of the biceps femoris, rectus femoris, and erector spinae during three deadlift variations using the hex bar. **METHODS:** Twenty resistance-trained male and female subjects performed hex bar deadlift variations in three different starting knee flexion positions:  $128.4 \pm 8.5^\circ$  (elevated Romanian Deadlift),  $111.9 \pm 8.7^\circ$  (conventional elevated deadlift), and  $98.3 \pm 6.5^\circ$  (conventional hexagonal bar deadlift). Subjects performed three repetitions at 75% of their three-repetition maximum. Electromyography sensors were placed on the dominant biceps femoris, rectus femoris, and lumbar erector spinae. A one-way repeated measures ANOVA was used to detect differences in mean and peak EMG values normalized to maximum voluntary isometric contraction (MVIC) ( $p < 0.05$ ). **RESULTS:** As knee flexion increased at the starting position, mean activation of the rectus femoris increased ( $24.7 \pm 21.5 \rightarrow 35.5 \pm 25.4 \rightarrow 62.1 \pm 31.3\%$  MVIC,  $p < 0.001$ ), while biceps femoris ( $40.6 \pm 17.9 \rightarrow 34.0 \pm 16.4 \rightarrow 28.1 \pm 14.5\%$  MVIC,  $p = 0.003$ ) and erector spinae ( $73.0 \pm 27.6 \rightarrow 65.9 \pm 34.4 \rightarrow 54.9 \pm 32.5\%$  MVIC,  $p = 0.009$ ) activation decreased. Peak activation of the rectus femoris increased ( $46.9 \pm 33.0 \rightarrow 60.9 \pm 38.7 \rightarrow 99.3 \pm 41.6\%$  MVIC,  $p < 0.001$ ) while decreasing in the erector spinae ( $118.6 \pm 47.1 \rightarrow 105.9 \pm 49.4 \rightarrow 89.1 \pm 40.1\%$  MVIC,  $p = 0.008$ ). The rectus femoris experienced the greatest mean differences of the three muscles. **CONCLUSIONS:** Practitioners should consider the muscular goals when adjusting the starting position of a hex bar deadlift as posterior chain recruitment diminished and quadriceps activation increased as knee flexion increased.

## 28. SWACSM Abstract

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### Kinesiophobia Prevalence Among College Athletes

LINDSEY R. MCNEELY, ROBERT I. DUDLEY

Department of Kinesiology; Azusa Pacific University; Azusa, CALIFORNIA

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*Category: Undergraduate*

*Advisor / Mentor: Dudley, Robert (rdudley@apu.edu)*

#### ABSTRACT

The fear avoidance model indicates that fear of re-injury and movement related fear (kinesiophobia) can foster avoidant behaviors leading to potentially injurious changes in movement. The Tampa Scale of Kinesiophobia (TSK-11), an 11-question survey, measures movement related fear. While much of the kinesiophobia literature has focused on individuals with chronic pain, there is little evidence on the prevalence of kinesiophobia among collegiate athletes, a population with high frequency of injury. What little evidence exists indicates a connection between high kinesiophobia and injurious movement patterns. **PURPOSE:** Given the lack of data on collegiate athletes, the purpose of this investigation is to determine the general prevalence of kinesiophobia in a sample of collegiate athletes. **METHODS:** Eighty-two athletes (58 female, 24 male; 20.28±1.88 yrs) agreed to participate and completed an online questionnaire. The questionnaire included the TSK-11 (a series of 11 statements to which participants rated their level of agreement on a scale of strongly disagree to strongly agree), general demographic information including biological sex, age, sport, and years of experience, and questions regarding prior injury history. **RESULTS:** Among all athletes, prevalence of kinesiophobia was moderate (TSK-11: 21.38±5.47). TSK-11 scores did not differ between males or females (Males: 20.88±4.88, Females: 21.59±5.71,  $p>0.05$ ) nor between athletes with a history of prior sports injury and those without (Injured: 21.87±5.45, No injury: 20.37±5.46,  $p>0.05$ ). Softball athletes scored highest (TSK-11: 23.75±8.66) followed by Acrobatics and Tumbling (TSK-11: 23.13±4.42). Women's soccer athletes scored lowest (TSK-11: 18.56±4.88). **CONCLUSION:** In this sample of collegiate athletes, there was a moderate prevalence of kinesiophobia as measured by the TSK-11. While there were no differences between male and female athletes, certain sports did trend higher than others. Given that increased kinesiophobia may influence movement patterns, it would be prudent to address kinesiophobia with targeted psychological interventions. Additionally, future research should investigate the relationship between kinesiophobia and biomechanics and between kinesiophobia and injury rates in a similar sample of collegiate athletes.

## 29. SWACSM Abstract

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### Genetic Drivers of Adipose Tissue Weight Loss Following Exercise Training

LORNA Q. MENDOZA, Timothy M. Moore, Alexander R. Strumwasser, Xia Yang, Aldons J. Lusis & Andrea L. Hevener

David Geffen School of Medicine, University of California, Los Angeles; Los Angeles, CA

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Category: Masters

Advisor / Mentor: Hevener, Andrea (ahevener@mednet.ucla.edu)

#### ABSTRACT

Metabolic dysfunction and obesity are clinical conditions that challenge society and the medical community, as therapeutics to combat these disorders are lacking. Currently, exercise and diet modification are the only effective interventions to promote weight loss and improve metabolic health in humans. To formulate novel pharmacological strategies to combat obesity, it is incumbent to understand the adipocyte-specific adaptations that occur following exercise training to drive healthy reductions in adiposity. **PURPOSE:** Determine the central genetic drivers of exercise-induced adipose tissue (AT) weight loss. **METHODS:** Leveraging genetic diversity, we studied 100 strains of sedentary (SED) and exercise trained (TRN; in cage running wheels) animals of the UCLA hybrid mouse diversity panel (ExcHMDP). Adipose tissue mass was determined and RNA sequencing was performed on gonadal AT from SED and TRN female mice. Differential gene expression analysis and candidate gene identification was performed. **RESULTS:** Body weight and AT mass were reduced ( $p < 0.05$ ) across nearly all strains of the ExcHMDP following TRN. A genome wide association study (GWAS) identified a region on chromosome (chr)17 that significantly associated with exercise-induced weight loss. Correlational analysis between all chr17 region genes with adiposity, exercise induced-weight loss, and running volume collectively revealed a significant association with only one gene, FAT10 (human leukocyte antigen-F adjacent transcript 10). Adipose expression of FAT10 was decreased in frequently exercising men from the Metabolic Syndrome in Men (METSIM) study, and across all subjects, AT FAT10 expression was significantly correlated with fat mass. Moreover, similar to humans, AT FAT10 expression was reduced following acute and chronic exercise in rats studied by the Molecular Transducers of Physical Activity Consortium. **CONCLUSION:** Our findings provide strong evidence in humans and rodents that exercise training induces adipocyte-specific changes in gene expression that are correlated with changes in adiposity. We are currently studying whether manipulation of FAT10 expression, independent of physical activity, can recapitulate reductions in adiposity similar to those observed during exercise training intervention.

### 30. SWACSM Abstract

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## A Comparison of Multiple Body Composition Measurement Methods to the Department of Defense's Physical Fitness and Body Fat Program Procedures

DESMOND J. MILLENDER, HOLLY M. HALL, JEREMY B. DUCHARME, AVADNEY F. GERARD-OSBOURNE, & ANN L. GIBSON, FACSM

Exercise Physiology Laboratory; Department of Health, Exercise, and Sports Sciences; University of New Mexico; Albuquerque, NM

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*Category: Doctoral*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

**INTRODUCTION:** The Department of Defense (DoD) developed body composition standards that require service personnel to meet sex- and branch-specific body mass index criteria. Failing to meet these criteria leads to body fat percentage (%BF) estimation via the DoD's circumference method. Service members exceeding these standards face administrative action and a possible premature discharge, thus emphasizing the importance of accurately estimating %BF with this method. **PURPOSE:** To compare the predictive accuracy of the DoD's circumference-based equation to estimate %BF compared to hydrostatic weighting (HW); segmental and whole-body bioelectrical impedance analyses (BIA), and sex-specific skinfold thickness assessments. **METHODS:** Physically active men ( $n = 35$ ,  $25 \pm 4.7$  yrs,  $79.6 \pm 21$  kg,  $176.3 \pm 6.7$  cm) and women ( $n = 34$ ,  $24.7 \pm 5.1$  yrs,  $63.6 \pm 8.6$  kg,  $166.0 \pm 7.3$  cm) participated. Population-specific equations were used to compute body density (Db) from  $\Sigma$ SKF and HW and to convert Db to %BF. Sex-specific repeated measures ANOVAs with Bonferroni's multiple comparisons tests were applied. Agreement between the DoD and the other %BF results were quantified via Bland-Altman 95% limits-of-agreement plots. Statistical significance was set at  $p < .05$ . **RESULTS:** The DoD method predicted a significantly ( $p < .05$ ) higher %BF ( $27.1 \pm 6.3\%$ ) compared to upper body BIA ( $23.1 \pm 4.9\%$ ) and SKF ( $21.9 \pm 4.8\%$ ) for the women only. For men, the DoD method estimated a significantly lower ( $p < .05$ ) %BF ( $12.9 \pm 5.5\%$ ) compared to lower body BIA ( $17.5 \pm 5.7\%$ ). Wide limits-of-agreement ( $> \pm 3.5$  %BF) for mean differences in %BF were observed between the DoD method and all assessments for both men and women. **CONCLUSION:** Our findings suggest that at the group level, the DoD's current method of assessing %BF produces similar values compared to whole-body vertical BIA and HW. However, DoD estimates of %BF at the individual level lack predictive accuracy given the wide limits-of-agreement. Since the DoD method is applied at the individual level, caution is needed when determining if administrative action is necessary.

### 31. SWACSM Abstract

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## No Sex Differences in Common Carotid Artery Stiffness Response Following Maximal Oxygen Consumption Test

HEYSEL MORALES, MICHAEL DIAZ, ZARIA OPARA, ALLAN KNOX, PH.D.

Integrative Human Physiology Laboratory, Exercise Science Department, California Lutheran University, CA

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*Category: Undergraduate*

*Advisor / Mentor: Advisor / Mentor: Knox, Allan (aknox@callutheran.edu)*

#### ABSTRACT

**PURPOSE:** Previous investigations have reported sex differences in the time course of age-related arterial stiffness, with postmenopausal women presenting increased risk of cardiovascular diseases. Using sex as a biological variable has identified differences between males and females in physiological responses to equivalent doses of exercise. The purpose of this study was to determine if sex differences exist in arterial stiffness response to a maximum oxygen consumption ( $VO_{2max}$ ) exercise test. **METHODS:**  $VO_{2max}$  was measured by indirect calorimetry. Body composition was measured by air displacement plethysmography (BODPOD). Indices of common carotid artery (CCA) stiffness (Peterson's elastic modulus [Ep], Beta stiffness [B1], distensibility [DIST], and diameter compliance [DC]) were calculated before and within 5 minutes following  $VO_{2max}$ . CCA's were imaged for 1 minute by duplex Doppler ultrasound approximately 2-3cm below bifurcation and stored for offline analysis of velocities and diameters. Brachial blood pressures were captured by automated cuff. **RESULTS:** Males (n=14) and females (n=15) were matched for age ( $p=0.549$ ), fat mass ( $p=0.775$ ), body fat percentage ( $p=0.08$ ), fat free mass percentage ( $p=0.087$ ), and  $VO_{2max}$  ( $p=0.349$ ). Males had higher body mass ( $p<0.001$ ) and fat free mass ( $p<0.001$ ). No sex differences were observed before or after exercise for Ep, B1, DIST, and DC ( $p>0.05$  for all). No sex differences were identified for delta changes in any CCA stiffness indices ( $p>0.05$ ). **CONCLUSION:** The CCA response to  $VO_{2max}$  test is equivalent in males and females who are matched for baseline  $VO_{2max}$ , despite males presenting high fat free masses. Previously reported sex differences in response to equivalent exercise dose may not be evident in the CCA stiffness characteristics.

## 32. SWACSM Abstract

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### Effect of Exercise in Sync with Circadian Preference on Classification of Response and Non-response in Migraineurs

JAMES W. NAVALTA, FACSM, GRAHAM R. MCGINNIS, & ELIAS M. MALEK

Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences;  
University of Nevada, Las Vegas; Las Vegas, NV

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*Category: Professional*

#### ABSTRACT

It is estimated that 36 million individuals in the U.S. suffer from migraines. While pharmacological treatments are most often prescribed, adverse side effects cause nearly 70% to delay or avoid taking medication. Treatments such as exercise, that have fewer side effects than medications, are needed. While exercise is effective, not all migraineurs benefit (40% were classified as non-responders in one study), indicating certain aspects should be evaluated. The **PURPOSE** was to determine if exercise prescribed at a time-of-day in synchrony versus out of synchrony with circadian preference (chronotype) affected responder versus non-responder status when considering monthly migraine load. **METHODS:** Participants were 7 sedentary individuals who experienced migraines 8+ times per month (age =  $34 \pm 11$  yrs,  $167 \pm 8$  cm,  $99 \pm 26$  kg). The Morningness/Eveningness Questionnaire was completed to determine chronotype. Participants completed one month of exercise (3 x week, 30-min, 60-70% estimated HRmax) in the morning (before 9:00am) or evening (after 7:00pm) in a randomized counterbalanced order, with a two-week washout period. 'In Sync' exercise was considered when a morning type exercised in the morning, and an evening type exercised in the evening. 'Out of Sync' exercise was considered when a morning type exercised in the evening, and an evening type exercised in the morning. migraine load was determined using the Headache Impact Test (HIT-6) and Migraine Disability Assessment (MIDAS) at the beginning and end of each month. Responders were considered as any individual with 10% or greater improvement in scores. Chi squared ( $\chi^2$ ) analysis was performed and significance accepted at  $p < 0.05$ . **RESULTS:** On the HIT-6 evaluation, 43% of participants were considered 'responders' after completing in sync versus out of sync exercise (14% 'responders') ( $\chi^2 = 1.4$ ,  $p = 0.24$ ). Similarly, on the MIDAS evaluation, 57% of participants were considered 'responders' after completing in sync exercise, while only 29% of participants completing out of sync exercise were classified as 'responders' ( $\chi^2 = 1.16$ ,  $p = 0.28$ ). **CONCLUSION:** While no statistical differences were observed, exercise prescriptions that incorporate a participant's circadian rhythm may be a promising option toward helping chronic migraine sufferers reduce the monthly migraine load.

### 33. SWACSM Abstract

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## Two Weeks of Remote Ischemic Preconditioning Improved Cutaneous Microvascular Responses to Post-Occlusive Reactive Hyperemia

MARTIN NAVARRO<sup>1</sup>, JAMES A. LANG<sup>2</sup> & JAHYUN KIM<sup>1</sup>

Department of Kinesiology, California State University, Bakersfield; Bakersfield, CA<sup>1</sup>;  
Department of Kinesiology, Iowa State University, Ames, IA<sup>2</sup>

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*Category: Undergraduate*

*Mentor: Kim, Jahyun (jkim7@csu.edu)*

#### ABSTRACT

Repeated remote ischemic preconditioning (RIPC), induced by intermittent periods of ischemia and reperfusion in a limb body, improves non-nitric oxide (NO)-mediated endothelial-dependent cutaneous vasodilation. Post-occlusive reactive hyperemia (PORH) occurs following the release of a brief arterial occlusion and is principally mediated by non-NO mediated vasodilatory factors such as prostaglandins, sensory nerve axon reflex, and endothelium-derived hyperpolarizing factors (EDHFs). However, the role of repeated bouts of RIPC on the PORH response is unknown. The purpose of this study was to test whether two weeks of RIPC improves PORH elicited cutaneous microvascular hyperemia responses. **METHODS:** The study was conducted with twenty-one participants (Control; 24±5 yr old, 4M/4F, n=8, RIPC; 22±2 yr old, 7M/6F, n=13). The RIPC group received RIPC daily sessions over a two week period (3 intervals of 4 days with RIPC followed by a 1 day break). Each RIPC session consisted of 4 repetitions of 5-minute arm blood flow occlusion interspersed by 5-minute reperfusion. PORH was elicited by brachial artery occlusion for 5 minutes by inflating an arm cuff to 200 mmHg, and the cutaneous hyperemic response was measured after cuff release. Skin blood flow measurements were collected with laser speckle contrast image (LSCI) before and after the repeated RIPC intervention. The control group did not receive RIPC but underwent repeated PORH measurements two weeks later. **RESULTS:** Both Time to Peak (Tp) and max/time improved after two weeks of RIPC (Tp; 16.5 ± 2.1 vs. 15.2 ± 2.9 s, Pre vs. Post, p<0.05, max/time; 0.11 ± 0.03 vs. 0.13 ± 0.04 CVC/s, Pre vs. Post, p<0.05). The control group did not change after 2 weeks. **CONCLUSION:** These data suggest that non-NO mediated vasodilator responses in the skin microvasculature may be affected with 2 weeks of repeated RIPC.

### 34. SWACSM Abstract

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## Effect of Sustained COVID-19 Guidelines on Eating Behaviors and Weight Gain

MALIA NOWLEN, KYLIE ALVAREZ, RILEY MORTON, ESTEPHANIA CAMPA,  
ZACHARY ZEIGLER

College of Science, Engineering, and Technology; Grand Canyon University; AZ

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#### ABSTRACT

**PURPOSE:** Prior research examining the impact of *short-term* self-quarantine indicates altered eating behaviors and weight change. Roughly ten months after the first lockdown was announced, the COVID-19 pandemic continues without abatement. The purpose of this study was to assess the impact of *long-term* COVID-19 guidelines on eating behaviors and weight change. **METHODS:** A research announcement was sent out via Facebook to 1200 possible participants. The Weight and Lifestyle Inventory (WALI) was used to assess possible changes in factors that contribute to eating. Participants were also asked to report weight before the pandemic and at the time of the study. Weight categories were created, and ordinal regression modeling was used to assess the impact of weight gain risk factors. **RESULTS:** One hundred and fifty-seven participants (40 male, 117 female) completed the surveys. Participants were  $30.3 \pm 13.5$  years old with a BMI of  $27.7 \pm 7.4\text{kg/m}^2$ . The average weight change was  $-1.9 \pm 10.2$  lbs. Thirty-three percent reported weight loss, while 27% reported weight gain. Besides, "eating at breakfast" and "eating when tired," all eating behaviors were statistically related to weight gain ( $p < .05$ ). When all eating related factors were placed into a regression model, the only two still significant were 'snacking after dinner' (OR: 1.153, B: .142,  $p = .041$ , 95 CI: 1.006 – 1.321) and 'eating too much food' (OR: 1.333, B: .288,  $p = .004$ , 95 CI: 1.095 – 1.623). **CONCLUSION:** The current study reported a mean weight loss of 1.9 pounds. However, the standard deviation was 10 pounds. Meaning, individual heterogeneity of the COVID bodyweight response is evident and appears to be partially explained by snacking after dinner and overeating.

Southwest Chapter

### 35. SWACSM Abstract

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## Maintained Elevated Systolic Blood Pressures in African Americans and Hispanic Individuals Following Maximum Oxygen Consumption Test When Compared to Caucasians: A Pilot Study

ZARIA OPARA, HEYSEL MORALES, MICHAEL DIAZ, ALLAN KNOX, PH.D.

Integrative Human Physiology Laboratory, Exercise Science Department, California Lutheran University, CA

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*Category: Undergraduate*

*Advisor / Mentor: Knox, Allan (aknox@callutheran.edu)*

#### ABSTRACT

**PURPOSE:** There is robust evidence presenting higher incidences of hypertension experienced by the African American (AA) population when compared with matched cohorts. Exercise has been shown to reduce the prevalence of hypertension, however, the cardiovascular recovery of exercise is associated with mortality. The purpose of the present study was to investigate the cardiovascular recovery between AAs, Hispanics (HSPs), and Caucasians (CAs). **METHODS:**  $VO_{2max}$  was measured by indirect calorimetry. Body composition was measured by air displacement plethysmography (BODPOD). Brachial blood pressures were captured by automated cuff before exercise, immediately after exercise, and every 2 minutes following exercise for a total of 15 minutes in a supine position. **RESULTS:** 15 healthy volunteers (n=5 AA, n=5 HSP, n=5 CA) participated in the study. Participants were matched for age and all body composition measures ( $p>0.05$  for all). No statistical effects of time were observed within-groups ( $p>0.05$ ) or between-groups ( $p>0.05$ ) for systolic (SBP) and diastolic (DBP) blood pressures. However, the AA maintained “elevated” SBP throughout the recovery phase. The HSP group maintained “elevated” SBP up to 10 minutes following the cessation of exercise. The CA cohort returned to “healthy” SBP within 2 minutes following  $VO_{2max}$ . **CONCLUSION:** Young AA and HSP individuals may show varying recovery from  $VO_{2max}$  when compared to CAs. These results need to be confirmed by a larger sample.

## 36. SWACSM Abstract

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### The Effects of Short Foot Exercise on Ground Reaction Forces during Landing

Connor Owen, DANIEL METRI, JACOB MAYORAL, ANDY ARANT, DANE JOHNSON, ROBERT DUDLEY, & ANDREA DU BOIS

APU Biomechanics Lab; Department of Kinesiology; Azusa Pacific University; Azusa, CA

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*Category: Undergraduate*

*Advisor / Mentor: Du Bois, Andrea (adubois@apu.edu)*

#### ABSTRACT

The foot is a shock absorber which helps attenuate loads during landing activities via pronation. Intrinsic foot muscles help stabilize the arch of the foot and assist in controlling pronation. Excessive pronation during landing may transfer up the kinetic chain, increasing the risk of knee injury. Additionally, increased ground reaction forces (GRF) during landing may increase the risk for an ACL injury. Acute bouts of short foot exercise (SFE) can strengthen IFM, improving foot posture, balance, and energy transfer in dynamic activities, reducing injury risk. **PURPOSE:** Therefore, this study investigates whether SFE training before jump performance lowers GRF upon landing. It is hypothesized that GRF will decrease following SFE. **METHODS:** Ten healthy participants, all right leg dominant, (6 males, 4 females; Age:  $24.9 \pm 1.91$  y; Height:  $1.71 \pm 0.08$  m; Mass:  $66.09 \pm 10.39$  kg), began testing with drop jumps (DJ) from an 18-inch box (PRE), being told to step off the box with hands on their hips, land with feet on the force plate, and immediately jump as high as possible. Two familiarization DJ trials were followed by three test trials with one minute rest between DJ. After initial DJ trials, participants performed 2 sets of 30 repetitions of SFE on each foot while seated, with contractions being held for 5 seconds, and with 2 seconds of rest between repetitions. Two more sets were completed on each foot with the participants standing. Following SFE, participants performed 3 additional DJ (POST). GRF data was sampled at 1000Hz with dual AMTI (Newton, MA) force platforms. Peak GRF during landing was normalized to body mass. **RESULTS:** Paired t-tests indicated no effect of SFE on GRF during landing (PRE= $374 \pm 0.50$  N/kg; POST= $386 \pm 0.54$  N/kg;  $p=0.379$ ;  $d=0.292$ ). **CONCLUSION:** Performing SFE before jumping for a healthy population had no significant impact on GRF during landing. It may be beneficial to investigate SFE effects on GRF in unhealthy or injured populations.

### 37. SWACSM Abstract

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## The Role of Physical Activity in the Relationship Between Sitting Time and Insulin Resistance

KAYLA PARKER, LARRY A. TUCKER, FACSM

Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Masters*

*Advisor / Mentor: Tucker, Larry (tucker@byu.edu)*

### ABSTRACT

**PURPOSE:** The primary objective of the present study was to determine the role of physical activity in the relationship between sitting time and insulin resistance in 7,092 randomly selected U.S. adults. **METHODS:** Cross-sectional data from the National Health and Nutrition Examination Survey (NHANES), 2011-2018, were used to answer the research question. NHANES data for 2019-2020 were not available because of COVID. Participants were selected using a multi-stage, random sampling strategy. Subjects reported average sitting time, quantified as the number of minutes spent per day sitting. Insulin resistance was determined using HOMA-IR (homeostatic model assessment). HOMA-IR is the most common measure of insulin resistance in the literature, calculated by multiplying fasting glucose (mg/dL) by fasting insulin (uU/mL) and dividing by 405. Low HOMA-IR scores indicate insulin sensitivity, and high scores mean increased insulin resistance. Physical activity (PA) was indexed using minutes per week of moderate PA and vigorous PA. These values were summed, resulting in a measure of total minutes of MVPA. Because of the cluster sampling technique employed by NHANES, degrees of freedom in the denominator were 62 for each statistical analysis. Multiple regression using SAS was employed to determine the linear relationship between sitting time and HOMA-IR, with both measures treated as continuous variables. Partial correlation was used to control for potential confounding factors, including minutes of PA. **RESULTS:** Average (+SE) sitting time was 376.8+4.25 minutes per day and average physical activity per week was 164.2+5.5 minutes. Mean (+SE) HOMA-IR was 3.2+0.06. After controlling for age, sex, race, and year of assessment, the relationship between sitting time and HOMA-IR was significant ( $F=29.64$ ,  $P<.0001$ ). After controlling for differences in these factors plus physical activity, the relationship between sitting time and HOMA remained linear and highly significant ( $F=24.81$ ,  $P<.0001$ ). **CONCLUSION:** In U.S. adults, minutes of daily sitting were strongly related to insulin resistance, regardless of physical activity level. In short, it appears that it does not matter whether or not U.S. adults are highly active or sedentary or somewhere in-between, time spent sitting remains a good predictor of insulin resistance.

### 38. SWACSM Abstract

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## Understanding Muscle Power Decline Through Cross-sectional and Longitudinal Analyses of Elite and Masters Track & Field Data

BRANDON PFEIFER, MICHAEL HALL, MEGHAN CARLISLE, ROBERT D. HYLDAHL

Hylldahl Research Lab; Exercise Science; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Hylldahl, Robert (robhylldahl@byu.edu)*

#### ABSTRACT

Sarcopenia, the loss of muscle mass and function with age, is associated with increased morbidity and mortality. Muscle power, which can be defined as the force a muscle can exert quickly (power = force × velocity), has the greatest impact on mobility in geriatric populations. Loss of muscle power has been well-established among the elderly ( $\geq 60$ ), but studies suggesting the age at which muscle power decline begins are lacking. **PURPOSE:** This study seeks to determine the extent of muscle power decline in middle-aged populations (40-60) through data analysis of masters and elite track and field athletes. **METHODS:** Four track and field events were selected based on maximal power output and minimal skill requirement: the 100m dash, long jump, high jump, and triple jump. Elite and masters athlete data were gathered from the World Masters Outdoor Championships and the IAAF World Athletics Championships (17,945 total individual results). Data was analyzed by fitting individual and group results to quadratic and linear models. **RESULTS:** Average age of peak performance in all events ranged from 27.0 years for men's high jump to 29.3 years for women's triple jump, though the difference was not statistically significant. The average rate of decline from age of peak performance to end of career ( $39 \pm 2.6$  years) for elite longitudinal data ranged from .49% per year for women's 100m dash to 1.01% per year for women's long jump. The average rate of decline for the cross-sectional masters data ages 35-60 ranged from .55% per year for men's 100m dash to 1.04% per year for women's long jump. The average rate of decline from 35-100 ranged from .92% per year for women's high jump to 1.36% per year for women's 100m dash. Elite longitudinal data was better modeled by a quadratic model (mean R-squared =  $.72 \pm .19$ ) than a linear model (mean R-squared =  $.68 \pm .20$ ). Cross-sectional masters data from age 35-100 preferred a quadratic model over a linear model ( $p < .01$ ), while cross-sectional data from 35-60 favored a linear model ( $p = .25$ ). **CONCLUSION:** Results indicate that muscle power decline begins with an exponential decrease in the early 30s, then declines linearly until approximately age 60, when it again becomes exponential. This pattern of decline provides a basis for further research on power decline pathophysiology and preventive measures starting in the 30s.

### 39. SWACSM Abstract

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## What do you Need, Coach? Translating the Relationship Between Sprint Metrics and Training Load for Practical Application in Division I Women's Soccer

DIEANNA C. PRUDHOLME†, ROBERT G. LOCKIE, Ph.D.‡

Department of Kinesiology, California State University-Fullerton, Fullerton, CA, USA

*Category: Graduate*

Advisor: Lockie, Robert (rlockie@fullerton.edu)

#### ABSTRACT

An array of athlete-generated data can be collected with GPS technology during training sessions. Sport scientists working with collegiate team sports, including soccer, must be able to contextualize data for coaches. Coaches may then manipulate the most impactful variables, such as player load (a scoring value that accounts for intensity and duration of effort based on GPS readings) and variables most impacting player load, to increase training efficiency. **PURPOSE:** To determine which sprint metric most relates to and predicts player load, that is practical to coaches. **METHODS:** Data for 16 Division I collegiate female field (forwards, midfielders, defenders) soccer players from one team were collected. Fourteen different practice sessions were analyzed. The focus of each session ranged from skills, tactical training, and conditioning. Players wore GPS units in a vest encapsulated between the scapulae. GPS variables included: player load, sprint distance (an effort with movement speed  $\geq 4.75\text{m/s}$  for  $\geq 1\text{s}$ ), top speed, and number of accelerations and decelerations in different speed zones ( $\pm 1\text{m/s}$ ,  $\pm 2\text{m/s}$ ,  $\pm 3\text{m/s}$ ,  $\pm 4\text{m/s}$ ,  $\pm 5\text{m/s}$ ). Pearson's correlations and linear stepwise regression analysis were used to determine sprint variables most influencing player load ( $p < 0.05$ ). **RESULTS:** Except for the number of accelerations at  $3\text{m/s}$ , all sprint metrics significantly correlated to player load ( $p \leq 0.04$ ,  $r = 0.56-0.91$ ). Regression analysis revealed both sprint distance and number of accelerations at  $2\text{m/s}$  ( $p < 0.01$ ,  $r^2 = 0.94$ ) significantly predicted player load. **CONCLUSION:** The correlations indicated player load reflected total sprint distance, top speed attained, and number of accelerations and decelerations in different speed zones. Sprint distance and number of accelerations at  $2\text{m/s}$  predicted player load with 94% explained variance. This pilot data suggests that if a coach intends to manipulate player load, drills influencing total sprint distance and accelerations could most impact session intensity. An example method is via small-sided games, where field dimensions or number of players in a drill could affect the number of sprints and direction changes (accelerations/decelerations) completed by players. This is useful in situations where coaches request simplified translation of GPS data for training.

## 40. SWACSM Abstract

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### Influence of Sleep Disturbances on Landing and Jumping Forces in Elite College Age Individuals

SPENCER RASMUSSEN, CAITLYN STAINBROOK, EMILY SULLENGER, SHANE DRAPER, ANDREW CREER, TYLER STANDIFIRD

Applied Human Performance Laboratory; Department of Exercise Science and Outdoor Recreation; Utah Valley University; Orem, Utah

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*Category: Undergraduate*

*Advisor / Mentor: Standifird, Tyler, tyler.standifird@uvu.edu*

#### ABSTRACT

**BACKGROUND:** Sleep has been demonstrated to influence sport-specific performance in college athletes with sleep deprivation decreasing sport-specific performance and possibly leading to greater risk of injury (Reyner & Horne, 2013). Jumping and landing are important movements in many sports, therefore, sleep disturbances could potentially increase the risk of injury in sports with jumping and landing movements.

**PURPOSE:** The intent of this study was to determine if sleep disturbances influence forces produced during jumping and landing in elite college age individuals. **METHODS:** Twenty-five UVU athletes (males=8, females=17) completed the Morningness-Eveningness Questionnaire (MEQ) and the Pittsburgh Sleep Quality Index Questionnaire (PSQI) before testing. A five-minute warm-up was performed by the athletes on a stationary bicycle (Monark 827E). Following the warm-up, three countermovement jumps were performed while force (Bertec) and video (Ninox, 120cc) data were collected. Data analysis was performed using Noraxon software (Noraxon MR3). **RESULTS:** A one-way between subjects ANOVA was conducted to compare the effect of sleep disturbances on jumping forces and power output. A 28% decrease in relative peak power produced was observed between those who reported having three or more sleep disturbances a week and those who reported not having any sleep disturbances in the last month ( $p=0.091$ ). Relative maximum peak braking force produced by athletes reporting three or more nights of late sleep onset (later than 30 minutes) per week was lower than those reporting fewer than one occurrence of late sleep onset per week ( $p=0.019$ ). Relative maximum peak propulsive force showed no such trend with little variance between those who reported multiple nights of later than 30-minute sleep onset and those who reported having less than one occurrence per week ( $p=0.291$ ). **CONCLUSION:** The relative peak power produced when jumping showed a decreasing trend as the number of sleep disturbances in the middle of the night increased. A similar trend was observed when comparing relative maximum peak braking force and late sleep onset. Future research should assess the connection between jumping and landing force variables and different aspects of athletes' sleep habits.

## 41. SWACSM Abstract

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### Mechanics of Running Grade Ability

KALEIGH RENNINGER<sup>1</sup>, TYLER STANDIFIRD<sup>2</sup> & IAIN HUNTER<sup>1</sup>

<sup>1</sup>Running Mechanics Lab, Exercise Sciences, Brigham Young University, Provo, UT;

<sup>2</sup>Exercise Sciences, Utah Valley University, Orem, UT

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*Category: Undergraduate*

*Advisor / Mentor: Hunter, Iain (iain\_hunter@byu.edu)*

#### ABSTRACT

Gait efficiency while running on level ground surfaces has been analyzed by numerous mechanists, however with the dynamic of elevation changes during running, more research is needed to educate runners on how to optimize their energy usage running up and downhill. **PURPOSE:** In this study, we focused on determining whether certain running mechanics would predict a runner's ability for uphill versus downhill running. **METHODS:** Twenty-one experienced runners ran uphill, level, and downhill while having oxygen uptake measured. Conditions were performed in random order and repeated on a second day. Runners used the Saucony TypeA shoe for all conditions. Oxygen measures were averaged over the final three minutes of each five minutes run at each condition. A best-fitting line was generated through oxygen uptake versus grade to classify uphill/downhill running ability. The steepness of this slope indicated whether runners were more economical at uphill or downhill running. Various running mechanics were measured using Vicon Nexus and a Bertec treadmill. A linear regression determined any correlations between peak vertical force, stride rate, plantar velocity, and ground time against uphill/downhill running ability. **RESULTS:** Peak force was the only factor associated with uphill/downhill running ability ( $p < 0.01$ ). The slope of oxygen uptake versus grade averaged  $0.076 \pm 0.278$  ((ml/kg/min)/%grade). **CONCLUSION:** Runners that naturally select a higher peak vertical force when running on level ground tend to be more economical in downhill running.

## 42. SWACSM Abstract

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### Online Physical Activity Advice for Older Adults during COVID-19: Results of a Pilot Study

MIRABELLA R. RUSSO, JAFRĀ D. THOMAS, CALVIN J. WU, & ABIGAIL M. MCINTYRE

Department of Kinesiology and Public Health; California Polytechnic State University; San Luis Obispo, California

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*Category: Undergraduate*

*Advisor / Mentor: Thomas, Jafrā (jthoma84@calpoly.edu)*

#### ABSTRACT

Throughout the COVID-19 pandemic (March 2020-present), US. older adults in quarantine likely turned to the internet, often a first source for exercise information, for health and exercise advice. **PURPOSE:** Given adherence to physical activity guidelines (PAGs) lowers risk of sickness and death due to COVID-19, this presentation is to present results of a pilot study which determined the extent online physical activity promotion articles published during the COVID-19 pandemic, with messages tailored to older adults, aligned with US. 2018 PAGs. **METHODS:** Online articles were sought based on an *a priori* inclusion criteria (e.g., targeted older adults, published March 2020–February 2021). Three search engines set to private browsing were used: Bing, Google, and Yahoo. After piloting search terms, an internet search was conducted within a 24-hour period (February 10, 2021). Two review levels (title & full text) narrowed the initial sample from 763 articles to 15. The Content Analysis Approach to Theory-specified Persuasive Educational Communication (CAATSPEC) guided the line-by-line categorization of article messages into three categories: PAG-mismatch, -partial match, - full match. The coding form contained 15 PAGs across four categories: aerobic, muscle, older adult, sedentary adult. The coding form and procedures were refined across three practice phrases using a random subset of like, pre-pandemic articles. Reliability was tested with a random subset of the study sample ( $n = 9/15$ ). **RESULTS:** The coding formed showed fair between-rater reliability (1st vs 2nd author, ICC = .56) and excellent within-rater reliability (1st author, 3-day grace period, ICC = .99). Articles in the pilot sample contained the following fitness topics: aerobic (100%), muscle (78%) and safety (78%). Twenty-six advisements had explicitly aligned with 8 PAGs. Most tallies were partial matches (92% statements). No mismatches were observed. Most tallies were older adult PAGs (46%), then sedentary lifestyle (36%), then muscle fitness (15%). Zero statements aligned with aerobic PAGs. **CONCLUSION:** Pilot data suggests older adults seeking credible advice for maintaining their health during COVID-19 likely receive little advice matching PAGs through online articles. Implication of these findings and project next steps will be presented.

### 43. SWACSM Abstract

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## Cannabis and Cannabidiol Use in Active Individuals: A Survey of Timing and Reasons for Use

MATTHEW M. SCHUBERT<sup>1</sup>, JAMIE E. HIBBERT<sup>1,2</sup>, RICHARD F. ARMENTA<sup>1</sup>, ERIK A. WILLIS<sup>3</sup>, & WHITNEY OGLE<sup>4</sup>

<sup>1</sup>Department of Kinesiology; California State University, San Marcos; San Marcos, CA;

<sup>2</sup>School of Veterinary Medicine; University of Wisconsin; Madison, WI; <sup>3</sup>Center for Health Promotion and Disease Prevention; University of North Carolina; Chapel Hill, NC;

<sup>4</sup>Department of Kinesiology and Recreation Administration; Humboldt State University; Arcata, CA

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*Category: Professional*

#### ABSTRACT

The use of cannabis for medicinal and recreational purposes is widespread across the globe. However, relatively little is known regarding the use of cannabis and its constituents among athletic populations. **PURPOSE:** The aim of this study was to examine timing of cannabis use relative to exercise, reasons for use, forms of consumption, and sources of information in active adults. **METHODS:** This cross-sectional survey was administered electronically beginning in September 2020. Participants were recruited through social media advertisements, email blasts, and word of mouth. Data were collected on health and exercise habits, use of cannabis/cannabidiol (CBD), reasons for use, form of consumption, and sources of information. **RESULTS:** 231 participants (82% ♂) completed the survey. Most participants exercised  $\geq 3$  d  $\cdot$  wk<sup>-1</sup> (84%) for  $\geq 45$  minutes a session (79.7%). Endurance sports were most common (47%), followed by functional/resistance training (11.3%) and sports participation (7.4%). 55% of the population self-described as “recreational exercisers” and 45% self-described as “competitive athletes”. 74% of participants reported using cannabis with THC, 15% reported using both cannabis with THC and CBD, and 11% only used CBD. 44% of participants used cannabis before and after exercise, with another 26% using cannabis after exercise only. 45% reported using cannabis before exercise for psychological reasons, while only 14% reported using for physiological reasons. Of those who only used cannabis after exercise, 36% reported using cannabis for psychological reasons, with 28% using it for rehabilitative purposes. Family/friends were the primary source of information (16%), followed by other media (14.5%; social media, podcasts, blogs, etc.), doctor or healthcare provider (14%), news media (13.3%), and sports coaches, teammates, and other athletes (12.8%). **CONCLUSION:** Results of the present study add to the meager data on cannabis use, exercise, and their interaction. It appears most active individuals believe that cannabis and CBD can improve the psychological aspects of exercise and assist with recovery from exercise. Adequately powered, well-controlled and conducted randomized trials are needed to further determine the influence of cannabis consumption on exercise performance and recovery.

## 44. SWACSM Abstract

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### Single Running Bout Achilles Tendon Stiffness Adaptations in Elite Male Runners with Various Foot Strike Patterns

JOSHUA K. SPONECK, IAIN HUNTER, LUKE BROGAN, ZACHARY LUDWIG, COLLETTE BATTY, & A. WAYNE JOHNSON

Mitchell and Johnson Orthopedic Laboratory; Exercise Sciences; Brigham Young University; Provo, UTAH

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*Category: Doctoral*

*Advisor / Mentor: Johnson, A. Wayne (wayne\_johnson@byu.edu)*

#### ABSTRACT

**PURPOSE:** Midfoot strike runners experience greater amounts of force through the Achilles Tendon while running compared with heel strike runners which may increase the risk of Achilles tendinopathy. The purpose of this study is to examine the effect of a five-mile running bout, on Achilles tendon stiffness as measured by elastography in elite male runners that exhibit a midfoot or heel strike pattern. **METHODS:** Ten male runners (age = 21.4 years, height = 179.54 cm, weight = 66.2 kg, average miles run over the last 6 weeks = 6) participated in this study. Runners free from injury and running at least 50 miles a week and able to run a 10k in 33:00 minutes participated. Prior to running participants were marked with permanent marker on the posterior aspect of the Achilles tendon in a straight line between the apex of the medial and lateral malleolus. The Achilles was imaged before running and after each mile until five miles. Running sessions were completed on an instrumented treadmill with 0% incline. Runners ran a standard recovery pace of 4.31 m/s. Between mile 3 and mile 4 study participants were filmed using a high speed digital camera to determine foot strike patterns at initial contact. Rear foot strike was classified as initial ground contact with heel or rear 1/3 of shoe, mid-foot strike was classified as initial ground contact with midfoot. **RESULTS:** Neither running group experienced significant changes in Achilles tendon stiffness from the initial measurement ( $p>0.05$ ), despite an increase in Achilles stiffness of 23.68% and 30.92% in the midfoot strike and heel strike running groups respectively. There were no significant differences between the running groups at any of the measurement time intervals ( $p>0.05$ ). A medium Cohen's D effect size (0.54) was found between groups at the mile 4 measurement. No significant differences were found in the rate of Achilles tendon stiffening between groups ( $p=0.90$ ) **CONCLUSIONS:** Elite runners that midfoot strike and heel strike do not experience statistically significant Achilles tendon stiffness changes over a five mile run at a recovery pace. No initial differences in Achilles tendon stiffness existed between foot strike groups and heel strike runners and midfoot strike runners experienced similar Achilles tendon stiffness changes during the run.

## 45. SWACSM Abstract

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### Effects Of Various Self-Myofascial Release Devices On 60-Meter Sprint Performance

JARED R. STEELE, NICOLE D. BOLTER, MARIA J. VERI, MATT LEE, FACSM

Kinesiology; San Francisco State University; San Francisco, California Category:

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Doctoral Advisor / Mentor: Lee, Matt (cmlee@sfsu.edu)

#### ABSTRACT

Over the past decade, self-myofascial release (SMR) has become a common tool amongst athletes as it is highly regarded in its ability to increase range of motion (ROM), athletic performance, and post-exercise recovery. **PURPOSE:** The purpose of this study was to compare 60-meter sprint performances with and without two technologically advanced SMR devices - the percussive massager and clamp roller. Based on the available literature, it was hypothesized that sprint time metrics and stride biomechanics would be improved after the use of either of these advanced SMR devices compared to not using an SMR device. **METHODS:** The study consisted of 1 healthy young adult (25 years old) male. Prior to the COVID-19 pandemic, the study was intended to examine the effects of SMR devices on high schoolaged athletes. Due to the closure of public schools across the country, the study pivoted into a pilot study. The study implemented a randomized, cross over design over three study days, with 24 hours between trials. Three different intervention conditions -- percussive massager (PM), clamp roller (CR), and no roller (NR) -- were implemented. During the sprint, Sixty-meter time (60-m), Thirty-meter Time (30-m), Flying thirty-meter Time (30-60m), Foot Strikes, time differential from Sprint #1 & #2, Stride Length (meters), and Stride Rate (steps per second) were recorded and analyzed. Since this was a pilot study involving one participant, inferential statistics could not be performed on the data. Descriptive statistics (means, standard deviations) were calculated from the recorded variables and examined to determine any noticeable differences between interventions. **RESULTS:** PM improved sprint performance while CR showed no improvements on sprint performance but had improvements on stride length. PM was also better at reducing fatigue from sprint-1 and sprint-2 compared to CR and NR. **CONCLUSION:** Results show potential performance benefits of using percussive massagers as a way of improving sprint performance. While this study looked at the performance of a short sprint following an acute bout of SMR, future research should focus on benefits within the vertical and horizontal jump events in track & field as both of those require speed and range of motion on the approach to elicit strong performances.

## 46. SWACSM Abstract

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### Comparison of Plantar Fascia Thickness and Foot Pain in People with Plantar Fasciitis: A Preliminary Analysis

SPENCER G. STRADDECK, CAMILLE L. NGUYEN, KALEB BARKER, SARAH T. RIDGE, AARON W. JOHNSON

Michell-Johnson Lab, Exercise Science, Brigham Young University, Provo, UTAH

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*Category: Undergraduate*

*Ridge, Sarah (sarach\_ridge@byu.edu)*

#### ABSTRACT

Researchers have found that people with plantar fasciitis have lower stiffness in their plantar fascia than healthy people. However, the relationship between perceived pain and plantar fascia stiffness has not been well documented. **PURPOSE:** The aim of this study was to observe the correlation between plantar fascia stiffness and self-reported foot pain scores. **METHODS:** Sixteen people with plantar fasciitis (PFis) participated in this study. Screening criteria included a score of > 25 on the Plantar Fasciitis Pain Scale (PFPS) and plantar fascia (PF) thickness > 0.40 cm on a Brightness-Ultrasound image recorded prior to the start of data collection. At the start of data collection, subjects completed a 10-unit visual analog scale (VAS) based on their current foot pain. PF stiffness (kPa) was measured at 3 locations (Location 1: insertion at the calcaneus; Locations 2: 1 cm distal from calcaneal insertion; Location 3: 2 cm distal from calcaneal insertion) using shear wave elastography (SWE). A total of 9 measurements were taken from 3 SWE images and the average of all 9 measurements was used to represent the SWE value for statistical analysis. Pearson's correlations were run to determine relationships between SWE and VAS score, and SWE and PFPS score. **RESULTS:** There were moderate correlations between SWE and PFPS ( $29.15 \pm 15.62$  kPa,  $47.76 \pm 11.26$ ;  $r=0.35$ ,  $p=0.19$ ) and SWE and VAS ( $29.15 \pm 15.62$  kPa,  $2.38 \pm 2.12$ ;  $r=0.49$ ,  $p=0.05$ ). **CONCLUSION:** The moderate correlation between SWE measurements and VAS was observed to be stronger than the correlation between SWE and PFPS. This may be due to the fact that the SWE measurements were taken within minutes of the VAS score, while the PFPS score is based on pain over a longer period of time. As our study's data collection is ongoing, a larger data pool may reveal a different correlation between VAS and SWE measurements.

## 47. SWACSM Abstract

### Validity of Fitbit Devices while Ascending and Descending Flights of Stairs

MELISSA G. STREHLOW<sup>1</sup>, ALAN GARCIA<sup>1</sup>, DUSTIN W. DAVIS<sup>1</sup>, JAVEN MIGUEL<sup>1</sup>, JEFF MONTES<sup>2</sup>, & JAMES W. NAVALTA<sup>1</sup>, FACSM

<sup>1</sup>Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV; <sup>2</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

Category: Masters

Advisor / Mentor: Navalta, James (james.navalta@unlv.edu)

#### ABSTRACT

With wearable technology becoming increasingly popular, devices that provide valid step counts during physical activities are important for people trying to accumulate a certain number of steps, as is a common goal when trying to become more active. One of the most popular manufacturers of wearable devices in the world is Fitbit. It is not clear if wrist-worn Fitbit devices provide valid step counts while ascending and descending flights of stairs at different speeds. **PURPOSE:** The purpose of this study was to determine the validity of step counts by the wrist-worn Fitbit Charge and Fitbit Versa 2 while walking up and down flights of stairs. **METHODS:** Eight participants (6M, 2F, 29 ± 8 yrs, 178 ± 8 cm, 79 ± 15 kg) walked up and then down one, two and three flights of stairs to a metronome set at 50, 75, and 100 beats per minute (BPM). A Fitbit device was randomly chosen for each arm. Steps were recorded at the bottom and top of each flight. The step data were analyzed using mean absolute percent error (MAPE), Lin's concordance, and dependent *t*-tests. The criterion measure of steps was the actual number of steps through one flight (19 steps), two flights (39 steps = 19 steps in flight two + one step on the landing between flights one and two), and three flights (59 steps = 19 steps in flight three + one step on the landing between flights two and three). Prior to testing, the benchmark for validity was established as having both of the following: a MAPE < 10%, and a Lin's concordance ≥ 0.7. Significance on the dependent *t*-tests were accepted at the *p* < 0.05. **RESULTS:** Neither of the devices were considered valid measures of step count when ascending or descending stairs when the walking speed was 50, 75, or 100 BPM (see table).

		Fitbit Charge		Fitbit Versa 2	
		Up	Down	Up	Down
50 BPM	MAPE (%)	49.09	35.86	53.81	29.19
	Lin's Concordance	0.57	0.65	0.53	0.70
	<i>p</i> -value	0.005	0.04	0.003	0.08
75 BPM	MAPE (%)	22.75	10.65	16.42	9.45
	Lin's Concordance	0.052	0.96	0.89	0.95
	<i>p</i> -value	0.74	0.47	0.26	0.54
100 BPM	MAPE (%)	21.42	8.97	13.06	7.34
	Lin's Concordance	0.78	0.94	0.93	0.96
	<i>p</i> -value	0.296	0.51	0.505	0.59

**CONCLUSION:** Our evidence suggests the Fitbit Charge and Fitbit Versa 2 do not provide valid step counts while ascending or descending stairs, regardless of the speed. People who wish to utilize these devices for a valid measure of steps should understand this limitation.

## 48. SWACSM Abstract

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### Assessing Changes in Exercise, Dietary and Sleeping Habits in Students During the COVID-19 Pandemic

JENNIFER TRAM BS<sup>1</sup>, JUSTIN TRAM BS<sup>2</sup>, KENNETH VITALE MD, FACSM<sup>3</sup>

<sup>1</sup>University of California San Diego School of Medicine; San Diego, CALIFORNIA; <sup>2</sup>Albany Medical College; Albany, NEW YORK; <sup>3</sup>Department of Orthopedic Surgery; University of California San Diego; San Diego, CALIFORNIA

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*Category: Professional-in-Training*

*Advisor / Mentor: Vitale, Kenneth (kvitale@health.ucsd.edu)*

#### ABSTRACT

**PURPOSE:** The purpose of this study was to analyze changes in exercise, dietary and sleeping habits of undergraduate and graduate students at University of California, San Diego (UCSD) and Albany Medical College (AMC) before the COVID-19 pandemic, in April 2020 (start of stay-at-home restrictions) and in April 2021 (1 year later). **METHODS:** An anonymous online survey was distributed to UCSD and AMC students. Participants used the Likert scale with “strongly agree,” “agree,” “neutral,” “disagree,” and “strongly disagree” to report how COVID-19 has changed each aspect of their lifestyle during three time points: before pandemic, April 2020 and April 2021. Responses were divided by undergraduate and graduate students. Paired t tests were run to determine if there was a statistically significant difference before pandemic vs. April 2020; before pandemic vs. April 2021; and April 2020 vs. April 2021. **RESULTS:** Our study found the following statistically significant trends ( $p < 0.05$ ). Undergraduate students reported fewer hours of sleep before pandemic vs. April 2020 and before pandemic vs. April 2021. Graduate students reported decreased exercise levels before pandemic vs. April 2020. Both undergraduate and graduate students experienced decreased access to recreational facilities and healthy food sources at each time point. Graduate students reported significant difficulty in following a healthy lifestyle at each of the three time points. **CONCLUSION:** Undergraduate students experienced statistically significant difficulties with obtaining adequate sleep, access to recreational facilities and access to healthy food sources. Graduate students reported statistically significant difficulties with participating in weekly exercise, access to recreational facilities, access to healthy food sources and healthy lifestyles overall. Both student communities would benefit from administrative policies that increase access to on-campus recreational facilities and dining halls. Further interventions for undergraduate students include targeted sleep hygiene or sleep education programs. Graduate students could benefit from wellness programs that involve a fitness component to help meet the recommended 150 minutes of weekly exercise.

## 49. SWACSM Abstract

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### Biomechanical Changes in Running Post-Transition in a Triathlon

J LUKE VANKEERSBILCK, TRAVIS PETERSON

CALIFORNIA LUTHERAN UNIVERSITY

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#### ABSTRACT

Triathletes often complain about lower limb discomfort when running after cycling (Quigley, 1996). Several studies have found differences in muscle activation (Chapman, 2009), kinematics (Rendos et al., 2013), and kinetic cost (Millet, 2001) during the transition run. These differences were also found to be more severe in less experienced triathletes (Chapman, 2008). **PURPOSE:** This study aimed to determine the kinetic differences between baseline and transition runs of inexperienced triathletes. **METHODS:** Twelve novice triathletes age:  $29.4 \pm 12.15$  y, mass:  $71.2 \pm 10.3$  kg, weekly running mileage:  $24.4 \pm 16.7$  mi/week volunteered to participate. Athletes completed a 20 min run during session 1, and a 20 min bike followed by a 20 min run during session 2, each conducted at 75-80% effort level. Cycling sessions occurred on a stationary trainer (Wahoo Kickr snap) allowing athletes to use their own bike or have a standard bike fitted to their preferred geometry. Running sessions occurred on an outdoor loop (~370m) where subjects passed through timing gates (Brower) and over two force plates (Kistler, 1200 Hz). Sagittal view, right side video (Sony, 240 Hz) was also collected. Each running session was broken into 4 five-minute blocks. Duration of foot contact with the ground determined stance phase, while braking (-RFY) and propulsive phases (+RFY) were also defined. A two-way repeated measures ANOVA was used to determine differences between run type and time block ( $\alpha = 0.05$ ). **RESULTS:** During the stance phase, there was a main effect for time block of anterior linear impulse ( $F = 3.03$ ,  $p = 0.043$ ) and average +RFY (main effect  $F = 3.37$ ,  $p = 0.03$ ) and contact time ( $F = 3.11$ ,  $p = 0.039$ ). Similarly, there was a main effect for time of propulsive phase linear impulse ( $F = 7.94$ ,  $p < 0.001$ ) and average +RFY ( $F = 7.95$ ,  $p < 0.001$ ). Although post-hoc analysis did not reveal significant differences, it appears the later time blocks decreased anterior linear impulse as RFY decreased. **CONCLUSIONS:** Athletes displayed similar running kinetics between the baseline and transition run, however differences did occur between time blocks. This suggests that athletes fatigued similarly between the two run types. These findings may indicate that self-reported discomfort in the transition run may not be detected by measures of whole-body kinetics.

## 50. SWACSM Abstract

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### Crossing Over to The Other side; Studying Effect of Fatigue When Walking in a Randomized & New Space

JOSHUA ALEXANDER VICENTE, ALEX X KRAUSE, RABBANI NZEZA, EPHARIM FLORES, JACOB W. HINKEL-LIPSKER, PH.D.

Move Learn Lab; Kinesiology; California State University, Northridge; Northridge, CA

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*Category: Undergraduate*

*Advisor / Mentor: Hinkel-Lipsker, Jacob (jacob.hinkellipsker@csun.edu)*

#### ABSTRACT

Slips, trips, and falls (STFs) that lead to a substantial amount of workplace injuries. In any career that requires physical effort, it is crucial to maintain a strong reaction and response time to these unpredictable environments to maintain worker safety. In dynamic, ever-changing workplaces, it is important to know how to best mitigate trip and fall risk. However, there is little literature describing how physical fatigue affects young, healthy individuals' ability to negotiate obstacles, as well as whether there are worker characteristics that may put them at greater risk of STFs. **PURPOSE:** Therefore, our purpose is to identify the effects of physical fatigue on an individual's ability to navigate unpredictable obstacles and to see if factors such as age, sex, height, and physical fitness could predict how participant obstacle negotiation mechanics. **METHODS:** Twenty-one college aged subjects with a moderate to high fitness level were screened for participation. These participants then underwent 10 obstacle crossing trials where they navigated a randomly placed hurdle in a pitch-black room, 5 before and 5 immediately after undergoing a fatiguing exercise protocol. An 8-camera three-dimensional (3D) motion capture system was used to quantify spatiotemporal obstacle negotiation variables like toe and heel clearances of both legs, as well as foot placement on the step before negotiation. Regression models were used to determine if participant age, sex, height, or estimated  $VO_2$ max significantly predicted these obstacle negotiation outcomes. **RESULTS:** Following fatiguing exercise, participants exhibited statistically lower foot clearance and foot placement values, indicating riskier behavior when fatigued. Moreover, we found that estimated  $VO_2$ max significantly predicted foot placement on the step before negotiation, indicating a decreased ability to properly plan and negotiate an obstacle when fatigued. **CONCLUSION:** The results obtained help to highlight the impact of physical fatigue in laborious professions with dynamic and unpredictable workplaces. These results hope to inform companies and workers to explore and highlight the importance of maintaining the cardiovascular health of their employees to decrease the risk of a workplace accident.

## 51. SWACSM Abstract

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### Effect of 4-week Creatine Monohydrate Supplementation on Absolute Strength in Trained and Untrained Healthy Adults

C. VOLLMER & B. SANCHEZ, PHD

Human Performance Laboratory; Kinesiology; California State University, Bakersfield; Bakersfield, CALIFORNIA

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*Category: Undergraduate*

*Advisor: Sanchez, Brittany (bksanchez@csu.edu)*

#### ABSTRACT

Creatine monohydrate (CrM) is a synthetic form of creatine which has similar effects on the body as compared to the endogenous form. Creatine is used by the body to supply rapid ATP to muscles for contractile movements and is regularly obtained in the diet, primarily from meat products, or synthesized by the liver at a 24-hour turnover rate of approximately 1-2 g/day. Creatine supplementation is commonly used with the intention of improving muscular strength and hypertrophy for athletic performance along with enhanced recovery time, injury prevention, rehabilitation, and potential neuroprotective benefits. **PURPOSE:** The specific aim of this study is to measure the effect of CrM supplementation on absolute strength after a bout of maximal resistance exercise in trained and untrained healthy adults. **METHODS:** 18 females (F) and 25 males (M) ( $23 \pm 4.7$  yr,  $26.7 \pm 5.3$  BMI) participated in a 4-week CrM (BodyTech®) supplement intervention. Week 1 dosage was 20g/day, followed by 10g/day for the remaining 3 weeks. One repetition max (1RM) bench press and squat (Rogue Fitness®) resistance tests were performed to assess absolute strength at baseline (week 0) and post-intervention (week 4). Participants did not alter their current regimen of physical activity or dietary intake throughout the 4-week trial. Data are presented as changes from baseline through week 4 to determine strength outcomes before and after CrM supplementation. **RESULTS:** Paired sample t-Tests revealed significant increases in 1 RM bench press (F  $2.76 \pm 0.72$  kg,  $p=0.001$ ; M  $5.16 \pm 0.89$  kg,  $p<0.001$ ). Additionally, significant increases in 1 RM squat were observed (F  $6.5 \pm 2.1$  kg,  $p=0.006$ ; M  $9.53 \pm 1.91$  kg,  $p<0.001$ ). **CONCLUSION:** These results indicate the given quantity of CrM supplementation improves upper and lower extremity maximal strength outputs independent of training status, sex, or current activity levels in young healthy adults.

## 52. SWACSM Abstract

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### Combine Anthropometric and Physical Performance Predictors of Professional Basketball Rookie Free Throw Accuracy

KRISTINE R. WILSON, ANTHONY B. CICCONE

Applied Human Performance Laboratory; Department of Exercise Science & Outdoor Recreation; Utah Valley University; Orem, UT

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*Category: Undergraduate*

*Advisor / Mentor: Ciccone, Anthony ([aciccone@uvu.edu](mailto:aciccone@uvu.edu))*

#### ABSTRACT

It is suggested that stronger basketball players and players with larger hands have poorer free throw percentages. However, research suggests stronger individuals have better force steadiness. **PURPOSE:** Therefore, the purpose of this study was to analyze the relationships between free throw percentage and anthropometric and physical performance metrics of National Basketball Association (NBA) players. **METHODS:** Using nbastatR, NBA draft combine data from 2000 to 2020 and respective NBA rookie season player data was scraped. Players who attempted at least 30 free throws were analyzed. Free throw percentage was predicted by the three performance variables and five anthropometric variables: lane agility, bench press performance, and vertical jump height and weight, body composition, height, wingspan, hand length, and hand width. Alpha of 0.05 was used for all statistical analysis. Each variable was correlated with free throw percentage. Multiple regression models were ran and the most parsimonious model was identified. **RESULTS:** There were significant correlations between free throw percentage and the following variables: wingspan ( $r=-0.4$ ), weight ( $r=-0.35$ ), hand length ( $r=-0.34$ ), height ( $r=-0.32$ ), lane agility ( $r=-0.24$ ), bench press performance ( $r=-0.17$ ), and hand width ( $r=-0.16$ ). The full multiple regression model yielded an  $R^2$  value of 0.20 but the only significant predictor was wingspan ( $p=0.0164$ ). The most parsimonious prediction model only contained wingspan as a predictor ( $R^2 = .16$ ,  $p<0.001$ ). **CONCLUSION:** The strongest predictor of free throw percentage was wingspan, although the relationship strength was weak. When wingspan was accounted for, no other variables were related to free throw percentage. Therefore, the frequent assumption that stronger athletes and athletes with larger hands are poorer free throw shooters is not supported. This relationship does not suggest a causal effect of longer limbs on free throw percentage. Due to the advantage in rebounding and defensive performance, athletes with bigger wingspan have, shorter players with shorter limbs may be required to be more accurate shooters to earn a career in the NBA. However, no research has been done on the effect of limb length to movement accuracy. Future research should investigate the effect of limb length on movement accuracy.

# SATURDAY POSTER SESSION

## 1. SWACSM Abstract

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### The Effect of Percussive Massage on Skeletal Muscle Mitochondrial Fat Oxidation and Thigh Fat Thickness

MOHADESEH AHMADI, ERIK D. MARCHANT & ROBERT D. HYLDAHL

Department of Exercise Sciences; Brigham Young University; Provo, UT

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Category: Doctoral

Advisor / Mentor: Hyldahl, Robert (robhyldahl@gmail.com)

#### ABSTRACT

Nutrition and exercise are well-established modalities for the induction of fat loss. However, it is important that alternative methods of fat reduction be investigated whether as supplementary treatments to traditional methods or stand-alone interventions, as a significant portion of the population is unable to participate in exercise training or undergo effective diet programs. Some studies have shown that daily whole-body massage can limit body fat deposition in infants, as well as young and middle-aged adults. While most studies have investigated the effects of traditional massage modalities in which massage is applied by a massage therapist using touch to manipulate the soft tissues of the body, research regarding the efficacy of newer massage modalities like percussive massage remains limited. **PURPOSE:** To investigate the effects of percussive massage on skeletal muscle mitochondrial fat metabolism and thigh subcutaneous fat thickness. **METHODS:** Nine healthy young ( $22 \pm 4$  yr) men ( $n=4$ ) and women ( $n=5$ ) received 18 sessions of 30-min-percussive massage on their right thigh over the course of 6 weeks. Muscle samples were collected one week before the start of massage sessions and 48 h after the last session from the participant's treated thigh. Subcutaneous fat was imaged and measured using ultrasound on both the treated and contralateral thighs. Mitochondrial fat oxidation was assessed in permeabilized muscle fibers using high-resolution respirometry (Oroboros O2k), supported by octanoylcarnitine (0.5 mM), malate (2 mM), and ADP (2.5 mM). Respiration is expressed as pmol of  $O_2$  consumed per second per mg of tissue (wet weight). **RESULTS** Percussive massage treatment decreased the subcutaneous fat thickness of the treated thigh by  $7.2\% \pm 5.4$ , which was not significantly higher than the contralateral leg ( $0.5\% \pm 4.3$ ;  $p=0.07$ ). Subcutaneous fat thickness decreased from  $10.04 \pm 5.49$  mm at baseline to  $9.36 \pm 5.39$  mm post treatment in the treated thigh and remained unchanged in the contralateral limb ( $9.53 \pm 5.18$  mm to  $9.54 \pm 5.24$  mm). However, maximal mitochondrial fat oxidation increased significantly ( $p=0.038$ ) from  $13.16 \pm 4.9$  pmol $O_2$ /s/mg to  $17.33 \pm 3.59$  pmol $O_2$ /s/mg (+31.7%), after 6 weeks of percussive massage. **CONCLUSION:** These results suggest that percussive massage increases mitochondrial fat oxidation, which could potentially lead to a decrease in body fat deposition if applied daily, or over a longer time course.

## 2. SWACSM Abstract

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### Short-duration Massage Does not Affect Grip Strength in Rock Climbers

TAYLER S. AH NEE <sup>1</sup> & CHRISTOPHER G. BERGER <sup>2</sup>

<sup>1</sup>Physical Therapy; A.T. Still University; Mesa, ARIZONA; <sup>2</sup>Kinesiology and Health Studies; University of Central Oklahoma; Edmond, OKLAHOMA

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*Category: Undergraduate*

*Advisor / Mentor: Berger, Christopher (aucgb@outlook.com)*

#### ABSTRACT

Handgrip strength (HGS) is now viewed as an index of overall health and may even be prognostic for conditions that include cancer and cardiovascular disease. Consequently, it is important to understand influences on HGS, one of which may be forearm massage. **PURPOSE:** The aim of this study was to test the hypothesis that a bout of short-duration massage would augment HGS in rock climbers, a population for which massage is commonly employed and HGS is acutely important. **METHODS:** Subjects included fifteen female (age  $28 \pm 7$  yr; height  $165.8 \pm 5.5$  cm; weight  $63.1 \pm 11.7$  kg) and fifteen male (age  $26 \pm 5$  yr; height  $179.2 \pm 9.8$  cm; weight  $72.5 \pm 12.1$  kg) experienced rock climbers. Experience was quantified using self-reported Yosemite Decimal System scores (group mean  $5.11 \pm 0.01$ ). Following a brief warmup of the wrist flexors, wrist extensors, and finger flexors, HGS was measured bilaterally using a Smedley-type dynamometer with the highest of three trials flagged for data analysis. Subjects squeezed the dynamometer while standing with the elbow at  $180^\circ$ . Verbal encouragement was provided. Forearm massage of the self-reported dominant limb was provided only by the lead author. Strokes included effleurage (1 min), wringing (1 min), and petrissage (3 min) using grapeseed oil. During massage, the non-dominant limb rested and subsequent measures of this limb HGS served as controls. Following massage, subjects were re-measured for bilateral HGS and the resulting data were interpreted using Student's *t* for dependent measures. **RESULTS:** Following massage, dominant limb HGS increased by 1.0% and non-dominant limb (control) HGS increased by 1.4% for the group. These measures were not statistically significant for either female ( $t(14) = -0.16, p = 0.88$ ) or male ( $t(14) = -0.58, p = 0.58$ ) subjects. Effect sizes computed using Cohen's *d* suggested that short-duration massage has no constructive influence on HGS for either female ( $d = 0.015$ ) or male ( $d = 0.05$ ) experienced rock climbers. **CONCLUSION:** Short-duration massage of the forearm musculature does not seem to affect HGS in experienced rock climbers.

### 3. SWACSM Abstract

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## The Effect of Heat Therapy on Skeletal Muscle Satellite Cell Content

BOSTON J. ANDERSEN, JAMIE P. KALUHIOKALANI, BRANDON S. PFEIFER, JACK B. MEHLING, ROBERT D. HYLDAHL

Department of Exercise Science; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Hyldahl, Robert (robhyldahl@byu.edu)*

#### ABSTRACT

Satellite cells are essential for proper muscle repair and adaptation. Studies have shown that exercise can lead to an increase in satellite cell content within muscle tissue. However, it is unknown whether other environmental stressors, such as heat, are also capable of augmenting the satellite cell pool. **PURPOSE:** The purpose of this study was to quantify changes in satellite cell content before and after 6-weeks (3x/wk) of skeletal muscle heat therapy (HT) or single leg knee extension exercise training (EX). Additionally, a sham heat treatment was used as a control. We hypothesized that HT would result in an increase in satellite cell content, though to a lesser extent than the EX group. **METHODS:** We randomized 28 sedentary but otherwise healthy, young adults (ages 18-36; n = 13 female, n = 15 male) to receive either HT (2 hr, 3 days/wk, 6-week period), EX (40 min, 3 days/wk, 6-week period), or sham heating sessions (CON; 2hr, 3 days/wk, 6-week period). The HT was administered through pulsed, shortwave diathermy. Muscle biopsies were taken from the vastus lateralis at baseline, after 3 weeks of intervention, and again after 6 weeks of intervention. **RESULTS:** For the Control Group, satellite cell count per  $\mu\text{m}^2$  at baseline = 8.107 ( $\pm$  0.4799), at 3 weeks = 10.27 ( $\pm$  0.911), at 6 weeks = 9.84 ( $\pm$  0.675). For the EX Group, satellite cell count per  $\mu\text{m}^2$  at baseline = 9.705 ( $\pm$  1.27), at 3 weeks = 10.87 ( $\pm$  1.12), and at 6 weeks = 10.47 ( $\pm$  0.7997). For the HT Group, satellite cell count per  $\mu\text{m}^2$  at baseline = 8.535 ( $\pm$  0.582), at 3 weeks = 11.54 ( $\pm$  1.43), and at 6 weeks = 10.202 ( $\pm$  0.940). Statistical analysis indicated a significant main effect of time ( $p=0.0125$ ), but no significant effect of group ( $p=0.5504$ ) or the group x time interaction ( $p=0.8412$ ). **CONCLUSION:** Our findings suggest that 6 weeks of HT is insufficient to affect the satellite cell content within muscle fibers. This study provides additional insight in the literature about the effects of HT on human subjects.

#### 4. SWACSM Abstract

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### Acute Effects of Swimming and Running on Serum Cartilage Oligomeric Matrix Concentration

STEPHANIE BANGERTER, MARTHA GILL, MADISON J. RHOADES, ALEXANDRA M. HAY, SETH A. FERGUSON, HYUNWOOK LEE, RONALD L. HAGER, GARY J. MEASOM, MATTHEW K. SEELEY.

Biomechanics Laboratory; Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Seeley, Matthew K. (matt\_seeley@byu.edu)*

#### ABSTRACT

Most older adults are thought to have some level of knee joint articular cartilage degradation or knee osteoarthritis, a debilitating and incurable disease. Physical exercise is known to benefit joint health for older adults, yet it is unclear how different modes of exercise affect knee joint articular cartilage. Serum cartilage oligomeric matrix protein (COMP) is a biomarker that is thought to reflect articular cartilage metabolism. **PURPOSE:** To compare effects of running and swimming on serum COMP concentration in older adults. **METHODS:** Serum COMP concentration was measured before and after physical exercise for two groups of older adults: runners and swimmers. The runners ( $n = 20$ ; Age =  $56 \pm 4$  yrs; BMI =  $24.5 \pm 3.2$ ) completed a 5000-m run. The swimmers ( $n = 19$ ; Age =  $60 \pm 6$  yrs; BMI =  $24.0 \pm 2.7$ ) completed a 1500-m swim. Blood samples were collected before and after the exercise and serum COMP concentration was quantified using an ELISA assay. A repeated measures ANOVA was used to compare the effects of running and swimming on serum COMP concentration. **RESULTS:** A significant group  $\times$  time interaction existed for serum COMP concentration ( $p < 0.01$ ). Running significantly increased serum COMP concentration (29%, from  $171.4 \pm 41.1$  to  $220.7 \pm 63.2$  ng/ $\mu$ L;  $p < 0.01$ ), but swimming did not (5%, from  $179.5 \pm 60.7$  to  $187.9 \pm 59.0$  ng/ $\mu$ L;  $p = 0.99$ ). **CONCLUSION:** Assuming that serum COMP concentration increase after physical exercise represents knee articular cartilage metabolism due to physical exercise, the present data show that running results in more articular cartilage metabolism than swimming. This supports the idea that, when tolerated, land-based exercise involving ground reaction forces and corresponding joint loads contributes to knee joint health in older adults. We suspect that this is due to increased joint loads associated with running, relative to swimming.

## 5. SWACSM Abstract

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### Effect of Moderate Intensity Cycle Ergometer Exercise in Normoxia and Hypobaric Hypoxia on Markers Related to Autophagy – A Pilot Study

QUINT N. BERKEMEIER, ZACHARY MCKENNA, ZACHARY FENNEL, ROBERTO NAVA, CHRISTINE MERMIER, & ANN L. GIBSON, FACSM.

Exercise Physiology Lab; Health, Exercise & Sports Sciences; University of New Mexico; Albuquerque, NM

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*Category: Doctoral*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

Autophagy is a process by which damaged and dysfunctional cellular components are transported to and decomposed in the lysosome, which is integral for maintenance of healthy cellular function and homeostasis. Among many health benefits, exercise is shown to catalyze autophagy. However, limited research exists on the effect of high-altitude exercise (>2500m) on autophagy in humans. **PURPOSE:** To determine the effect of exercise in hypoxia (HYP) on autophagic markers compared to intensity-matched exercise in normoxia (NORM). **METHODS:** 8 healthy and active males ( $23.3 \pm 2.4$  yrs,  $75.2 \pm 10.7$  kg,  $49.6 \pm 6.5$  ml/kg/min) completed 1hr of moderate intensity cycling (65% normoxic  $\text{VO}_2\text{max}$ ) in normoxia (1600m) and hypobaric hypoxia (4300m), in a randomized counterbalanced crossover design, separated by two weeks. Venous blood samples were collected pre and post exercise, from which peripheral blood mononuclear cells (PBMCs) were isolated and analyzed for expression of a regulatory autophagic protein (p62) and an upstream contributor to hypoxia-inducible factor  $1\alpha$  (HIF1 $\alpha$ ) mediated autophagy (PHD2). Comparisons between conditions were made using paired t-tests. **RESULTS:** Post exercise decreases in protein expression were similar between HYP and NORM for p62 ( $0.50 \pm 0.2$  vs  $0.70 \pm 0.5$  Fold Change) and PHD2 ( $0.15 \pm 0.17$  vs  $0.21 \pm 0.16$  Fold Change), respectively ( $p > 0.05$ ). **CONCLUSION:** Decreased expression of p62 following exercise is suggestive of upregulation in autophagy regardless of exercise condition. Further, inhibition of PHD2 in immune cells post exercise may be due to exercise induced hypoxemia, and activation of autophagy via the HIF1 $\alpha$ /BNIP3 pathway. These data suggest that oxygen sensing occurs in PBMCs as a result of physiological stressors such as altitude and exercise which increase autophagic processes. Autophagic flux may occur similarly following exercise in hypoxic and normoxic environments, however more comprehensive analyses of multiple autophagic markers measured in heterogenous participant sample sizes are warranted.

## 6. SWACSM Abstract

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### Time Spent Jogging/Running and Telomere Length in 5805 U.S. Adults

CHRISTINA BLACKMON, LARRY A. TUCKER, FACSM

Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Masters*

*Advisor / Mentor: Tucker, Larry (tucker@byu.edu)*

#### ABSTRACT

A scientifically accepted measure of biological aging is the length of telomeres. Telomeres shorten with each year of life. Although age is the primary driving force, lifestyle can also have a substantial effect on telomere length. **PURPOSE:** The aim of this study was to investigate the degree to which minutes spent jogging or running per week accounted for differences in leukocyte telomere length (LTL) in a randomly selected sample of 5805 U.S. adults. **METHODS:** A cross-sectional design was employed using data from the National Health and Nutrition Examination Survey (NHANES) and findings are generalizable to the U.S. adult population. Time spent jogging and/or running, both vigorous physical activities (PA), was compiled from duration and frequency measures reported by each participant. NHANES used the quantitative polymerase chain reaction technique to quantify LTL. Multiple regression was performed using SAS software to interpret the data. Partial correlation was used to control for potential confounders. **RESULTS:** Telomere lengths were 15.6 base pairs shorter for every year of chronological age ( $F=414.3$ ,  $p<0.0001$ ). Weekly PA was divided into 3 categories: 1) No regular PA, 2) Some jogging/running, but less than the minimum recommendation of at least 75 min/wk for vigorous PA, and 3)  $\geq 75$  min/wk of jogging/running. After controlling for age, sex, income, and race, telomere lengths differed across the three categories ( $F=5.8$ ,  $P=0.0074$ ). Specifically, adults in category 3 exhibited significantly longer telomeres, 5999 base pairs (bp), than those not engaging in any regular PA (5799 bp). After adjusting for smoking, BMI, PA minutes other than jogging/running, diabetes, and heart disease, along with age, sex, income, and race, differences in LTL across the 3 categories remained significant ( $F=3.9$ ,  $P=0.0315$ ). Inactive adults had telomeres that were 170 bp shorter than those meeting the guidelines using jogging/running. This LTL difference was equal to 10.9 yrs of extra biological aging ( $170/15.6=10.9$ ). Adults performing some jogging/running, but did not meet the guidelines, had LTL that were 105 bp longer than inactive adults. **CONCLUSION:** The present study indicates that  $\geq 75$  min/wk of jogging/running accounts for almost 11 yrs less cellular aging compared to being physically inactive.

## 7. SWACSM Abstract

### Validity of Average Heart Rate and Energy Expenditure in Polar OH1 and Verity Sense While Self-Paced Walking

NATHANIEL BODELL<sup>3</sup>, BRYSON CARRIER<sup>2</sup>, DAMIAN GIL<sup>3</sup>, WYATT B. FULLMER<sup>1</sup>, KYLE CRUZ<sup>2</sup>, CHARLI AGUILAR<sup>2</sup>, DUSTIN W. DAVIS<sup>2</sup>, ELIAS MALEK<sup>2</sup>, JEFF MONTES<sup>4</sup>, JACOB MANNING<sup>1</sup>, FACSM<sup>1</sup>, JAMES W. NAVALTA, FACSM<sup>2</sup>, MARCUS M. LAWRENCE<sup>1</sup>, MARK DEBELISO

<sup>1</sup>Department of Kinesiology and Outdoor Recreation, Southern Utah University, Cedar City, UT; <sup>2</sup>Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas, Las Vegas, NV; <sup>3</sup>Department of Kinesiology, California State University San Bernardino, San Bernardino, CA; <sup>4</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

Category: Professional

Bodell Nathaniel ([nathaniel.bodell@csusb.edu](mailto:nathaniel.bodell@csusb.edu))

#### ABSTRACT

Walking is the most widely used form of exercise. Advancements in wearable technology allow for the estimation of steps and energy consumption. Polar is a leading brand in wearable technology. The Polar OH1 and Verity Sense are commonly used optical sensors for activity tracking. It is unknown as to whether these devices provide a valid estimate of average heart rate (HR) and energy expenditure (EE) while walking. **PURPOSE:** The purpose of this investigation was to determine the validity of the Polar OH1 and Verity Sense during self-paced walking. **METHODS:** Twenty participants (n=10 female, n=10 male;  $23.5 \pm 6.48$  years) participated in a 5min of self-paced walking. The Polar OH1 and Polar Verity Sense were placed on either biceps, in accordance to the manufacture recommendations. Mean absolute percent error (MAPE,  $\leq 10\%$ ) and Lin's Concordance ( $\rho \geq 0.7$ ) were used to validate the device's average HR (in bpm) and estimated EE (in kcals). The Polar H10 heart rate strap and COSMED K5 were used in conjunction as the criterion reference. Dependent T-tests was used to determine potential differences ( $p \leq 0.05$ ). **RESULTS:** Heart rate was valid for self-paced walking among both the Verity Sense and OH1 optical sensors. Energy expenditure estimates were not valid during self-paced walking (see Table 1). **CONCLUSION:** The Polar Verity Sense and Polar OH1 are valid instruments for HR measures, however are not valid when attempting to estimate energy expenditure.

	Polar H10	Verity Sense	Polar OH1
Mean HR (bpm)	101 $\pm$ 17.7	103.44 $\pm$ 15.83	104.89 $\pm$ 17.15
MAPE		6.62%	7.49%
Lin's Concordance		0.79	0.68
t-test		0.15	0.47
Estimated EE (Kcal)	33.95 $\pm$ 6.35	33.17 $\pm$ 17.91	34.72 $\pm$ 17.91
MAPE		34.43%	31.65%
Lin's Concordance		0.46	0.45
t-test		0.81	0.93

## 8. SWACSM Abstract

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### Live Long and Prosper: A Systematic Review of Equipment-Based Training Programs for Older Adults

CHARISMA BYRD, B.S., PATRIC LEE, B.S., KATIE LOPEZ, B.S., SARAH PEARCE, B.S., LANDEN WONG, ALEXANDRA T. AUSLANDER, PH.D., MPH, M.S., ZAKKOYYA H. LEWIS, PH.D., & LARA KILLICK, PH.D., MPH

Kinesiology and Health Promotion; California State Polytechnic University; Pomona, CA

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*Category: Masters*

*Advisor / Mentor: Killick, Lara (lkillick@cpp.edu)*

#### ABSTRACT

**PURPOSE:** Within the US, people are experiencing longer life expectancy, yet these extended lifespans have not necessarily translated into years living in good health. Degenerative diseases such as osteoporosis and sarcopenia are particularly prevalent amongst older adults. Research shows that regular resistance exercise carries distinct preventive health benefits to combat these conditions. Therefore, the purpose of this study was to conduct a systematic review into the effectiveness of equipment-based resistance training programs for older adults (65+ years) on physical function. **METHODS:** Five databases were searched (PubMed, Web of Science, Science Direct, Medline, and Sports Medicine & Education Index) in July 2021. Inclusion criteria were participants aged 65 and older, programs that utilized equipment, and intervention studies. Exclusion criteria were non-intervention studies, assessment interventions, animal-based studies, no assessment of physical function, no exercise program, or not published in English. A total of 331 articles were identified, 282 after removing duplicates. Four screeners reviewed the articles independently. Currently, 68 articles are included for the systematic review. **RESULTS:** Our review will describe the impact of these interventions on static flexibility, walking efficacy, body composition, and other physical factors resulting from a resistance training program in older adult communities. **CONCLUSIONS:** The anticipated outcomes of the review will inform the implementation of equipment-based resistance training programs with older adults.

## 9. SWACSM Abstract

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### Effects of an Achilles Speedbridge on Ankle Joint Motion: A Case Study

ALFREDO J. CERVANTES<sup>1</sup>, KEVIN A. VALENZUELA<sup>1</sup>, JUSTIN DEMOSS<sup>1</sup>, ANAYA BLADE<sup>1</sup>, HUNTER J. BENNETT<sup>2</sup>

<sup>1</sup>Movement Science Lab, Department of Kinesiology, California State University Long Beach, CALIFORNIA

<sup>2</sup>Neuromechanics Lab, Department of Human Movement Science, Old Dominion University, VIRGINIA

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*Category: Masters*

*Advisor / Mentor: Valenzuela, Kevin (Kevin.Valenzuela@csulb.edu)*

#### ABSTRACT

Over 80% of Achilles injuries are related to individuals who participate in sports or recreational activities that involve either jumping or running. Current research does not provide insight into the longitudinal recovery effects following an Achilles repair surgery. **PURPOSE:** To evaluate the longitudinal effects of lower extremity kinematics following an Achilles Speedbridge surgery. **METHODS:** A 35-year-old male (1.85m, 86.4kg) presented right Achilles insertional tendinitis and a large retrocalcaneal bone spur which had fractured and was partially embedded in the Achilles tendon. One week prior to operation the subject completed over ground walking trials at 1.0 m/s velocity. Following surgery to repair the Achilles tendon, smooth down excess calcaneal bone, and remove fragments from the tendon and six weeks of no weight bearing, the subject repeated the overground walking trials at 8-, 12-, and 16- weeks. **RESULTS:** At 8-weeks post-operation, an increase of 13.9° in peak dorsiflexion angle had occurred, increasing the peak angle from 0.6° pre-operation to 14.5°. Furthermore, a 7° increase in plantarflexion ROM and a decrease in knee flexion ROM of 12° occurred. Along with these changes, during the over ground walking trials, the participant was only able to achieve a maximum gait velocity of 0.89 m/s at the 8-week post-operation trial. At 12- and 16-weeks, the peak dorsiflexion angle decreased from the 8-week post-operation trial to 10.4° and 10.7°, respectively, while the ankle ROM decreased to -24.5° and -25.4°, respectively. By the 12-week trial, knee flexion ROM returned to pre-operative levels. **CONCLUSION:** Kinematic data were used to quantify ROM changes to a recovering limb after an Achilles repair surgery. The subject had displayed a lower peak dorsiflexion angle in the pre-operation trial. After the Achilles repair surgery, there was a complete shift of the ankle angle curve during the stance phase into a more dorsiflexed pattern. Although the peak dorsiflexion angle reduced at the 12-week trial, the alteration in the curve continued to be present as peak dorsiflexion was still 10° higher than pre-op levels. The use of an Achilles Speedbridge had a significant effect on the alteration of ankle motion as there was a significant increase in the peak dorsiflexion angle following the operation.

## 10. SWACSM Abstract

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### Electromyographic Analysis of the Vastus Lateralis and Vastus Medialis Muscles Among Different Crank Lengths in Cycling

JACKSON C. CROVELLA, KAROLINE M. WUCHERER, JOY HE, CHRISTIANE R. O'HARA

Human Motion Biomechanics Laboratory; Kinesiology; California Polytechnic Institute; San Luis Obispo, CA

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*Category: Undergraduate*

*Advisor / Mentor: O'Hara, Christiane (crohara@calpoly.edu)*

#### ABSTRACT

Crank length (CL) on a bicycle may influence the total activation and period of activation of the leg muscles. Differences in total muscular activation suggest that CL may alter muscular fatigue. Differences in muscular onset and offset suggest that CL may shift muscle activation periods across a 360 degree crank cycle. **PURPOSE:** To examine the effects of four different CL (155, 165, 175, and 185 mm) on muscular activation of vastus lateralis (VL) and vastus medialis (VM). **METHODS:** Nine non-cyclists (6M, 3F, aged 18-55) participated in a single blind randomized cross-over experiment with four CL. Delsys EMG sensors were placed on five muscles of the right leg (VL, VM, TAS, GAS, BF). Participants completed two trials at 70 RPM and two trials at a constant pedal speed of 1.4 m/s for each CL. EMG data for each trial was recorded for one minute at 2 W/kg, trimmed to 30 seconds, and then averaged into one 360 degree crank cycle in MATLAB. Averaged EMG signals were rectified and filtered with a 4th order Butterworth low-pass filter, with a 20 Hz cut off frequency. A threshold value of 20% of the maximum voltage was applied to determine periods of muscular activation. Onset time, offset time, total onset time, and total onset time were recorded to determine changes in muscular activation at various CLs. Mean amplitude of the EMG signals were recorded to quantify muscle excitation. Area under the curve was recorded to estimate total muscular activity. An ANOVA and General Linear Model were run to compare participant data across CLs. Data was only analyzed for VL and VM at 70 RPM. **RESULTS:** There were no significant differences between any of the dependent measures at the four different CLs ( $p>0.05$ ). **CONCLUSION:** CL has no significant effect on total muscular activation or period of activation in VL and VM.

## 11. SWACSM Abstract

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### Quality of Knee Strengthening Exercises Performed at Home Deteriorates After One Week

HAYDEN E. DENNIS<sup>1</sup>; HYUNWOOK LEE, MS, ATC<sup>1</sup>; ULRIKE H. MITCHELL, PHD, PT, OCS<sup>1</sup>; MATTHEW K. SEELEY, PHD<sup>1</sup>

<sup>1</sup>Biomechanics Laboratory, Department of Exercise Sciences, Brigham Young University, Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Seeley, Matthew K. (matt\_seeley@byu.edu)*

#### ABSTRACT

Current clinical practice guidelines for physical therapy (PT) post-total knee arthroplasty (TKA) recommend supervised postoperative PT; this recommendation is based on research demonstrating that more direct supervision from a physical therapist yields improved mobility, balance, and overall quality-of-life, relative to less supervision. Supervised post-operative PT is not always feasible due to non-availability of a licensed physical therapist, lack of health insurance, and/or other factors. Consequently, patients often perform post-TKA PT exercises without supervision. **PURPOSE:** To compare the quality (determined via the ability to replicate lower extremity kinematics recommended by a physical therapist) of post-TKA PT exercises in healthy older adults (1) immediately after instruction from a physical therapist and (2) one week later, without feedback from or supervision of a licensed physical therapist. **METHODS:** 19 participants (age [y]  $63.1 \pm 8.6$ , mass [kg]  $76 \pm 15$ , height [m]  $1.7 \pm 0.1$ ) performed four post-TKA exercises on two different days, seven days apart. The first day involved direct supervision from a physical therapist, and the second day did not. The exercises were knee flexion, straight leg raise, "V" in supine position, and hip abduction in side lying position. High-speed videography was used to track 3D lower-extremity joint angles for all exercises on both days. The therapist observed and, when necessary, corrected the exercises during the first day. A repeated measures t-test was used to compare joint kinematics between visits. **RESULTS:** Participants exhibited 4° and 5° more knee flexion during straight leg raise ( $p < 0.01$ ) and "V in" ( $p = 0.00$ ) exercises on the second day, respectively, relative to the first day. Also, during the "V in" exercise, participants exhibited 34° more internal rotation ( $p < 0.01$ ), and 29° less ( $p < 0.01$ ) internal rotation during the "V out" exercise on the second day relative to the first day. **CONCLUSION:** One-time direct supervision from a physical therapist is not enough to ensure proper performance of PT exercises, post-TKA, seven days later, without the direct supervision of a licensed physical therapist. Other methods need to be explored with the intent of improving performance of post-TKA PT performed without direct supervision of a physical therapist.

## 12. SWACSM Abstract

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### Validity of Garmin Devices while Ascending and Descending Flights of Stairs

ALAN V. GARCIA<sup>1</sup>, MELISSA G. STREHLOW<sup>1</sup>, DUSTIN W. DAVIS<sup>1</sup>, JAVEN MIGUEL<sup>1</sup>, JEFF MONTES<sup>2</sup> & JAMES W. NAVALTA<sup>1</sup>, FACSM

<sup>1</sup>Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV; <sup>2</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

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Category: Masters

Advisor / Mentor: Navalta, James ([james.navalta@unlv.edu](mailto:james.navalta@unlv.edu))

#### ABSTRACT

The use of wearable technology to track physical activity is popular among fitness enthusiasts and the general public. There are many brands that offer a variety of devices. One popular brand is Garmin. The validity of Garmin's wrist-worn devices in measuring step counts in various settings, such as walking up and down a staircase, is unclear. **PURPOSE:** The purpose of the present study was to determine if two devices, the Garmin fēnix 5 and Garmin vivosmart HR record valid measures of step count when ascending and descending flights of stairs at three different speeds. **METHODS:** Eight participants (n=8) were tested individually. The Garmin fēnix 5 and Garmin vivosmart HR were worn on separate wrists (placement was randomly selected). Participants climbed up then down one, two, and three flights of stairs (19, 39, and 59 steps, respectively [manual count]) at speeds of 50, 75, and 100, beats per minute (bpm) for a total of 18 trials. The step counts provided by both devices were recorded before and after each up and down trial. Each trial was separated by 2-3 minutes of rest. Mean absolute percent error (MAPE,  $\leq 10\%$ ) and Lin's Concordance ( $\rho \geq 0.7$ ) were used to validate the device step counts with the actual number of steps. Dependent T-tests determined differences ( $p \leq 0.05$ ). **RESULTS:** The only condition that was considered valid was descending stairs at 100 bpm using the Garmin vivosmart (see table). **CONCLUSION:** Individuals who ascend and descend numerous stairs during their day may wish to consider the implications of these findings.

		Garmin fēnix 5		Garmin vivosmart HR	
		Up	Down	Up	Down
50 BPM	MAPE	50.90	73.13	84.77	62.13
	Lins	0.42	0.360	0.313	0.369
	P- Value	0.025	0.512	0.026	0.03
75 BPM	MAPE	77.07	110.09	64.86	89.38
	Lins	0.37	0.314	0.516	0.395
	P- Value	0.01	0.00001685	0.001	0.00009966
100 BPM	MAPE	16.77	11.97	24.66	9.62
	Lins	0.781	0.95	0.703	0.961
	P- Value	0.667	0.685	0.263	0.797

### 13. SWACSM Abstract

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## Evaluating the Effect of Electrode Placement on Phase Angle and Body Fat Percentage via the RJL Quantum Legacy Device

AVADNEY GERARD-OSBOURNE, JEREMY B. DUCHARME, JONATHAN HOUCK, HOLLY HALL, CHLOE CLARK, & ANN L. GIBSON, FACSM

Exercise Physiology Laboratory; Department of Health, Exercise, and Sports Sciences; University of New Mexico; Albuquerque, NM

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*Category: Undergraduate*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

To obtain the highest values for resistance (R) and reactance (Xc) during bioelectrical impedance analysis (BIA) it's recommended to measure on the right side of the body. Less is known if this relationship is true for phase angle (PhA) or when these variables are measured with the RJL Quantum Legacy device. **PURPOSE:** Evaluate the reliability, difference, and bias between bioelectrical impedance variables assessed on the left and right side of the body by the RJL Quantum Legacy device. **METHODS:** Thirty-eight young (18-38 yrs.), hydrated (urine specific gravity  $\leq 1.020$ ), men (n=16) and women (n=22) laid in the supine position for 15 minutes to allow for bodily water compartment stabilization prior to having three measurements of R, Xc, and PhA at 50 kHz on the left and right sides of their body. Paired samples t-tests were used to determine side differences in R, Xc, and PhA on both sides of the body. Cronbach's alpha reliability coefficient was used to evaluate the internal consistency of the device. Systematic bias between sides for PhA was quantified via Bland-Altman plots with linear regression analysis. Alpha of .05 was used to determine statistical significance. **RESULTS:** No significant differences were observed for R ( $564.7 \pm 94.5\Omega$ ,  $562.1 \pm 92.3\Omega$ ;  $p=.407$ ), Xc ( $68.9 \pm 7.4\Omega$ ,  $69.4 \pm 8.0\Omega$ ;  $p=.143$ ), or PhA ( $7.09 \pm .94^\circ$ ,  $7.15 \pm .84^\circ$ ;  $p=.083$ ) when measured on the left and right sides, respectively. Cronbach's alpha showed that the RJL device had excellent internal consistency across the three assessments on both sides for the measurement of R (.999), Xc (.998), and PhA (.998). A systematic bias between sides for PhA was identified so that values on the right side was significantly lower than on the left when PhA was greater than  $6.50^\circ$  ( $p=.006$ ). **CONCLUSION:** It's recommended that R, Xc, and PhA are measured on the right side of the body, but we observed no difference and excellent reliability between these variables when assessed on either side. Only measuring PhA on the right side may underestimate and ultimately misclassify individuals with greater PhA values. We recommend measuring on the left side to confirm that the highest PhA is being represented for individuals with a  $PhA \geq 6.50^\circ$ . While we observed a statistically significant bias, more research is warranted to determine whether this relationship is of clinical importance.

## 14. SWACSM Abstract

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### Comparison of Whole-Body Phase Angle Assessed by Supine and Vertical Bioelectrical Impedance Analyzers

ANN L. GIBSON FACSM, CHLOE CLARK, JEREMY B. DUCHARME, JONATHAN HOUCK, HOLLY HALL, & AVADNEY GERARD-OSBOURNE

Exercise Physiology Laboratory; Department of Health, Exercise, and Sports Sciences; University of New Mexico; Albuquerque, NM

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*Category: Professional*

*Advisor / Mentor: Gibson, Ann (alg@unm.edu)*

#### ABSTRACT

Several bioelectrical impedance analysis (BIA) analyzers such as the RJL Quantum Legacy and the InBody 770 measure phase angle (PhA, marker of cellular health) in addition to estimating body fat percentage (%BF). These analyzers require the participant to be supine or vertical, respectively, during the assessment and use different electrode configurations, both of which may affect the measurement of PhA and %BF. **PURPOSE:** Investigate the difference and agreement between PhA and %BF assessed by the RJL and InBody analyzers. **METHODS:** Thirty-eight young (18-38 yrs.), hydrated (urine specific gravity  $\leq 1.020$ ) adults (16 men; 22 women) stood for 15 minutes to allow for body water compartment stabilization prior to undergoing PhA and %BF assessment by the InBody. Participants then laid in the supine position for 15 minutes prior to having resistance, reactance, and PhA assessed on the right side of their body via the RJL analyzer. Resistance and reactance values were used in prediction equations provided by the RJL's BC4 software to estimate %BF. Paired samples *t*-tests were used to determine differences in PhA and %BF between the two analyzers. Agreement between the analyzers for assessing PhA and %BF was quantified via Bland-Altman 95% limits-of-agreement (LoA) plots. Acceptable LoA for %BF and PhA were determined to be less than  $\pm 3.5\%$  and  $\pm 1.0^\circ$ , respectively. Cohen's *d* was used to represent effect size, where small = .2; medium = .5; large = .8. Statistical significance was set at  $\alpha < .05$ . **RESULTS:** PhA was significantly greater using the RJL ( $7.15 \pm 0.84^\circ$ ) compared to the InBody ( $6.11 \pm 0.74^\circ$ ),  $p \leq .001$ ;  $d = 2.47$ . The LoA for bias in PhA between devices (RJL - InBody) was  $1.04 \pm .42^\circ$ , indicating poor agreement at the individual level. No significant difference was observed for %BF estimated between the RJL ( $23.0 \pm 6.8\%$ ) and the InBody ( $23.1 \pm 7.4\%$ ),  $p = .813$ ;  $d = .04$ . The LoA for bias in %BF between devices (RJL - InBody) was  $-.09 \pm 2.5\%$ , indicating good agreement at the individual level. **CONCLUSION:** Both analyzers estimated %BF similarly, suggesting they are interchangeable for this purpose. An individual's PhA may be misclassified if measured in the vertical position and compared to supine reference values. Until vertical reference values of PhA are available, caution is urged when interpreting PhA from vertical BIA assessments.

## 15. SWACSM Abstract

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### Alterations in Musculoskeletal Function and Body Composition in Children with Autism Spectrum Disorder

ALVARO LEAL GOMEZ, STEPHANIE S. WANG, JODI F. ENGELHARDT, MONICA C. OROSA, AREUM K. JENSEN

Human Neural Control Laboratory; Department of Kinesiology; San Jose State University; San Jose, CA

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*Category: Masters*

*Advisor / Mentor: Jensen, Areum K. (areum.jensen@sjsu.edu)*

#### ABSTRACT

Autism Spectrum Disorder (ASD) is a neurological disorder characterized by impaired social interaction and atypical behaviors. Children with ASD appear to have lower muscular function and low bone mineral density. Recent studies have indicated that adolescents with ASD develop obesity and bone fracture incidence at a higher rate compared to typically developing children (TDC). However, it is unclear if such weakened musculoskeletal function is a consequence of neurological disorder state in ASD or if it is due to the limited opportunity for physical activity and exercise in the ASD population. **PURPOSE:** To determine whether regional differences in body composition affect muscular strength differently in prepubescent ASD children compared to TDC. **METHODS:** A total of 36 adults, TDC, and children with ASD participated in the study. Muscular strength (i.e., torque, work, and power) during knee extension and flexion was measured at 90, 150, and 210 °/sec in the lower extremity using Humac Norm Isokinetic Dynamometer. Maximal isometric forearm muscular strength was measured using a handgrip dynamometer. Body mass index (BMI), waist-to-hip ratio, and whole-body scan from Dual Energy X-Ray Absorptiometry were used to identify the body composition. **RESULTS:** Compared to control adults, TDC and ASD had lower BMI (19.2±1.1 TDC, 21.7±1.7 ASD vs. 24.7±1.2 Adults, kg/m<sup>2</sup>). Compared to TDC, ASD children had significantly lower bone mass (2.6±.14 ASD vs. 3.0±0.14 TDC, %). Waist-to-hip ratio was higher for ASD (0.89±0.02 ASD vs. 0.83±0.02 TDC, p=0.058). The maximal forearm and leg strength were significantly lower in ASD compared to TDC normalized for their body weight (forearm; 27.9 ±3.4 ASD vs. 40.2 ± 3.4 TDC, kg and leg; 17.0 ±3.9 ASD vs. 27.1 ± 3.5 TDC, p<0.05). ASD group showed a significant inverse relationship with muscular strength and percent fat in the leg while TDC showed no relationship. **CONCLUSION:** These findings suggest that regional differences in body composition appeared to influence muscular strength in children with ASD, not in TDC. Less regional fat and higher bone mass rather than the total body mass may contribute to a higher forearm and leg muscular strength in children with ASD.

Supported by CASA RSCA Infusion, Central RSCA, Multidisciplinary RSCA Stimulus Grant, and Undergraduate Research Grant, SJSU

## 16. SWACSM Abstract

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### Acute Effect of Dietary Supplementation with Grape Seed Extract Attenuates Blood Pressure increase during Cold Pressor Test in Prehypertensive Men

GREENAWALT, S., LIRA, A., MORRISON, K., MENESES, R., LUTZ, C., UHLIR, S., AND J.K., KIM

Exercise Physiology Lab, Department of Kinesiology, California Baptist University, Riverside, CA 92504

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*Category: Masters*

*Advisor / Mentor: Kim, Jong-Kyung (jokim@calbaptist.edu)*

#### ABSTRACT

It is well documented that prehypertension or hypertension is associated with sympathetic overdrive and loss of parasympathetically mediated cardiac variability. Previous studies demonstrated that increased NO bioavailability reduced central sympathetic output. Despite the fact that grape seed extract (GSE) treatment increases the production of NO and improves endothelial function in prehypertensive males, no studies have assessed the effects of GSE on autonomic balance and autonomic function. **PURPOSE:** the aim of the study was to investigate the acute effect of dietary GSE supplementation on heart rate variability (HRV) and cold pressor test (CPT). **METHODS:** Six males were recruited in this study. Each subject received GSE or placebo supplementation with a one-week wash-out period. In a double-blinded, cross-over design, heart rate (HR), stroke volume (SV), cardiac output (CO), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean atrial pressure (MAP), very low frequency (VLF), low frequency (LF), high frequency (HF), LF/HF ratio, and CPT were compared before and 2 hours after GSE or placebo supplementation. **RESULTS:** Our study indicated that dietary supplementation with GSE was likely to decrease resting MAP and MAP responses to CPT at rest compared to the placebo. There were no effects on the HR, SV, CO, SBP, DBP, VLF, LF, HF, LF/HF ratios, and RMSSD after both placebo and GSE supplementation. **CONCLUSION:** This current study suggests that the GSE supplements can be used as a non-pharmacological treatment to reduce blood pressure in prehypertensive males. The chronic effects of GSE supplementation on HRV and CPT needs to be revealed in the future.

## 17. SWACSM Abstract

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### A Case Study Comparison of Lower Extremity Kinematics in Medial Tibial Stress Syndrome

AMANDA HERNÁNDEZ, PATRICIA VAN OOSBREE, KRISTYNE WIEGAND

Movement Sciences Lab; Department of Kinesiology; Whittier College; Whittier, CA

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*Category: Undergraduate*

*Advisor / Mentor: Wiegand, Kristyne (kwiegand@whittier.edu)*

#### ABSTRACT

Medial tibial stress syndrome (MTSS) affects up to 35% of runners. Chronic MTSS can negatively affect performance or lead to a cessation of activity. Though biomechanical variables such as hip internal rotation, tibial abduction, and rearfoot eversion are considered potential risk factors for MTSS, the research is equivocal. **PURPOSE:** Therefore, the purpose of this case analysis is to compare lower extremity kinematics of a D3 middle-distance runner with chronic MTSS vs. a matched uninjured runner. **METHODS:** This case study consists of two female middle-distance runners. Participant one (19 y.o., 1.73 m, 70.3 kg) experienced intermittent MTSS for 4 years. Participant two (20 y.o., 1.70 m, 70 kg) had no history of MTSS. Participants reported to the laboratory for one day of testing. Forty-one retroreflective markers were adhered to the hip, legs, and feet using a modified 6-degrees of freedom model. Participants ran on a treadmill at 3.58 m/s in a lab while eight 3D motion capture cameras collected kinematic data. Marker trajectories were labeled, gap-filled, and smoothed using a low-pass, zero lag Butterworth filter at 10 Hz. Hip, knee, and ankle angles were calculated during stance phase, defined as heel strike to toe-off and identified using a kinematic-only method. Variables of interest include right-limb ROM and peak values of transverse hip kinematics and frontal knee and ankle kinematics. **RESULTS:** The injured participant had less transverse hip ROM (UI: 15.1°, I: 9.6°), and less peak internal rotation (UI: 0.4°, I: 3.0°). At the knee, the injured participant had greater frontal ROM (UI: 6.0°, I: 8.2°) but less peak tibial abduction (UI: 6.6°, I: 5.8°). At the rearfoot, the injured participant had less frontal ROM (UI: 14.5°, I: 6.3°) and less peak eversion (UI: 23.6°, I: 15.2°). **CONCLUSION:** These differences provide additional information regarding potential MTSS risk factors. The athlete with MTSS exhibited less hip internal rotation, which has been indicated as a potential risk factor for MTSS. Other potential factors, including hip abduction and rearfoot eversion, were limited. These results support findings that weak hip stabilizers may contribute to MTSS. Further research should be conducted to better identify biomechanical risk factors for the development of training and rehabilitation programs.

## 18. SWACSM Abstract

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### Depressive Symptoms Related to Domain-Specific Physical Activity

OLA IDUMA & ZACHARY ZENKO

Department of Kinesiology; California State University, Bakersfield; Bakersfield, CA

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*Category: Undergraduate*

*Advisor / Mentor: Zenko, Zachary (zzenko@csb.edu)*

#### ABSTRACT

Physical activity is positively associated with mental health. Exercise interventions have been shown to be effective for reducing depression. However, less is known about the role of domain-specific physical activity in mental health. **PURPOSE:** The purpose of this exploratory study was to examine the relationship between physical activity across domains (domestic/household, transportation-related, occupational, leisure-time) and depressive symptoms. **METHODS:** After obtaining ethical approval, 111 adults (75 men, 35 women, 1 non-binary person; mean age:  $36 \pm 10$  years) completed an online survey. Physical activity in each domain was assessed with the International Physical Activity Questionnaire. Depressive symptoms were assessed with the Center for Epidemiologic Studies Depression Scale (CES-D). **RESULTS:** Depressive symptoms in the sample were fairly low, with 50% of participants scoring less than 14 on the CES-D. Analyses revealed no associations between depressive symptoms and physical activity in any domain ( $ps > .05$ ). **CONCLUSION:** These findings contrast with more recent findings demonstrating that physical activity across domains is associated with fewer depressive symptoms. Possible explanations for the conflicting results include different methods and a less diverse and representative sample in the current exploratory study.

of SPORTS MEDICINE  
Southwest Chapter



## 19. SWACSM Abstract

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### Validity of B-Mode Ultrasound for Body Composition Assessment in the Field

NATE JENSEN, CONNER DEARDEN, BRETT HOLMES, SHANE DRAPER, ANDREW CREER

Applied Human Performance Laboratory; Department of Exercise Science & Outdoor Recreation; Utah Valley University; Orem, UT

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*Category: Undergraduate*

*Advisor / Mentor: Creer, Andrew (andrew.creer@uvu.edu)*

#### ABSTRACT

Air displacement plethysmography (ADP) is a common way to assess athlete body composition in many laboratories. While this method provides accurate values for body composition it is not a feasible option for field work. Identifying an accurate, user friendly alternative to skinfold calipers may allow for accurate assessment of body composition in more applied settings, such as various training and competition venues. **PURPOSE:** To determine the validity of B-mode ultrasound for body composition assessment by comparing this method to values obtained using ADP. **Methods:** To date, 14 actively training runners ( $\geq 4$  hours/week for the last year) have participated in this study. Participants ( $43.5 \pm 7.1$  yrs;  $173.2 \pm 9.0$  cm;  $69.4 \pm 14.1$  kg) include males ( $n=8$ ) and females ( $n=6$ ) that have undergone two forms of body composition assessment during a single lab visit; ADP and B-mode ultrasound (BMUS). ADP body density was estimated using a Bod Pod air displacement chamber (Bod Pod GS, Cosmed) in combination with measured lung volume. BMUS body density was estimated from measuring Jackson-Pollock 7 site skinfolds with a portable, app-based ultrasound device (Lumify, Philips) to determine subcutaneous fat thickness. Images were then analyzed using proprietary software (MuscleSound, Glendale, CO). Body density values for both methods were converted to body fat percentage using the Siri equation. **RESULTS:** A paired t-test was used to compare values obtained from each method ( $P < 0.05$ ). There was no difference between ADP ( $21.7 \pm 6.4\%$ ) and BMUS ( $20.4 \pm 6.3\%$ ) for percent body fat. In addition, data analysis revealed a strong positive correlation ( $R=0.8$ ) for percent body fat obtained from ADP and BMUS methods. **CONCLUSION:** These data suggest BMUS is a valid method for assessing body composition when compared to ADP and therefore may provide a portable, accurate method for assessing body composition in applied settings.

## 20. SWACSM Abstract

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### Angular Impulse of the Whole Body During American Football Long Snapping

JANELLE J. KIM AND TRAVIS J. PETERSON

Exercise Science Department; California Lutheran University; Thousand Oaks, CA

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*Category: Undergraduate*

*Advisor / Mentor: Peterson, Travis (tjpeterson@callutheran.edu)*

#### ABSTRACT

Long snapping is found in American football, and the goal is to have the ball reach the punter as quickly and accurately as possible so they can kick the ball downfield with minimal interference from the opposing team. Little research has been performed on the whole body kinetics of long snapping. **PURPOSE:** To describe the differences in angular impulse between high school and college athletes during the act of long snapping. **METHODS:** This study compared high school long snappers (n=5) and college long snappers (n=5). Whole group average age ( $18.9 \pm 1.3$  years), years of long snapping experience ( $5.1 \pm 1.65$  years), and body mass ( $99.6 \pm 7.5$  kg) were measured. One force plate was located under each foot (Kistler, 1200 Hz), and a left sagittal video (Apple, 30 Hz) was taken. Center of mass (CM) was calculated according to de Leva's body segment parameters (1996). The interval of interest began with a rise in posterior force and ended as posterior force decreased to zero. Sagittal plane resultant force and kinematic data were used to calculate whole body moments about the center of mass. The area under the moment-time curve defined the angular impulse and was normalized by mass. Independent t-tests were used to determine differences between college and high school athletes ( $\alpha = 0.05$ ). **RESULTS:** Angular impulse ( $p=0.98$ , college= $0.019 \pm 0.015$  Nms/kg, high school= $0.018 \pm 0.033$  Nms/kg) and average moment ( $p=0.61$ , college= $113.99 \pm 75.63$  Nm, high school= $133.46 \pm 191.27$  Nm) were similar between groups. Resultant force ( $p = 0.74$ ) as well as the angle between force and position vectors ( $p = 0.65$ ) displayed no difference. However, there were differences in the distance from CM to center of pressure ( $p=0.02$ , college= $0.79 \pm 0.015$  m, high school= $0.84 \pm 0.035$  m), as well as in time ( $p=0.045$ , college= $0.153 \text{ s} \pm 0.026$ , high school= $0.139 \text{ s} \pm 0.026$ ). **CONCLUSION:** The whole body angular impulse observed was positive – rotating the body counterclockwise to throw the ball posteriorly between the legs. There is a difference in how the two groups generated this counterclockwise motion as high school players had longer position vectors but took less time in the push phase compared to college players. Future research analyzing snap performance measures as it relates to long snap kinetics could provide insights into more effective strategies to produce this movement.

## 21. SWACSM Abstract

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### Short-Term Effects of Exercise on Grip and Pinch Strength

KRISTEN D. LANTIS & DEANNA J. SCHMIDT

Biomechanics; Kinesiology; California State University San Marcos; San Marcos, CA

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*Category: Masters*

*Advisor / Mentor: Schmidt, Deanna (djschmidt@csusm.edu)*

#### ABSTRACT

**PURPOSE:** Occupations such as first responders and military may require use of hand and finger muscles after exercise, therefore changes in grip strength (GS) and pinch strength (PS) could affect task performance. While previous studies have shown decreases in GS with load carriage, others have shown increases in GS with other forms of exercise. The purpose of this study is to examine the short-term changes in GS and PS with exercise and load carriage. **METHODS:** Seven participants to date (5 male, 2 female; mean  $\pm$  SD of 25.1  $\pm$  4.5 yrs, 176.9  $\pm$  11.9 cm height; 80.6  $\pm$  15.7 kg mass, 5 right hand dominant) completed three exercise conditions each for 5 minutes: (1) no exercise (2) run with a 9.1 kg weight belt at 3.0 m/s on a treadmill and (3) run with no load at 3.0 m/s on a treadmill. Order of exercise conditions was randomized. Heart rate was measured using a chest strap sensor. GS and PS were assessed using dynamometers pre-exercise and again post-exercise with 3 repetitions on each hand alternating bilaterally. RMANOVA with Bonferroni post-hoc was used to compare among exercise conditions. **RESULTS:** Mean heart rate (HR) was 93 bpm in the no exercise condition, 152 bpm in the unloaded run, and 167 bpm in the loaded run. When measured pre-exercise, GS on the dominant hand was 46.0  $\pm$  14.7 kg and non-dominant hand was 45.0  $\pm$  15.1 kg. There was no statistically significant change in grip or pinch strength among exercise conditions. In the no exercise condition, GS on the dominant hand was 47.6  $\pm$  15.1 kg and non-dominant hand was 47.0  $\pm$  15.1 kg. After the unloaded run, GS on the dominant hand was 46.9  $\pm$  14.6 kg and non-dominant hand was 45.3  $\pm$  14.5 kg. After the loaded run, dominant hand GS averaged 46.6  $\pm$  14.4 kg and non-dominant hand 46.4  $\pm$  13.8 kg. When comparing PS, pre-exercise PS on the dominant hand measured 5.1  $\pm$  1.9 kg and non-dominant hand 5.0  $\pm$  2.4 kg. In the no exercise condition, dominant hand PS was 5.5  $\pm$  2.5 kg and non-dominant hand was 5.0  $\pm$  2.7 kg. After unloaded run PS averaged 5.4  $\pm$  2.3 kg on the dominant hand and 5.1  $\pm$  2.5 kg for non-dominant hand. In the loaded run, PS in the dominant hand was 5.7  $\pm$  2.5 (kg) and non-dominant hand 5.5  $\pm$  3.0 kg. **CONCLUSION:** Grip and pinch strength did not change significantly after exercise. The implication is that hand strength is maintained after short exercise bouts.

## 22. SWACSM Abstract

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### Key Genetic Drivers of Volitional Physical Activity in the Central Nervous System

BRAYDEN K. LEYVA, TIMOTHY M. MOORE, ALEXANDER R. STRUMWASSER, XIA YANG, ALDONS J. LUSIS, & ANDREA L. HEVENER

Hevener Laboratory; David Geffen School of Medicine; University of California, Los Angeles; Los Angeles, CA

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*Category: Masters*

*Advisor / Mentor: Hevener, Andrea (ahevener@mednet.ucla.edu)*

#### ABSTRACT

Previous studies suggest that physical activity is driven by the Central Nervous System (CNS). **PURPOSE:** We determined the central genetic drivers of volitional activity in the CNS and identified several molecular mechanisms promoting improvements in metabolism as a consequence of daily exercise. **METHODS:** Leveraging genetic diversity, we studied 100 strains of sedentary (SED) and exercise-trained (TRN; in cage running wheels) animals of the UCLA hybrid mouse diversity panel (HMDP). Candidate gene identification analysis and single-cell RNA sequencing in three brain regions (hypothalamus, hippocampus, and striatum) were performed. Differential gene analysis was conducted between a cohort of exercise-trained and sedentary C57BL/6J mice using the same exercise training protocol as employed for the exercise HMDP. **RESULTS:** The hypothalamus contained the highest number of candidate genes associated with volitional activity (n=81), followed by the striatum (n=56), and the hippocampus (n=41), with many driver transcripts being shared among all three brain regions. Seventeen distinct cell populations were identified within the hypothalamus, and significant differences in cell-specific transcripts were identified in TRN vs SED mice (FDR<0.05). Interestingly, expression of mt-Rnr2, which encodes the neuroprotective and anti-diabetic mitochondrial peptide *Humanin*, was significantly increased in nearly all cell types. **CONCLUSION:** Volitional activity appears significantly controlled by the genetic architecture of the hypothalamus, striatum, and hippocampus brain regions. Transcript signatures within the various cell types of these brain regions were altered following 30 days of exercise training. Our findings show that the gene encoding the mitochondrial peptide *Humanin* is exercise responsive, induced by exercise training in all three brain regions examined, and is a likely mediator of exercise-induced neuroprotection.

## 23. SWACSM Abstract

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### Do Sex Differences Exist in Critical Power and W'?

JESSICA LINDE, JESSICA COLLINS, OLIVIA LEACH, MEGAN SHERMAN, KIESE MPONGO, JARON, QUIRANTE, & JAYSON GIFFORD

BYU Cardiovascular Lab; Exercise Science; Brigham Young University; Provo, UT

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*Category: Masters*

*Advisor / Mentor: Gifford, Jayson jaysongifford@byu.edu*

#### ABSTRACT

Among world-class athletes, biological males tend to be faster and stronger than biological females, in part due to differences in body composition, such as lower body fat percentage and increased muscle mass. Critical power (CP) represents the highest intensity that elicits compensable and sustainable disturbances to homeostasis, while W' is the amount of work and its associated metabolic disturbance that can be tolerated above CP. Together, CP and W' strongly influence endurance performance. **PURPOSE:** To determine if sex-based differences in CP and W' exist when normalizing for lean muscle mass. **METHODS:** We recruited 20 non-endurance trained individuals (10 female and 10 male, age= ~25.7yrs). VO<sub>2</sub>max was first determined through a graded exercise test on a cycle ergometer. The subjects then performed time to task failure tests at different percentages of their maximum work rate. CP and W' were determined by linear regression of the relationship between time and work for the various tests to task failure. **RESULTS:** Leg lean mass was approximately 37% less in females than males (p<0.001). Critical Power, in Watts, was significantly greater in males than females (168 ± 11 vs. 105 ± 7, P<0.001). When normalizing CP by leg muscle mass, CP was no longer different between males and females (7.87 ± 0.42 vs. 7.69 ± 0.36, P=0.740). Absolute W' was approximately 64% less in females than males (p<0.001). The difference in W' persisted when normalizing for leg lean mass (females: 601 ± 18 J/kg, males: 838 ± 66 J/kg, p=0.006). **CONCLUSION:** Absolute CP and W' are lower in biological females than males. Sex differences in CP, but not W', appear to be mediated by differences in muscle mass. Even when normalizing for differences in muscle mass, females exhibit a lower W' than males, indicating that biological females tolerate less disturbance to homeostasis than biological males.

## 24. SWACSM Abstract

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### Cardiorespiratory Fitness Level Alters Blood Pressure Responses Induced by Histamine H1- and H2-receptor Blockade During Dynamic Exercise

LIRA, A., LIRAZAN, D., MENESES, R., YUN, S.J., AND J.K., KIM

Exercise Physiology Lab, Department of Kinesiology, California Baptist University, Riverside, CA 92504

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*Category: Masters*

*Advisor / Mentor: Kim, Jong-Kyung (jokim@calbaptist.edu)*

#### ABSTRACT

Epidemiological studies have reported that greater cardiorespiratory fitness (CRF) is associated with lower blood pressure (BP). Histamine receptor-mediated peripheral vasodilation contributes to postexercise hypotension and lowering exercising BP responses. Previously, our laboratory found that overactive BP responses to exercise were induced by the inability of histamine receptors in individuals with prehypertension. However, it is still unknown that CRF can impact BP responses elicited by the inability of the receptors. **PURPOSE:** This study was to assess whether aerobic fitness is effective in lowering excessive BP responses induced by the blockade of histamine receptors. **METHODS:** In twelve male and female subjects (6 high CRF and 6 low CRF), we examined the effects of histamine H<sub>1</sub>- and H<sub>2</sub>- receptor blockades on heart rate (HR), stroke volume (SV), cardiac output (CO), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and total peripheral resistance (TPR) at workloads corresponding to 40% and 60% workloads of VO<sub>2peak</sub> during cycling exercise. **RESULTS:** Our study indicated that compared to the high CRF group, changes in MAP from the baselines were higher in the low CRF group before the blockade at each workload (40%: D14±2 vs. 8±1 mmHg; 60%: D21±3 vs. 15±2 mmHg). The changes in MAP in response to the blockade during exercise were substantially lower in the high CRF group (40%: D18±2 vs. 11±1 mmHg; 60%: D29±3 vs. 19±2 mmHg). **CONCLUSION:** Our study suggests that an improvement in CRF likely reduces exaggerated BP responses elicited due to the inability of histamine receptors in pathological conditions such as prehypertension and hypertension.

## 25. SWACSM Abstract

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### Rare Case of Simultaneous Thoracic Outlet Syndrome and Musculocutaneous Neuropathy in a Baseball Pitcher

STEVEN C. LIU, KENNETH VITALE, FACSM

Department of Orthopedic Surgery; University of California, San Diego; San Diego, CA

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*Category: Professional*

#### ABSTRACT

**Introduction:** The thoracic outlet is bounded by the clavicle, first rib, and muscles of the scalene triangle. When a compression within the outlet occurs, it presents as thoracic outlet syndrome (TOS). TOS typically develops from the combination of developmental abnormalities, injuries, and physical activities that cause compression of the brachial plexus neurovasculature. This classically manifests as sensory and motor symptoms involving lower trunk (C8-T1) dermatomes and myotomes. The upper trunk and associated peripheral nerves, including musculocutaneous, are typically spared. **Case Description:** A 22 y.o. male with a history of ulnar collateral ligament reconstruction and right elbow ulnar decompression a year prior presented for follow up with persistent shoulder soreness. He was collegiate pitcher and after 18 months post op, he started to experience vague anterior shoulder/upper arm pain and numbness down the arm. He had some difficulty localizing the symptoms. He was clinically diagnosed with TOS and initial recommendations included physical therapy, changing pitching biomechanics, pitch count limits and an interval throwing program. **Clinical course:** His symptoms progressed however and he developed worsening paresthesias. He was now able to endorse both medial and lateral forearm symptoms, and later some weakness in the biceps with weightlifting. Electromyography testing was consistent with brachial plexopathy (TOS) but also showed a superimposed musculocutaneous neuropathy. He was treated more aggressively with activity modification and therapy, along with education and counseling regarding TOS and musculocutaneous neuropathy. His musculocutaneous neuropathy symptoms improved, but TOS symptoms continued. At last follow-up he returned to pitching but was considering consultation with a TOS surgeon. **Conclusions:** When diagnosed, TOS typically should involve sensory changes in the medial arm and motor changes of C8-T1 innervated muscles. Isolated musculocutaneous neuropathy can cause vague shoulder and arm symptoms and may be difficult to diagnose clinically in absence of biceps weakness. This case highlights the rarity of musculocutaneous neuropathy superimposed on TOS and the importance of dermatome and myotome clinical correlations as it relates to the brachial plexus.

## 26. SWACSM Abstract

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### Fit (and Healthy) for Duty: Lipid Profiles and Fitness Relationships from Police Officers in a Health and Wellness Program

ROBERT G. LOCKIE, PH.D.<sup>1</sup>, ROBIN M. ORR, PH.D.<sup>2</sup>, J. JAY DAWES, PH.D.<sup>3</sup>.

<sup>1</sup>CENTER FOR SPORT PERFORMANCE; DEPARTMENT OF KINESIOLOGY; CALIFORNIA STATE UNIVERSITY, FULLERTON; FULLERTON, CA, USA; <sup>2</sup>TACTICAL RESEARCH UNIT; BOND UNIVERSITY; ROBINA, QLD, AUSTRALIA; <sup>3</sup>TACTICAL FITNESS AND NUTRITION LAB; SCHOOL OF KINESIOLOGY, APPLIED HEALTH AND RECREATION; OKLAHOMA STATE UNIVERSITY, STILLWATER, OK, USA

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*Category: Professional*

#### ABSTRACT

Police work can place officers at risk of cardiovascular disease (CVD). Sedentary activities, stress, shift work, sleep loss, reduced physical activity, and poor dietary choices contribute to this risk. Lipid profiles (total cholesterol, low-density lipoproteins [LDL], high-density lipoproteins [HDL], triglycerides) can indicate CVD risk. **PURPOSE:** To detail the lipid profiles of police officers from a health and wellness program in 2018-2019, and correlate lipid profiles with fitness. **METHODS:** Archival data for officers from 2 years of the program were analyzed (2018: 169 males, 39 females; 2019: 194 males, 43 females). Bloodwork (total cholesterol, LDL, HDL, triglycerides) was collected in a fasted or non-fasted state at the selection of the officer. Fitness data included estimated maximal aerobic capacity ( $\dot{V}O_{2max}$ ); sit-and-reach; push-ups; vertical jump; grip strength; sit-ups; and absolute and relative 1RM bench press. Data were analyzed by year, and lipid profiles were categorized from national standards. Partial correlations controlling for sex and age derived relationships between lipid profiles and fitness ( $p < 0.05$ ). **RESULTS:** Across both years, 68-76% of officers had desirable total cholesterol ( $< 200\text{mg/dL}$ ) and HDL ( $\geq 60\text{mg/dL}$ ); 67-72% of officers had desirable triglycerides ( $< 150\text{mg/dL}$ ). However, 54-62% of officers had LDL above desirable ( $\geq 100\text{mg/dL}$ ); 13-14% of officers had mildly high triglycerides (150-199mg/dL); 16-18% had high triglycerides (200-499mg/dL). In 2018, HDL correlated with  $\dot{V}O_{2max}$  ( $r=0.23$ ) and sit-ups ( $r=0.18$ ); triglycerides related to sit-ups ( $r=-0.20$ ). In 2019, HDL correlated with  $\dot{V}O_{2max}$  ( $r=0.20$ ). **CONCLUSIONS:** Most officers had good lipid profiles relative to CVD risk. As the program was voluntary, results could be due to healthy worker effect. There were officers who had poorer lipid profiles who would benefit from continued program participation, validating the importance of such programming within departments. Higher  $\dot{V}O_{2max}$  and more sit-ups related to higher HDL, which is preferable. In 2018, lower triglycerides related to higher sit-ups. However, the correlation strengths were low, and there were no other significant relationships. This could indicate the need for a multifaceted approach to reducing CVD risk in officers (fitness, diet, wellness education).

## 27. SWACSM Abstract

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### Local Skin Temperature and Local Sweat Rate

GARY W MACK<sup>1,2</sup> AND JIM D. COTTER<sup>2</sup>

<sup>1</sup>Department of Exercise Sciences, Brigham Young University, Provo, Utah and <sup>2</sup>School of Physical Education, Sport & Exercise Sciences, University of Otago; Dunedin, New Zealand

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*Category: Professional*

#### ABSTRACT

Local skin temperature may be a modulator of sweat gland function but the mechanism is unclear. **PURPOSE:** To examine the role of local skin temperature in modulating local sweating rate (LSR) using a model of sweat gland activation that produces a moderate, physiologically based sweating response. **METHODS:** Each subject (n=15) was instrumented with 7 skin temperature probes ( $\bar{T}_{skin}$ ), an esophageal probe ( $T_{core}$ ), and a sweat rate capsule (dorsal forearm). A LSR was produced by 30 s of intradermal electrical stimulation (5 mA, 0.2 to 64 Hz) that resulted in release of ACh from the sudomotor nerve and produced a transient sweating response lasting 60 to 90 s. To modify local skin temperature the subjects sat in an environmental chamber for 60 min at three different ambient temperatures ( $T_a$ ): 21, 27, and 34 °C, on the same day without moving the sweat capsule. Subjects acclimated to the chamber temperature for 45 min prior to producing the LSR. The LSR was quantified as the area-under the sweat rate-time curve (LSR AUC, normalized to peak LSR AUC at 21°C) and curve fit using a four parameter logistic model. **RESULTS:** Local skin temperature averaged  $29.3 \pm 1.2$ ,  $31.3 \pm 0.8$ , and  $34.6 \pm 0.8$ °C, baseline sweat rate (SR) averaged  $0.127 \pm 0.05$ ,  $0.142 \pm 0.065$ , and  $0.124 \pm 0.083$  mg • min<sup>-1</sup> • cm<sup>-2</sup> and  $T_{core}$  averaged  $37.1 \pm 0.7$ ,  $36.8 \pm 0.6$ , and  $36.6 \pm 0.5$ °C at 21, 27, and 34°C  $T_a$ , respectively. Comparison of the models indicated that the both the plateau LSR AUCX and the EC<sub>50</sub> at 21, 27 and 34°C were not the same (p=0.0022). The onset of sweating occurred sooner at 34°C ( $4.6 \pm 2$  s) than at 21°C ( $7.3 \pm 3.0$  s) or 27°C ( $6.1 \pm 2.0$  s) and was linearly related to local skin temperature (p = 0.0002). Finally, the increase in sweating rate at 34°C ( $0.032 \pm 0.027$  ΔSR•s<sup>-1</sup>) was also faster than at 21 or 27°C (p<0.05). **CONCLUSION:** The observed change in the stimulus-response characteristics of the LSR induced by intradermal electrical stimulation (decreased EC<sub>50</sub> and increased plateau LSR AUC) supports the hypothesis that an increased local skin temperature improves the sweat gland responsiveness to ACh released by the sudomotor nerve during intradermal electrical stimulation.

## 28. SWACSM Abstract

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### Effect of Exercise in Sync with Circadian Preference on Migraine Load in Migraineurs

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ELIAS M. MALEK, JAMES W. NAVALTA, FACSM, GRAHAM R. MCGINNIS

Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV

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*Category: Masters*

*Advisor: McGinnis, Graham (graham.mcginnis@unlv.edu)*

#### ABSTRACT

Migraines are the most common cause of chronic pain. Effective, non-pharmacological strategies to reduce migraine load are needed. Exercise is an effective strategy, but it is unclear how exercise timing and temporal preference (chronotype) factors modulate the laudatory effects of exercise. **Purpose:** The purpose of this study was to determine the effects of exercising in-sync or out-of-sync with one's chronotype on migraine load. **Methods:** Participants were 7 sedentary individuals who experienced migraines 8+ times per month (age =  $34 \pm 11$  yrs,  $167 \pm 8$  cm,  $99 \pm 26$  kg). Participants were categorized into morning- or evening-types based on the Morning/Eveningness Questionnaire (MEQ). Exercise consisted of 1 month of self-selected exercise in the morning and 1 month in the evening, 3 x per week of 30-min/session at 60-70% of estimated HRmax. In-sync (IS) refers to a morning-type exercising in the morning and an evening-type exercising in the evening. Out-of-sync (OOS) refers to a morning-type exercising in the evening and vice-versa. Before and after each month of exercise, participants completed questionnaires (Headache Impact Test [HIT-6], Migraine Disability Assessment Test [MIDAS]). We analyzed the data using a 2 (in sync, out of sync) x 2 (pre, post) repeated measures ANOVA with significance accepted at  $p < 0.05$ . **Results:** We observed a trend towards an interaction effect in HIT-6 scores suggesting IS exercise produced a decrease in HIT-6 scores while no reduction was seen in OOS exercise ( $p = 0.11$ ). The the number of migraine days experienced tended to increase in the month exercise was performed OOS ( $p = 0.12$ ), and this is reflected in increasing MIDAS scores obtained OOS ( $p = 0.63$ ). **Conclusion:** While no statistical changes were observed, trends in the data show that prescribing exercise in sync with migraineurs chronotype may be an accessible, non-pharmacological option to decreasing migraine load.

## 29. SWACSM Abstract

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### The Effect of the Short Foot Exercise on the Knee during Landing

JACOB MAYORAL, CONNOR OWEN, DANIEL METRI, ANDY ARANT, DANE JOHNSON, ROBERT DUDLEY, & ANDREA DU BOIS

APU Biomechanics Lab; Department of Kinesiology; Azusa Pacific University; Azusa, CA

*Category: Undergraduate*

*Advisor / Mentor: Du Bois, Andrea (adubois@apu.edu)*

#### ABSTRACT

Intrinsic foot muscles play an important role in the stabilization of the foot and assist with pronation of the foot. Excessive eversion, a component of pronation, may carry up the kinetic chain to impact the knee's frontal plane position, increasing the chance of a knee injury. Runners who go on to sustain injuries have a greater peak knee abduction moment during running than those without injury. Regular short foot exercise (SFE) strengthens the intrinsic foot muscles, which over time could help improve foot posture and mechanics up the kinetic chain. It is unclear if a single bout of SFE can change mechanics or reduce injurious movement patterns. **PURPOSE:** The purpose of this study was to study the effects of acute bouts of the SFE on knee adduction moments during a drop vertical jump (DVJ) landing. **METHODS:** Ten participants (6 male; 24.9±1.19 yr) were asked to do three DVJs (PRE) from an 18-inch box. They then completed the SFE bilaterally for two sets of 30 repetitions, both seated and standing followed by three DVJs (POST). Kinetic data was sampled at 1000 Hz with dual AMTI force platforms (Newton, MA); and the kinematics were sampled at 100 Hz with 14-camera motion capture system (Qualysis, Sweden). External moments were calculated via standard inverse dynamics using Visual 3D software (C-motion Inc, Rockville, MD). Peak external knee abduction moment (KABD) normalized to body mass was used for analysis. **RESULTS:** Paired-t tests showed that there was no effect of SFE on the right KABD (PRE: 0.29 ± 0.13 Nm/kg; POST: 0.28 ± 0.14 Nm/kg; p=0.432; d=0.26); however, there was trend towards a decrease in the left KABD with a moderate effect size (PRE: 0.30 ± 0.17 Nm/kg; POST: 0.25 ± 0.14 Nm/kg; p=0.051; d=0.76). **CONCLUSION:** In a healthy population, the SFE has little to no effect on the KABD. There was a small decrease in the left KABD in these individuals indicating that in a population with poor mechanics, SFE might be an effective intervention.

### 30. SWACSM Abstract

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## Uphill, Level, and Downhill Running in a New Style of Road-Racing Shoe

H. MCWILLIAMS, C. BRADSHAW, A.R. MCLEOD, J.E. WARD, T. STANDIFIRD, & I. HUNTER

Running Mechanics Lab; Exercise Science; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Hunter, Iain (iain\_hunter@byu.edu)*

#### ABSTRACT

Recent changes in road-racing shoe construction has prompted research comparing the metabolic benefit of new shoe constructions compared to older styles. Kinematic and kinetic changes with uphill and downhill running may affect the magnitude of benefit for this new style of racing shoe. **PURPOSE:** Due to the changes associated with downhill running, we hypothesize that new performance racing shoes will have a greater metabolic benefit when running downhill, than with level or uphill running. **METHODS:** Eighteen subjects (10 men and 8 women) ran on two separate days with shoe order reversed. They wore either the Saucony Type A (control shoe) or Saucony Endorphin Pro (treatment shoe) while running either uphill (4% grade), level, or downhill (-4% grade) in random order. Then, they switched to the other shoe and ran the various grades again. Treadmill speeds were adjusted to produce similar metabolic costs whether running uphill, level, or downhill. Efforts were relatively low for the caliber of subjects recruited. Oxygen uptake was recorded for the final 3 minutes of each 5-minute run at each grade. A linear model was used to determine the effect of the Endorphin shoe and grade on metabolic cost. **RESULTS:** The Endorphin shoe was effective in reducing metabolic cost compared with the Type A. However, the benefit was equal across grade conditions. Contrary to our expectations, the Endorphin shoe did not provide a greater benefit to metabolic cost during downhill running and a smaller benefit when running uphill compared with level running. We anticipated the downhill condition would show a greater metabolic benefit while wearing the Endorphin shoe. The Endorphin Pro shoe does provide an overall metabolic benefit when compared with the Type A shoe. **CONCLUSION:** The new style of marathon footwear seems to be effective. The lack of difference between the benefits of uphill, level, and downhill running show the current design of racing shoes works well across a range of grades. The main benefits seem to come from the foam, but the increases in bending stiffness and changes in shape of the shoe may also have room for improvement.

## 31. SWACSM Abstract

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### Macrophage Response to Damage in Old and Young Skeletal Muscle

MEHLING, JACK, AHMADI, MOHADESH, HYLDAHL, ROBERT D.

Department of Exercise Sciences; Brigham Young University; Provo, UT

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*Category: Undergraduate*

*Advisor / Mentor: Hyldahl, Robert (robhyldahl@gmail.com)*

#### ABSTRACT

**PURPOSE:** In skeletal muscle, macrophages migrate to damaged fibers, influencing the inflammatory response during muscle regeneration. Macrophages experience polarization, exhibiting different phenotypes described as M1 (pro-inflammatory) and M2 (anti-inflammatory.) Failure to properly transition between phenotypes inhibits fiber regeneration. Previous animal literature suggests that dysregulated macrophage polarization may contribute to the decreased regenerative capacity of aging muscle. The purpose of this study is to quantify macrophage response and polarization in a model of muscle damage and regeneration in older humans. We hypothesized that older people would have a higher percentage of M2 macrophages relative to the young. **METHODS:** Seven young ( $25 \pm 3$  y) and nineteen elderly ( $67 \pm 4$  y) male subjects were recruited for participation in the study. Muscle damage and regeneration events were initiated in one leg by electrically induced maximal eccentric contractions. Muscle biopsies were collected from the electrically stimulated leg pre and 9 days post stimulation. Biopsy samples were prepared for histological analysis and stained by immunohistochemistry to visualize macrophage content. Anti-CD68 antibodies were used as a panmacrophage marker, while an anti-CD206 antibody was used to identify M2 macrophage. **RESULTS:** Both groups (young and elderly) demonstrated an increase in the number of damaged fibers following the protocol ( $p=.0006$ ), but no significant effect of age was observed (add P). The total number of CD68+ cells increased post intervention ( $p<.0001$ ), and was higher in the young age group ( $p=.045$ ). Additionally, there was a significant age x time interaction with total CD68+ increasing more in the young group post damage ( $p=.048$ ). CD206+ cells were quantified as a percentage of total macrophage content. Overall there was a higher proportion of CD206+ macrophages in the elderly group both pre and post damage ( $p<.0001$ ). There was no significant age x time interaction (add P). **CONCLUSION:** These data demonstrate that the protocol was successful in eliciting similar muscular damage in both age groups. Damage in young muscle elicits a greater macrophage response post damage. A higher proportion of macrophages present in older muscle tissue exhibit an M2 phenotype.

## 32. SWACSM Abstract

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### Effects of Short Foot Exercise on Ankle Eversion Velocity

DANIEL METRI, JACOB MAYORAL, CONNOR OWEN, ANDY ARANT, DANE JOHNSON, ROBERT DUDLEY, & ANDREA DU BOIS

APU Biomechanics Lab; Department of Kinesiology; Azusa Pacific University; Azusa, CA

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*Category: Undergraduate*

*Advisor / Mentor: Du Bois, Andrea (adubois@apu.edu)*

#### ABSTRACT

The biomechanical position of the foot while landing plays a major role in performance and injury. A common issue of landing is excessive foot pronation and subsequently ankle eversion. This biomechanical position can result in knee abduction, increasing the chance of knee injury. The velocity at which the ankle everts may also be a component of injury as long distance runners that became injured had higher ankle eversion velocity in their landing strides while running. Short foot exercise (SFE) strengthens the intrinsic muscles of the foot and help stabilize the arch which assists in eccentrically controlling pronation. However, acute effects of SFE are unknown. **PURPOSE:** The purpose of the study was to examine if an acute bout of SFE utilized as a warm up before jumping would have an impact on ankle eversion velocity while landing. **METHODS:** Ten healthy participants (6 male;  $24.9 \pm 1.91$  y) underwent vertical drop jumps (DJ) from an 18-inch box. The test began with three DJ trials (PRE) and were followed by SFE. The SFE involved contractions of 5 seconds and were performed with two sets of 30 repetitions on both feet both in sitting and standing. The participants then performed three more DJ tests (POST). Kinematics were collected at 100 Hz with a 14-camera motion system. Marker position data to calculate joint velocity as motion in the distal segment relative to proximal. Peak frontal plane ankle eversion velocity (EV) during landing was used for analysis. **RESULTS:** There was no effect of SFE on right EV (PRE:  $-119.32 \pm 37.10$  °/s; POST:  $-104.40 \pm 39.32$  °/s;  $p=0.202$ ,  $d=0.435$ ) or left EV (PRE=  $-129.93 \pm 56.17$  °/s; POST=  $-135.43 \pm 66.41$  °/s;  $p=0.697$ ;  $d=0.127$ ). **CONCLUSION:** Performing acute SFE had no effect on ankle eversion velocity during the landing of the participants. It may be beneficial to examine single leg activity to increase demands. Additionally, participants were healthy and demonstrated proper mechanics, thus limiting the ability to induce a change.

### 33. SWACSM Abstract

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#### Comparison of Flights Climbed Between Garmin and Fitbit Devices

JAVEN MIGUEL<sup>1</sup>, ALAN V. GARCIA<sup>1</sup>, MELISSA G. STREHLOW<sup>1</sup>, DUSTIN W. DAVIS<sup>1</sup>, JEFF MONTES<sup>2</sup>, JAMES W. NAVALTA<sup>1</sup>, FACSM

<sup>1</sup>Exercise Physiology Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV; <sup>2</sup>Department of Kinesiology, Monmouth College, Monmouth, IL

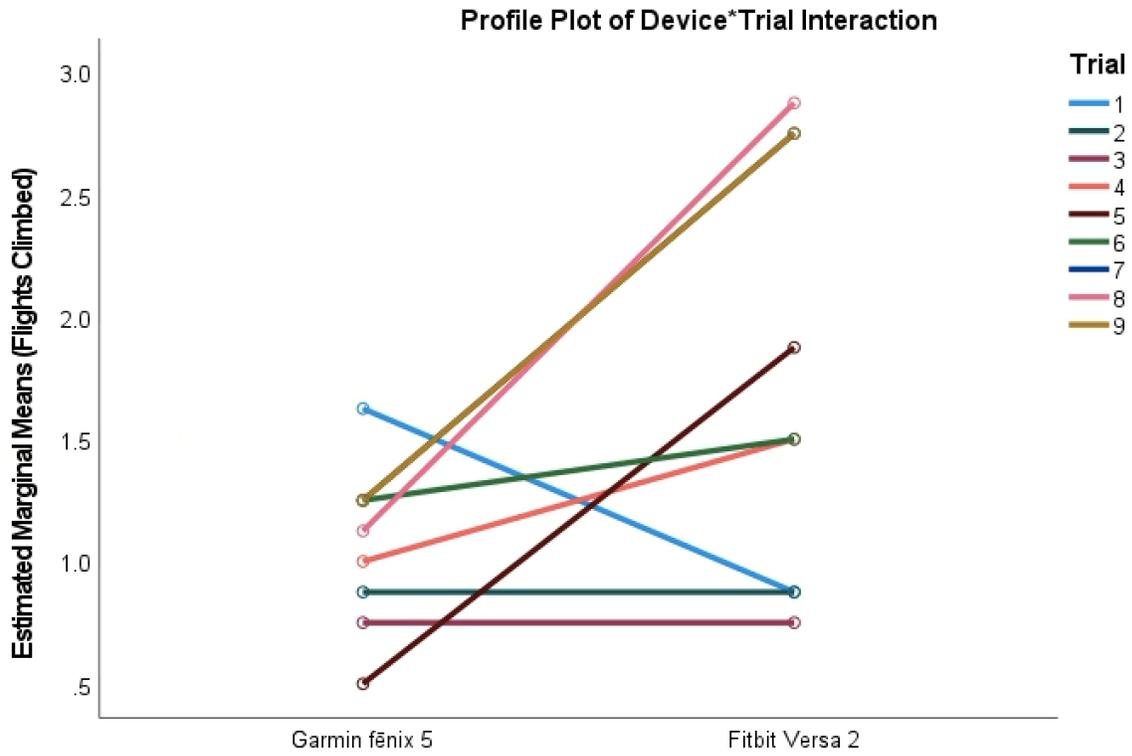
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*Category: Undergraduate*

*Advisor / Mentor: Navalta, James (james.navalta@unlv.edu)*

#### ABSTRACT

With exercise device technology and consumer interest in the field growing, it is important for users to be confident that their wearable fitness devices accurately track their flights climbed. Two manufacturers of devices that track flights climbed are Garmin and Fitbit. Comparing the measurements of flights climbed between devices from these two manufacturers is important to inform consumers as they decide which device to purchase for flight-related activities. **PURPOSE:** The purpose of this study was to compare the measurements of flights climbed between the Garmin fēnix 5 and Fitbit Versa 2. **METHODS:** Eight participants (6M, 2F, 29 ± 8 yrs, 178 ± 8 cm, 79 ± 15 kg) were tested individually, and the fēnix 5 and Versa 2 were assigned randomly to be worn on separate wrists. The participants climbed one, two, and three flights of stairs (19, 39, and 59 steps, respectively, as per manual counts) at a pace of 50, 75, and 100 steps per minute (spm; total trials = 9). Each device's display of flights climbed was recorded at the beginning and end of each trial to calculate the difference (i.e., the flights climbed per trial). A 2x9 repeated-measures (RM) ANOVA determined whether measurements of flights climbed were significantly different between the fēnix 5 and Versa 2 during each trial: 2x9 = device: 1) fēnix 5, 2) Versa 2 x trial: 1) 1 flight 50 spm, 2) 1 flight 75 spm, 3) 1 flight 100 spm, 4) 2 flights 50 spm, 5) 2 flights 75 spm, 6) 2 flights 100 spm, 8) 3 flights 50 spm, 3 flights 75 spm, 9) 3 flights 100 spm). The  $\alpha$ -level was 0.05 for the RM ANOVA and 0.006 for the post-hoc paired t-tests (adjustment = 0.05/9 comparisons). **RESULTS:** The device\*trial interaction effect was significant;  $F_{(8, 56)} = 4.273$ ,  $p < 0.001$ ,  $\eta^2 < 0.379$  (large effect). Before adjusting the  $\alpha$ -level, flights climbed significantly differed between the devices in the following trials: 2 flights 75 spm ( $p = 0.045$ ), 3 flights 50 spm ( $p = 0.009$ ), 3 flights 75 spm ( $p = 0.006$ ), and 3 flights 100 spm ( $p = 0.026$ ). In every significant comparison, the fēnix 5 reported a lower mean number of flights climbed than the Versa 2. However, after adjusting the  $\alpha$ -level, flights climbed did not significantly differ between the devices for any trials (all  $\geq 0.006$ ). **CONCLUSION:** Depending on the speed of ascent and number of flights actually climbed, the fēnix 5 and Versa 2 may not provide the same number of flights.



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### 34. SWACSM Abstract

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## A Comparison of High-intensity Interval and Moderate Intensity Continuous Training on Glucose Regulation in Sedentary, Obese Individuals

SOPHIA R. MIRTH, BRANDON J. SAWYER, DHARINI M. BHAMMAR, & GLENN A. GAESSER

Laboratory Name; Healthy Lifestyles Research Center, Arizona State University

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*Category: Undergraduate*

*Advisor / Mentor: Sawyer, Brandon (bsawyer@pointloma.edu)*

### ABSTRACT

It is well known that exercise is beneficial in the prevention of type 2 diabetes (T2D) but the ideal type of training is not clear. **PURPOSE:** To compare the effects of high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) on blood glucose regulation in sedentary, obese adults. **METHODS:** 22 sedentary, obese individuals were randomized into either HIIT or MICT. Each group exercised on a cycle ergometer 3 times/wk for 8 wks. The HIIT group performed 10, 1 min intervals at 90-95% HR<sub>max</sub> with 1 min rest intervals in between. The MICT group performed 30 min of continuous work at 70-75% HR<sub>max</sub>. Pre- and post-intervention testing consisted of 24-hour continuous glucose monitoring (CGM), VO<sub>2max</sub>, and anthropometric measurements. Glucose variability was calculated by multiple methods. Linear mixed models and 2-way ANOVA were used to measure differences between groups over time in the CGM values and glucose variability measures. **RESULTS:** Fifteen subjects finished the study, (8 = HIIT; 7 = MICT). There was a significant increase in VO<sub>2max</sub> (P = 0.01) and decrease in body fat percentage (P < 0.01) but no group x time interactions. There were no significant changes in variability measures, but a significant group x time interaction was found with the mixed models in blood glucose showing a greater effect of HIIT (P = 0.002). When the two-way ANOVA was run including only subjects with a baseline average 24-hour glucose level above 100 mg/dL (HIIT = 5; MICT = 4), there were significant differences (p < 0.05) found between pre-training and post-training, but not between training groups in the variability measurements (CONGA, J-Index, HBGI, M Value). In this same subset of subjects the mixed model analysis showed a significant group x time interaction for glucose demonstrating that HIIT improved glycemic control more than MICT (P < 0.001). **CONCLUSION:** Both HIIT and MICT can improve glycemic control with a potentially more powerful effect in response to HIIT in individuals with a higher 24-hour average blood glucose. This implies that HIIT may provide a time-efficient way to reduce glycemic control and slow the progression of disease especially in individuals who are farther along in the progression of type 2 diabetes.

## 35. SWACSM Abstract

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### Changes in Vertical Reaction Force During Treadmill High-Intensity Interval Training

JARED MOORE, GARRY CAI, & GEORGE SALEM, FACSM

Musculoskeletal Biomechanics Research Laboratory; Division of Biokinesiology & Physical Therapy; University of Southern California; Los Angeles, CA

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*Category: Doctoral*

*Advisor / Mentor: Salem, George (gsalem@pt.usc.edu)*

#### ABSTRACT

High-intensity interval training (HIIT) has become a popular form of exercise due to its low time burden and easily customized protocols. To date, there has been no investigation into how lower extremity loading (ie. GRF) changes over time during a HIIT protocol. Examining this load variability can help inform protocol development for different populations. **PURPOSE:** The purpose of this pilot study was to examine how the vertical reaction force (vRF) changes during a HIIT running protocol in order to elucidate how working at high intensity for 4min periods can influence subsequent lower extremity loading. **METHODS:** Three participants (26±3y) performed a 4x4 HIIT protocol on a treadmill with four 4min high-intensity active periods at 85-95% heart rate maximum (HRmax), each followed by 3min active recovery at 60-70% HRmax. HRmax was determined using an incremental protocol on a treadmill and used to determine treadmill speeds to elicit the required HR zones. The treadmill speeds obtained from the HRmax test were used to create customized, individual HIIT protocols. vRF was measured using Moticon shoe insoles sampled at 50Hz and normalized to body weight. Results are presented as mean±SD. **RESULTS:** vRF increased with each consecutive active period from 2.3±0.2 to 2.6±0.2 [BW] per step in the final active period. There were no adverse events. **CONCLUSION:** Lower extremity loading in the vertical direction increased as the HIIT protocol progressed. This has implications when deciding on the length of active high-intensity periods during HIIT protocol development. A future aim of this project is to include kinematic measures to assess changes in joint angles that occur with these increases in vRF. A limitation of this study is that the shoe insoles only measure vRF. Future studies should consider an instrumented treadmill to measure anterior-posterior and mediolateral reaction forces.

## 36. SWACSM Abstract

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### The Impact of Anterior Cruciate Ligament Injury Risk on Baseline Balance Assessment for Concussion in Collegiate Athletes

RYAN N. MORAN, & NICHOLAS G. MURRAY

Athletic Training Research Laboratory; Department of Health Science; The University of Alabama; Tuscaloosa, AL; Neuromechanics Laboratory; School of Community Health Sciences, University of Nevada, Reno; Reno, NV

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*Category: Professional*

#### ABSTRACT

**PURPOSE:** Recent literature has linked concussion and neuromuscular deficits in the lower extremity after injury. Neuromuscular control is frequently assessed using balance measures for concussion, but also dynamically to identify anterior cruciate ligament injury (ACL) risk via jump-landing movement screening. The purpose of this study was to examine the impact of ACL injury risk on baseline balance assessment for concussion. **METHODS:** Thirty-nine healthy, collegiate female soccer (n=22) and volleyball (n=17) athletes completed the modified-Clinical Test of Sensory Interaction of Balance (m-CTSIB) and the Landing Error Scoring System (LESS) test as part of routine concussion baseline testing and injury prevention screening, in a counterbalanced manner. Measures consisted of total m-CTSIB sway index scores on individual conditions (firm surface eyes open [condition 1] and eyes closed [condition 2], foam surface eyes open [condition 3] and eyes closed [condition 4]), m-CTSIB overall sway index composite score, and total LESS errors, with higher scores indicating worse performance on both tools. LESS scores were categorized into a low (0-4 errors; N=21) and high (5+ errors; N=18) risk. A series of Mann-Whitney *U* test were performed to determine differences between low and high LESS performance on m-CTSIB conditions and overall performance. **RESULTS:** There were no differences between the low and high risk LESS groups on sway index scores on conditions 1 ( $U = 158.5, p = 0.39$ ), 2 ( $U = 156.0, p = 0.36$ ), 3 ( $U = 165.5, p=0.51$ ), or 4 ( $U = 128.5, p= 0.08$ ), as well as overall m-CTSIB scores ( $U = 150.5, p = 0.28$ ). **CONCLUSION:** Athletes who may be more at risk for ACL injury due to abnormal jump-landing biomechanics, do not differ from low-risk athletes on baseline balance assessment. Postural stability may assess and comprise of different pathways of neurological function in the lower extremity than a jump-landing task.

## 37. SWACSM Abstract

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### Anthropometric Predictors of Arterial Stiffness When Adjusting for Fitness in College-Aged Adults

RILEY MORTON, KYLI ALVAREZ, MALIA NOWLEN, ESTEPHANIA CAMPA, ZACHARY ZEIGLER

College of Science, Engineering, and Technology; Grand Canyon University; AZ

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#### ABSTRACT

**PURPOSE:** Cardiovascular Disease (CVD) is the largest cause of non-communicable disease death worldwide. Arterial stiffness is an independent predictor of CVD. Body mass index (BMI), waist circumference (WC), and waist-to-hip ratio predict arterial stiffness. However, there is inconstancy in the literature as to which is the best predictor of arterial stiffness. Measured cardiovascular fitness is also an independent predictor of arterial stiffness and is rarely controlled for in epidemiological studies. The purpose of this study was to identify the superior anthropometric predictor of arterial stiffness after controlling for measured fitness. **METHODS:** Healthy young adults were recruited from Grand Canyon University. Subjects came to the lab for one visit and had anthropometric measures of height, weight, WC, and hip circumference measured. Additionally, aortic blood pressure (BP), augmentation pressure (AP), augmentation index adjusted at a heartrate of 75 (Aix@75), carotid-femoral pulse wave velocity (cfPWV), and a  $VO_{2peak}$  test were completed. **RESULTS:** 210 participants aged  $20.8 \pm 3.1$  yr with a BMI of  $25.3 \pm 3.8$   $kg/m^2$  and a  $VO_{2peak}$  of  $36.2 \pm 8.6$   $mL.kg^{-1}min^{-1}$  completed this study. Hierarchical regression analysis was run with age, gender, and  $VO_{2peak}$  entered into the first block, and the anthropometric variables entered into the second block. The addition of BMI significantly explained 4.2% ( $p = 0.03$ ) more variance in predicting central SBP and 6% ( $p = 0.001$ ) more variance when explaining cfPWV. The addition of WC significantly explained 2.5% ( $p = 0.001$ ) more variance in central systolic BP and 5% more variance in cfPWV ( $p = 0.002$ ). The addition of waist-to-hip ratio explained 4.8% more variance in predicting cfPWV ( $p = 0.003$ ). **CONCLUSION:** In conclusion, after accounting for measured fitness, it appears that BMI, WC, and waist to hip ratio all predict arterial stiffness. BMI explained the greatest amount of variance in predicting arterial stiffness.

### 38. SWACSM Abstract

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## Obstacle Negotiation Gaze Strategies Of The Physically Fatigued

BELLE P. PONCE DE LEON, SEDONA BOREN, ANDREW FISHMAN, JACOB W. HINKEL-LIPSKER, PH.D.

Move Learn Lab; Kinesiology; California State University, Northridge; Northridge, CA

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*Category: Masters*

*Advisor / Mentor: Hinkel-Lipsker, Jacob (jacob.hinkellipsker@csun.edu)*

#### ABSTRACT

Proper obstacle negotiation while in a fatigued state is a safety concern for first responders, firefighters and other primary relief personnel in their high-risk line of work. During locomotion the central gaze is focused beyond the obstacle to plan future steps while the peripheral vision spatially tracks the obstacle. Previous work indicates that following intense exercise people experience a narrowed peripheral visual field, making them more reliant on central gaze. Thus, it is possible that when physically-fatigued people become more reliant on central gaze to perceive obstacles, leaving them unable to plan future steps as effectively.

**PURPOSE:** This study further explored the relationship between fatiguing exercise and narrowing field of peripheral vision and increased reliance on central gaze when navigating obstacles that suddenly appeared in a walker's path. **METHODS:** Twenty-one healthy, young subjects completed a total of ten trials. The first five were completed while in a rested state. Then participants immediately followed a fatiguing aerobic protocol prior to completing the last five trials. All trials consisted of the participant navigating a dark laboratory where a light would illuminate an obstacle as they approached it to test their ability to avoid bodily collision. Pupillary movement was tracked and quantified in both conditions by wearable eye-tracking glasses. Further, the obstacle was marked as an area of interest (AOI) which illustrated the direction of participants' gaze towards the obstacle. **RESULTS:** Participants in a fatigued state exhibited significantly increased reliance on the use of central gaze when encountering the obstacle. This in turn resulted in a suboptimal gaze strategy where narrower vision was used to perceive a larger area as confirmed by the increased angular displacement of their central gaze. The time to first fixation and visual reaction time were not affected. **CONCLUSION:** Worker safety and effectiveness is important in physically laborious careers during emergency situations as slipshod navigation predisposes an individual to sustaining bodily injury. The role of vision is inextricably linked to efficient obstacle navigation. Understanding this relationship may inform the development of training protocols to enhance peripheral vision and gaze strategies.

## 39. SWACSM Abstract

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### The effects of transcranial direct current stimulation of dorsolateral prefrontal cortex over multiple days on shooting performance in elite Deaflympic athletes: A case series

NICHOLAS PUDAR, MILAN PANTOVIC, SHENIZ MOONEY, & BRACH POSTON

Neurophysiology of Human Movement Laboratory; Department of Kinesiology and Nutrition Sciences; University of Nevada, Las Vegas; Las Vegas, NV

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*Category: Undergraduate*

*Advisor / Mentor: Brach Poston (brach.poston@unlv.edu)*

#### ABSTRACT

Transcranial direct-current stimulation (tDCS) is a non-invasive brain stimulation method that has shown the ability to enhance motor learning in numerous studies. However, only a few of these studies have been conducted on elite level performers or in complex motor tasks that have been practiced extensively. Rifle shooting is a difficult motor task that has real-world implications in military, police, and sport settings. Although a few studies have investigated the influence of tDCS on shooting performance, these were all acute studies conducted on novice performers. The **PURPOSE** was to determine the effects of DLPFC-tDCS on motor learning over multiple days on 10-meter air rifle shooting performance in elite Deaflympic athletes. **METHODS:** Two male and 2 female elite Deaflympic athletes (e.g., European and National medalists) participated in the study. In a randomized, double-blind, SHAM-controlled, cross-over design, participants received 3 days of either DLPFC-tDCS or SHAM stimulation 1 week apart. Anodal tDCS was applied to the left DLPFC for 25 minutes with a current strength 2 mA concurrent with their standard shooting practice regiment. SHAM stimulation was applied according to standard SHAM protocols. A total of 7 trial blocks (10 shots per block) were performed each day and consisted of a pre-test block, 3 practice blocks with stimulation, and 3 post-test blocks without stimulation. An automated electronic scoring and target system used for sport shooting quantified the shot placement and shooting score. **RESULTS:** A 2 Condition x 3 Day within-subjects ANOVA revealed no significant main effects or interaction ( $P$  value range: 0.393-0.774). Due to the limitations of using statistical tests yielding  $P$  values for case series data, analyses involving improvement over time and historical control comparisons were undertaken, but revealed no discernable DLPFC-tDCS performance effects. **CONCLUSION:** The results indicate that DLPFC-tDCS applied for 3 consecutive days does not improve shooting performance in elite athletes. The findings are similar to a few previous studies that involved tDCS of motor cortex in other motor tasks in elite performers. Therefore, different stimulation parameters or long-term (weeks/months) application of tDCS may be needed to improve performance in elite populations.

## 40. SWACSM Abstract

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### College Students' Perceived Stress in Relation to Physical Activity Behaviors During the COVID-19 Pandemic

HOLLI ROSAS, ANDREA HUGHES, SARAH L. DUNN, PH.D.

Human Performance Laboratory; Kinesiology Department; California State University, San Bernardino, Palm Desert Campus, Palm Desert, CA

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*Category: Undergraduate*

*Advisor / Mentor: Dunn, Sarah L. (sarah.dunn@csusb.edu)*

#### ABSTRACT

College students may experience heightened stress during a global pandemic. It is well known that psychological distress during times of uncertainty and sedentary behaviors may lead to adverse health outcomes such as morbidity and mortality. Physical activity (PA) has been shown to positively mediate distress and other mental health outcomes. **PURPOSE:** The aim of this study was to examine college students' perceived stress levels and PA behaviors during the COVID-19 pandemic and remote learning. **METHODS:** An Institutional Review Board approved online Qualtrics survey was used to collect data from eighty-four enrolled college students (mean age 24.4±5.79 years, 57.6% female) in Spring 2021, in Southern California (83.5% public four-year institution, 14.1% other). A 48-item Perceived Stress Inventory (PSI, categories: financial, family, academic, time management, and social stressors) scale using a 10-point Likert scale (1 = no stress and 10 = high stress), along with the Major Life Events Scale (MLES) assessing distressful life experiences, and the International Physical Activity Questionnaire-Short Form (IPAQ-SF), reporting PA behaviors from the last seven days were included. PSI, MLES, and IPAQ-SF responses were analyzed using the Statistical Package for Social Sciences (SPSS) v27. A Spearman Rank Order Correlation was used to assess the relationships with a p-value <0.05 for significance. **RESULTS:** Time management stress was significantly and negatively correlated ( $\rho = -0.336$ ,  $p = 0.004$ ) to the total minutes spent sitting, based on IPAQ-SF data. Also, several PSI scores (various categories) trended toward significance with PA behaviors amongst the participants. **CONCLUSION:** Therefore, college students who had lower time management perceived stress levels also spent a greater amount of time being sedentary during their Spring 2021 semester amidst the COVID-19 Pandemic. Healthcare and fitness professionals should not rely solely on prescribing PA to minimize perceived stress levels and risk for comorbidity later in life, but compliment PA by providing students with the resources to acquire time management skills, especially during times of uncertainty and a global pandemic.

## 41. SWACSM Abstract

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### Body Composition and Fitness Characteristics from Structural Firefighters in a Health and Wellness Program: Differences According to Injury Status and Location

TOMAS J. RUVALCABA<sup>1,2</sup>, DANIEL HIGUERA, M.S.<sup>2</sup>, ROBIN M. ORR, Ph.D.<sup>3</sup>, J. JAY DAWES, Ph.D.<sup>4</sup>, KRISTINA A. ROSS, M.S.<sup>2</sup>, ROBERT G. LOCKIE, Ph.D.<sup>1</sup>

<sup>1</sup>Center for Sport Performance; Department of Kinesiology; California State University, Fullerton; Fullerton, CA, USA; <sup>2</sup>Department of Fire Technology; Santa Ana College; Santa Ana, CA, USA; <sup>3</sup>Tactical Research Unit; Bond University; Robina, Qld, Australia; <sup>4</sup>Tactical Fitness and Nutrition Lab; School of Kinesiology, Applied Health and Recreation; Oklahoma State University, Stillwater, OK, USA

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#### ABSTRACT

Structural firefighting can put firefighters at an elevated risk for injury. Numerous health and fitness characteristics (body composition, flexibility, muscular strength and endurance, aerobic capacity) can influence the performance of fireground operations, and could help prevent injury in firefighters. **PURPOSE:** To analyze the differences in health and fitness between healthy firefighters, and firefighters who reported a current upper-body, lower-body, or back injury. **METHODS:** Archival data from structural firefighters in a health and wellness program was investigated (258 males; 12 females). Body composition data included height; body mass; body mass index (BMI); body fat percentage; fat and lean body mass; waist circumference; and waist:hip ratio. Fitness data included flexibility; grip strength; predicted one-repetition maximum (1RM) leg press; crunches; push-ups; and estimated maximal aerobic capacity ( $\dot{V}O_{2max}$ ). Firefighters self-reported whether they had a current injury, and the location of the current injury (upper-body [UBI], lower-body [LBI], or back [BI]). A one-way ANOVA ( $p < 0.05$ ), with Bonferroni post hoc, compared the between-group differences as defined by injury status and location on body composition and fitness. **RESULTS:** Of the 270 firefighters, 208 were healthy and 62 had a current injury (UBI: 19; LBI: 26; BI: 17). When compared to healthy firefighters, UBI firefighters performed worse in the predicted 1RM leg press and push-ups ( $p \leq 0.041$ ). Compared to healthy firefighters, LBI firefighters had worse BMI and waist circumferences ( $p \leq 0.004$ ), and had lesser 1RM leg press, crunches, and  $\dot{V}O_{2max}$  ( $p \leq 0.012$ ). In comparison to healthy firefighters, BI firefighters performed worse in trunk extension (flexibility), 1RM leg press, crunches, and push-ups ( $p \leq 0.002$ ). **CONCLUSIONS:** Body composition and fitness of structural firefighters may influence injury status and location. Although poorer performance in the fitness tests could be the result of the current injury, these data highlight certain fitness qualities that could be developed to prevent injuries in structural firefighters. By participating in a regimented exercise and nutrition routine (e.g. a health and wellness program), firefighters could improve overall health and fitness while minimizing their risk for injury.

## 42. SWACSM Abstract

### Evaluating the Validity of the Salatto-Love and Care of Nature Direct Indication Scale Against the Love and Care of Nature Scale During Rest and After Self-Paced Hiking

RW. SALATTO<sup>1</sup>, DUSTIN W. DAVIS<sup>2</sup>, ELIAS MALEK<sup>2</sup>, JAMES W. NAVALTA<sup>2</sup>, FACSM, JEFF MONTES<sup>3</sup>, NATHANIEL BODELL<sup>4</sup>, BYRSON CARRIER<sup>2</sup>, JACOB W. MANNING<sup>5</sup>, & MARK DEBELISO<sup>5</sup>, FACSM

<sup>1</sup>Vanguard University, <sup>2</sup>University of Nevada, Las Vegas, <sup>3</sup>Monmouth College, <sup>4</sup>California State University San Bernardino, <sup>5</sup>Southern Utah University

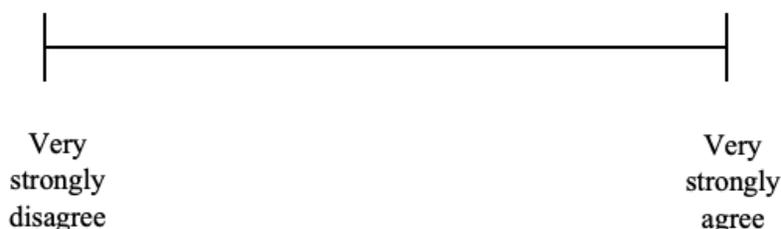
Category: Professional

#### ABSTRACT

There are several scales used to measure one's connectedness to or love of nature. Amongst these scales is The Love and Care of Nature Scale (LCN), which has been used across several disciplines in research. While the LCN is a valid and reliable scale, completing the 15-question scale may be time consuming and difficult during field research. **PURPOSE:** The purpose of the current investigation was to establish a fast, easy-to-administer, and easy-to-understand visual analog scale that is valid for evaluating participants' connectedness to or love of nature. **METHODS:** Nineteen participants met on two consecutive days at Thunderbird Gardens Trailhead in Cedar City, Utah. Upon arrival at the trailhead, participants completed the LCN and the Salatto-Love and Care of Nature Direct Indication Scale (SLCNDIS). The SLCNDIS is a 100-mm-long visual analog scale with two written phrases at opposing ends of the line: "Very Strongly Disagree" and "Very Strongly Agree" (see below).

Interacting with nature brings me joy and makes me feel a sense of personal connection to and care for nature.

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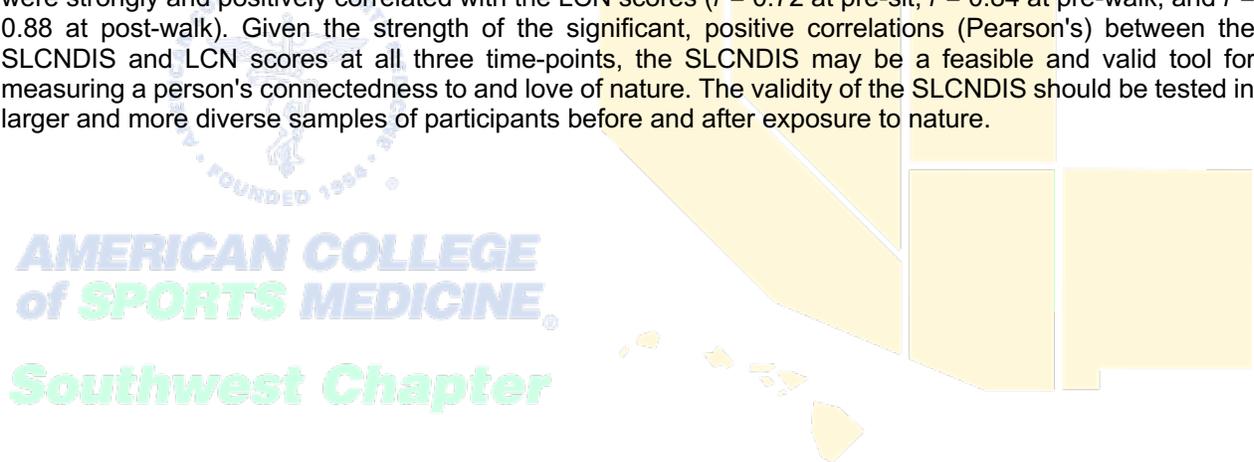
Participants were then instructed to walk into nature, sit, and observe the natural environment for 10 minutes. After this immersion period, participants completed the LCN and SLCNDIS again. After completing the scales this second time, participants completed a 10-minute, self-paced hike. After hiking, participants completed the LCN and SLCNDIS a third time. Scores on the LCN were calculated and compared to the measured mark indicated on the SLCNDIS. Validity will be established by observing a MAPE of 10% or lower as well as a Lin's concordance correlation coefficient above 0.7 Pearson's  $r$  will also be evaluated. **RESULTS:** While the SLCNDIS did not initially satisfy some criteria, the strength of correlation between the two scales increased throughout the investigation. See table below:

Condition	Statistical Test	LCN	SLCNDIS
Pre sitting	Mean (SD)	75.5 (16.2)	70.3 (27.4)
	MAPE (%)		20.7

	Lin's Concordance		0.61
	Pearson's <i>r</i>		0.72
Pre walking	Mean (SD)	80.0 (18.6)	81.3 (18.5)
	MAPE (%)		11.0
	Lin's Concordance		0.83
	Pearson's <i>r</i>		0.84
Post-walking	Mean (SD)	82.8 (19.4)	81.8 (18.6)
	MAPE (%)		8.6
	Lin's Concordance		0.87
	Pearson's <i>r</i>		0.88

### CONCLUSION:

According to the validity criteria of a MAPE  $\leq 10\%$  and Lin's Concordance Correlation Coefficient ( $r_c$ )  $> 0.7$ , the SLCNDIS is concurrently valid with the LCN after 10 minutes of seated immersion **and** 10 minutes of hiking at a self-selected pace in nature (post-walk, MAPE = 9.75%;  $r_c$  = 0.87). Both MAPE and  $r_c$  were too high at baseline (pre-sit; MAPE = 22.49%;  $r_c$  = 0.62) and after 10 minutes of seated immersion (pre-walk; MAPE = 13.00%;  $r_c$  = 0.80) to be considered valid. However, at all three time points, the SLCNDIS scores were strongly and positively correlated with the LCN scores ( $r$  = 0.72 at pre-sit,  $r$  = 0.84 at pre-walk, and  $r$  = 0.88 at post-walk). Given the strength of the significant, positive correlations (Pearson's) between the SLCNDIS and LCN scores at all three time-points, the SLCNDIS may be a feasible and valid tool for measuring a person's connectedness to and love of nature. The validity of the SLCNDIS should be tested in larger and more diverse samples of participants before and after exposure to nature.



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### 43. SWACSM Abstract

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## Reverting to a Healthier Diet or Employing an Aerobic Exercise Regime Independently Restore Muscle Fiber Phenotype Disturbed by High-Fat Diet in Muscle of Mice

NATHAN SERRANO<sup>1</sup>, HARKARAN S. SODHI<sup>1</sup>, KAILIN JOHNSON<sup>1</sup>, LAUREL B. WINSLOW<sup>1</sup>, LAYLA AL-NAKKASH PHD<sup>2</sup>, CHRISTOS S. KATSANOS PHD<sup>1</sup>  
Human Obesity and Metabolism Lab; School of Life Sciences; Arizona State University; Tempe, AZ<sup>1</sup>; Dept Physiology; Midwestern University, Glendale, AZ<sup>2</sup>

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Category: Doctoral

Advisor / Mentor: Katsanos, Christos ([Christos.Katsanos@asu.edu](mailto:Christos.Katsanos@asu.edu))

### ABSTRACT

Obesity affects roughly 42% of the US population. High fat/high sugar diets (HFHS) often referred to as “western diet” contributes to this prevalence. Diet-induced obesity results in impaired metabolic responses and associated disease states (i.e., Type 2 Diabetes). Metabolic impairments in diet-induced obesity are a result of changes in muscle metabolism, and changes in muscle fiber phenotype, which is determined by the isoform-content of the protein myosin heavy chain (MHC). Fast muscle fiber phenotype (i.e. type IIb in mice) is characterized by lower capacity for utilization of lipids, implicated in the pathogenesis of Type 2 Diabetes. Regular exercise shifts MHC proportions under healthy circumstances. However, exercise-driven fiber type shifts in diet-induced obesity are less understood. **PURPOSE** To determine the impact of exercise and diet on fiber-type proportions in mice. We hypothesized that exercise would shift the mouse gastrocnemius muscle phenotype induced by a HFHS diet away from IIb fast fiber types. **METHODS** 49 C57BL/6 mice were split into 4 groups: 1) a Control (n = 9) fed a standard chow diet and water for 24 weeks, 2) a HFHS, fed a HFHS diet (60% of calories from fat, high sugar/fructose: 42 g/L in drinking water) for 24 weeks, 3) a HFHS Control (n = 10) fed a HFHS diet for 12 weeks followed by a standard chow diet and water for the next 12 weeks (i.e., simulating traditional dieting approach), and 4) a HFHS + exercise group fed a HFHS diet for 24 weeks, and performed aerobic exercise (30 minutes of treadmill running 5 days/week) in the last 12 weeks. Gastrocnemius muscles were collected, homogenized, and analyzed for MHC isoforms using SDS-PAGE. Intensity of bands corresponding to MHC IIa, IIx, and IIb isoforms were quantified using Image J (bands for the IIa and IIx isoforms were analyzed as a single band). Paired sample t-tests were conducted for differences between the MHC isoforms across groups. **RESULTS** Proportions of MHC IIb isoform increased (91 +/- 3%) in HFHS compared to the Control (81 +/- 6.2%, p=0.195), HFHS Control (77 +/- 3%, p=0.004), and HFHS + exercise groups (79 +/- 5%, p=0.057). Additionally, MHC IIa/x proportions in the HFHS (8 +/- 3%) compared to the Control (17 +/- 5.9%, p=0.184), HFHS Control (20 +/- 2%, p=0.004), and the HFHS + exercise (18 +/- 4%, p=0.054) groups was reduced. **CONCLUSION** These data suggest HFHS diet increases the proportion of IIb fibers and reduces IIa/x fibers in mouse gastrocnemius muscle over 24 weeks. Importantly, performing aerobic exercise with a HFHS diet or switching to a healthier diet restores the muscle fiber phenotype in mouse gastrocnemius muscle. Thus, exercise and dietary interventions may be a good strategy to shift MHC isoforms away from the extreme fast fiber phenotype, which has lower capacity for lipid utilization. Future research should determine single muscle fiber phenotype shifts related to long-term diet changes and exercise in humans to better understand regulation of muscle fiber phenotype and its impact on human metabolism.

Funded by Midwestern-Arizona Alzheimer’s Consortium

## 44. SWACSM Abstract

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### Phase Angle is Associated with Muscular Fitness in Breast Cancer Survivors

TREVOR SHORT<sup>1</sup>, MICHELLE PITTS<sup>1</sup>, PAULETTE YAMADA<sup>1</sup>, CHERI TERINISHI-HASHIMOTO<sup>2</sup>

<sup>1</sup>Human Performance Laboratory; Kinesiology and Rehabilitation Science; University of Hawaii at Manoa; Honolulu, HI; <sup>2</sup>Rehabilitation Hospital of the Pacific; Honolulu, HI

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*Category: Doctoral*

*Advisor / Mentor: Yamada, Paulette (pyamada@hawaii.edu)*

#### ABSTRACT

Phase angle (PhA) has emerged as a prognostic indicator of survival and quality of life (QOL) in cancer patients. Identifying measures of physical fitness that correlate with PhA can provide guidance towards optimizing cancer rehabilitation programs. **PURPOSE:** To examine the relationship between PhA and physical fitness (muscular strength, muscular endurance, cardiorespiratory endurance, flexibility, and body composition) in breast cancer survivors. **METHODS:** Seventy female breast cancer survivors (61 ± 9 years, PhA 4.57 ± 0.51) were referred to the rehabilitation clinic by their oncologist. Participants completed assessments for muscular strength (predicted 1-repetition maximum of incline bench press, seated cable row, latissimus dorsi pulldown, leg press, leg curl, leg extension, and hand grip strength), muscular endurance (chair squat test, and plank hold), cardiorespiratory endurance (treadmill predicted VO<sub>2</sub> peak), flexibility (sit and reach, back scratch test, and shoulder range of motion), and body composition (lean body mass, body fat %). PhA and body composition were measured using bioimpedance analysis (Inbody 770) at 50 KHz. The correlations between phase angle and measures of fitness were evaluated using Pearson coefficients. **RESULTS:** PhA was significantly and positively correlated with muscular strength (incline bench press,  $r=0.54$ ,  $p<0.0001$ ; leg press,  $r=0.35$ ,  $p=0.0027$ ; leg extension,  $r=0.35$ ,  $p=0.0038$ ) and muscular endurance (chair test,  $r=0.29$ ,  $p=0.0151$ ). PhA was not associated with cardiorespiratory endurance (VO<sub>2</sub> peak,  $r=0.13$ ,  $p=0.298$ ), flexibility (sit and reach,  $r=-0.06$ ,  $p=0.624$ ), and body composition (lean body mass,  $r=0.06$ ,  $p=0.6117$ ) in breast cancer survivors. **CONCLUSION:** Our study suggests that larger PhA values are related to higher levels of muscular strength and muscular endurance in breast cancer survivors, potentially due to superior bioelectrical signaling that accompanies enhanced neuromuscular function. PhA was not related to measures of cardiorespiratory endurance, flexibility, or body composition. Therefore, exercise interventions designed to improve PhA in breast cancer survivors should prioritize muscular fitness as it relates to higher PhA and potentially improved survival and QOL. Further research is needed to confirm these findings.

## 45. SWACSM Abstract

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### Exercise Variability Did Not Affect Muscle Thickness and Peak Force for Elbow Flexors After a Resistance Training Session in Recreationally-Trained Subjects

KEANNA SULLIVAN, PAULO H. MARCHETTI, ACSM

Resistance Training Laboratory; Department of Kinesiology; California State University, Northridge; Northridge, CA

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*Category: Masters*

*Advisor / Mentor: Marchetti, Paulo (paulo.marchetti@csun.edu)*

#### ABSTRACT

The exercise variability principle states that to prolong muscle adaptations it is necessary to systematically manipulate the exercise selection over time to modify the training stimulus. **PURPOSE:** The purpose of this study is to measure the acute effects of exercise variability on muscle thickness and physical performance after two resistance training (RT) protocols using the same or different exercises in recreationally-trained subjects. **METHODS:** Fifteen resistance-trained men ( $23.1 \pm 2.6$  years,  $83.4 \pm 16.6$  kg,  $173.5 \pm 8.3$  cm) performed one of two RT protocols: SINGLE: 6 sets of 10RM/2-min rest of the unilateral biceps curl exercise using cables or 2. MIX: 6 sets of 10RM/2-min rest for the unilateral biceps curl exercises (cable: 3 sets and dumbbells: 3 sets, randomly). Muscle thickness (MT) and peak force (PF) were measured 10-min before (control), pre-RT session, and post-RT (immediately after and 15-min after). All acute RT variables were measured during both RT protocols: the maximal number of repetitions (MNR), the total number of repetitions (TNR), time under tension (TUT), and rating of perceived exertion (RPE). Two-way ANOVA (2x4) was used to test differences between RT protocol (SINGLE and MIX) and time (control, pre-test, post0, and post15) for MT and PF. Two-way ANOVAs (2x6) were used to test differences between RT protocol (SINGLE and MIX) and sets for MNR,  $RPE_{set}$ , and TUT. **RESULTS:** For PF and MT, there were significant differences in time for both RT protocols ( $p < 0.05$ ), however, there were not statistical differences between RT protocols. For MNR,  $RPE_{set}$ , and TUT, there were significant differences in time ( $p < 0.05$ ), however, there were not statistical differences between RT protocols. **CONCLUSION:** In conclusion, both RT protocols induced a similar increase in MT for elbow flexors and a reduction in peak force.

## 46. SWACSM Abstract

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### Understanding and Communicating Physical Activity Guidelines: Creating a Training Video for Health Care Providers

JAFRĀ D. THOMAS, BETHANY C. LOVE, & CAROLINE N. SMITH

Department of Kinesiology and Public Health; California Polytechnic State University; San Luis Obispo, California

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*Category: Professional*

*Advisor / Mentor: Thomas, Jafrā (jthoma84@calpoly.edu)*

#### ABSTRACT

Like Das et al.'s study (2018, *TJACSM*), studies over the last decade or so have shown that many health care providers have low knowledge of peer-reviewed physical activity guidelines (PAGs, e.g., Barton et al., 2021, *Physical Therapy in Sport*; Douglas et al., 2006, *BMC Public Health*). One remedy may be educational videos. **PURPOSE:** This presentation details a process to create a short, interactive, educational video to train health care providers in how to advise clients in a manner consistent with PAGs. **METHODS:** Over a four-month period (January to April of 2021), the second author developed a video summarizing the results of one peer-reviewed research article, which examined the extent online material matched US. PAGs at least once on average (Thomas et al., 2020, *TJACSM*). Methods described in the article to judge if advice matched PAGs were used to create an interactive exercise for the video. Canva and Excel were used to visually summarize key results from the research article to elicit understanding. Editorial feedback was provided by the first and third author. An oral slideshow presentation was developed in PowerPoint and narrated using a typed transcript. The presentation slides were converted into a video using the Screencast-o-Matic recording software. A checklist based on guidelines for "distraction-free" and "plain language" presentations was used to revise the video. The first author confirmed the accuracy of all content. Feedback on the clarity and utility of the video was requested from 14 undergraduates/alumni working in the first author's lab, using a 100% optional and anonymous online survey (64% response rate, 7-day response window). **RESULTS:** After several iterations (PowerPoint slides & transcript = 4, video = 2), a less than 7-minute, interactive, educational video to help train health care providers to communicate PAGs was created (see Love et al., 2021, Cal Poly Digital Commons). The video was deemed clear and useful. Its features included English subtitles, a hyperlinked transcript, an interactive exercise, a summary slide with hyperlinked resources (QR codes), and a post-video review quiz (6 questions) with tailored feedback. **CONCLUSION:** Videos summarizing peer-reviewed research could be a viable way to improve provider PAG knowledge and communication. Future research in this area is warranted.

## 47. SWACSM Abstract

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### Developing a Predictive Model for $VO_{2MAX}$ in Middle-Distance Track and Field Athletes

NICOLE VARGAS, PATRICIA VAN OOSBREE, KRISTYNE WIEGAND

Movement Sciences Lab; Department of Kinesiology; Whittier College; Whittier, CA

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*Category: Undergraduate*

*Advisor / Mentor: Wiegand, Kristyne (kwiegand@whittier.edu)*

#### ABSTRACT

**Purpose:** Aerobic capacity is an indicator of an athlete's endurance and a key predictor of performance. The greater the aerobic capacity, the more oxygen available for working muscles, leading to delays in lactate buildup, thus increasing the potential for successful performance. Studies have investigated non-exercise and/or submaximal exercise measures to predict aerobic capacity, but few have analyzed the combination of maximal exercise and non-exercise measures in Division-3 runners. Therefore, the purpose of this pilot study is to determine the predictive ability of heart rate ( $HR_{max}$ ), ventilation (VE), respiratory quotient (RQ), and rate of perceived exertion (RPE) on  $VO_{2max}$  in middle distance track and field runners. **Methods:** Eleven Division-3 400- and 800m runners (F:5, M:6, age 18-24) reported to the Human Movement Laboratory twice.  $HR_{max}$ , RQ, and RPE were collected during  $VO_{2max}$  testing using a CosMed treadmill and Cardiopulmonary Exercise Test (CPET), while VE was obtained through spirometry testing. A multiple regression analysis ( $\alpha=0.05$ ) was used to predict  $VO_{2max}$  from  $HR_{max}$ , VE, RQ, and RPE. Additionally, the pool was split by sex, and correlations were run to assess relationships among variables ( $\alpha=0.05$ ). **Results:** The multiple regression model statistically significantly predicted  $VO_{2max}$  ( $p=0.018$ ,  $adj. R^2=0.71$ ). Both  $HR_{max}$  ( $p=0.004$ ) and VE ( $p=0.014$ ) added to the statistically significant prediction. Correlation results indicate a positive relationship between  $HR_{max}$  and  $VO_{2max}$  in males ( $r=0.90$ ,  $p=0.015$ ) and females ( $r=0.97$ ,  $p=0.006$ ). **Conclusions:**  $HR_{max}$  contributed significantly to the model predicting  $VO_{2max}$ . VE also proved to be a significant contributor to the prediction of  $VO_{2max}$ . These results suggest that increasing VE through breathing training may positively influence  $VO_{2max}$  and performance in middle-distance runners. Future studies should formulate breathing exercises that work the respiratory muscles and test the effectiveness of breathing training in improving aerobic capacity in athletes.

## 48. SWACSM Abstract

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### Gender Differences in Physical Activity Level by Domain

NATASHA VINLUAN & ZACHARY ZENKO

Department of Kinesiology; California State University, Bakersfield; Bakersfield, CA

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*Category: Undergraduate*

*Advisor / Mentor: Zenko, Zachary (zzenko@csu.edu)*

#### ABSTRACT

Engaging in regular physical activity and exercise has been demonstrated to increase life expectancy, improve mental health, and prevent or manage noncommunicable diseases. Although the health benefits are well known, estimates suggest that the majority of women and men do not obtain the recommended amounts of physical activity per week. **PURPOSE:** The purpose of this study was to assess how physical activity levels differed by domain (i.e., domestic/household, transportation-related, occupational, leisure-time) between genders. This information can be useful for tailoring future interventions to promote activity. **METHODS:** After obtaining ethical approval, participants (79 men, 35 women; mean age:  $36 \pm 10$  years) completed an online survey to assess physical activity behavior. Physical activity in each domain (domestic/household, transportation-related, occupational, leisure-time) was assessed using the International Physical Activity Questionnaire. **RESULTS:** Independent *t*-tests revealed no differences in physical activity in domestic/household ( $p = .08$ ), transportation-related ( $p = .16$ ), or occupational ( $p = .15$ ) activity. Leisure-time and total physical activity were significantly higher among men ( $ps = .02$  and  $.03$ , respectively). **CONCLUSION:** Results suggests that men might perform more leisure-time and overall physical activity. Although nonsignificant, men also tended to obtain more occupational physical activity, transportation-related physical activity, and domestic/household physical activity than women. The small sample size likely resulted in an underpowered analysis and a failure to achieve statistical significance for several comparisons.

## 49. SWACSM Abstract

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### High School Strength and Conditioning: A Narrative Review of the Literature

ALEXANDER M. WAKELY†, ROBERT G. LOCKIE, Ph.D.‡

Department of Kinesiology, California State University-Fullerton, Fullerton, CA, USA

†Denotes graduate student author, ‡Denotes professional author

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*Category: Graduate*

#### ABSTRACT

Many high school athletes will complete strength and conditioning programs as part of their sports participation. The programs can vary in quality, and there is limited research specifically investigating programs at this level. **PURPOSE:** To review current literature specific to strength and conditioning training programs for high school student-athletes and calculate magnitude of performance changes. **METHODS:** Studies were searched for using the CSUF Pollack Library database. Search terms included “high school strength and conditioning” and “high school training programs”. Following this process, 5 studies were deemed appropriate for this narrative review. Performance changes from pre- to post-test for the strength and conditioning programs from these studies were interpreted via Cohen’s effect size ( $d$ ). **RESULTS:** A range of programs were used to improve performance in high school athletes. A 16-week functional movement system training program increased in hand grip and trunk extension flexibility in high school baseball players ( $d=0.72-0.83$ ). An 8-week sled pushing program (3 groups: light, moderate, heavy) showed some improvements in sprint interval times within 20 m in rugby and lacrosse high school players ( $d\leq 1.16$ ). A 6-week pelvic and core strength training program was used for high school cross country runners. The program led to faster 4000-5000 m race times for the male ( $d=4.41$ ) and female ( $d=0.47$ ) experimental groups. A 6-week neuromuscular training program led to small-to-moderate performance changes in the drop jump, multistage fitness test, and vertical jump in female high school basketball players ( $d=0.19-0.58$ ). An 8-week Olympic weightlifting program led to small-to-moderate changes in the vertical jump, back squat, and power clean in high school football players ( $d=0.45-0.70$ ). **CONCLUSION:** Strength and conditioning programs from the literature led to small-to-very large performance changes in high school student-athletes across a range of fitness variables. A variety of training programs could be used by high school student-athletes to improve athletic performance. The exercises in the reviewed studies could be programmed based on the athlete’s experience. Nonetheless, specific research is required to investigate strength and conditioning programs implemented at high schools.

## 50. SWACSM Abstract

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### My Brain Hurts: A Focus on Somatosensory Complaints in Traumatic Brain Injury Patients Assessed by Neurobehavioral Symptom Inventory

CHRISTINE WALKER, D.O.<sup>1</sup>, JASON M. BAILIE, PHD<sup>2,3,4</sup>, ROSEMAY A. REMIGIO-BAKER, PHD<sup>2,3,4</sup>, MPH, IDA BABAKHANYAN, PHD<sup>2,3,4</sup>

<sup>1</sup>Naval Hospital Camp Pendleton; Family Medicine Department; Oceanside, CA; <sup>2</sup>Naval Hospital Camp Pendleton; Intrepid Spirit Center; Oceanside, CA; <sup>3</sup>Traumatic Brain Injury Center of Excellence (TBICoE); Silver Spring, MD; <sup>4</sup>General Dynamics Information Technology, Falls Church, VA

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*Category: Professional-in-Training*

*Advisor / Mentor: Jason Bailie, PhD (jason.m.bailie.ctr@mail.mil)*

#### ABSTRACT

**PURPOSE:** Somatosensory symptoms are common complaints from patients following a Traumatic Brain Injury (TBI), but are not specific to TBI diagnosis. This study investigated the prevalence of somatosensory symptoms in TBI patients, evaluated if symptoms severity was associated with TBI severity, and assessed the relationship of somatosensory complaints to psychological complaints commonly associated with depression and Post Traumatic Stress Disorder (PTSD). **METHODS:** Somatic symptoms following traumatic brain injury (TBI) were assessed using 7 of the 22 items from the Neurobehavioral Symptom Inventory (NSI) which included headache, nausea, vision problems/blurriness, body numbness/tingling, taste/smell changes, light sensitivity, and noise sensitivity. **RESULTS:** Prior to treatment, 90.8% of patients endorsed clinically-elevated pre-treatment somatosensory symptoms. The presence of clinically-elevated somatosensory symptoms decreased after treatment to 77.6%. This demonstrated a high prevalence at admission of somatosensory complaints in patients with TBI which remained high even after completion of TBI treatment. Patients with a history of LOC greater than 30 minutes were three times less likely to endorse clinically-elevated somatosensory complaints when assessed prior to starting treatment as compared to those with no history of TBI. A similar association was found when evaluated clinically-elevated somatosensory complaints assessed after treatment. This study also demonstrated patients with clinically-elevated somatosensory symptoms at admission were more likely to have and clinically-elevated depressive symptoms post-treatment. Similar significance was found assessing clinically-elevated somatosensory symptoms as admission and PTSD symptoms. **CONCLUSION:** Somatosensory symptoms are highly prevalent in TBI patients, but do not appear to correlate to TBI severity. Additionally, there is a strong association between somatosensory symptoms and psychological symptoms. The presence of both somatosensory and psychological symptoms before starting TBI treatment may be considered a strong indicator that somatosensory complaints will persist following completion of a TBI treatment program. Patients that endorse a high degree of psychological symptoms may benefit from targeted behavioral health therapies instead of traditional TBI treatment strategies. Special focus on somatosensory symptoms assessed by NSI may help guide clinical decision-making when treating TBI patients.

## 51. SWACSM Abstract

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### Lifting in an Alternate Reality: The Application of Action Observation Within Virtual Reality and Weightlifting

WEISE M.A., CANDO N.R., NZEZA R., KRAUSE A., HERNANDEZ K., HINKEL-LIPSKER, J.W.

Move-Learn Laboratory; Kinesiology; California State University, Northridge; Northridge, CALIFORNIA

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*Category: Masters*

*Advisor / Mentor: Hinkel-Lipsker, Jacob (Jacob.hinkellipsker@csun.edu)*

#### ABSTRACT

Action observation (AO), where a learner watches a model perform a skill, has long been shown to facilitate motor learning of a variety of skills. There is great interest in learning ways to optimize the AO experience in order to maximize motor learning. In recent years, virtual reality (VR) technology has advanced considerably, where high-fidelity environments can facilitate a fully immersive experience. As such, the three-dimensional (3D) VR experience could allow for improved learning through AO over more traditional forms (e.g., watching a computer screen). **PURPOSE:** The purpose of this study is to determine how well people learn a novel exercise via AO through use of VR headsets, compared to computer-screen-based AO. **METHODS:** 15 participants (18-65 years old) who were novices to Olympic lifting were recruited for this study. Participants were randomly assigned into 1 of 3 groups: a control (looking at a poster describing the activity), 2D video, and 3D/VR group. Initially, participants observed a sequencing poster depicting the clean-and-jerk (C&J) and then completed the C&J using a 10-lb bar without further instruction. Participants were then asked to engage in AO using their assigned format, where they watched an expert perform the C&J. Afterwards, each individual repeated the exercise for 5 reps. This process was repeated 4 more times. 2 retro-reflective markers are placed on the ends of the bar. During baseline, training, and post-training, 3D coordinate data were collected at 150 Hz from an 8-camera motion capture system. **RESULTS:** Bar kinematics were analyzed for pre and post lifts, including horizontal displacement (HD), time to completion (TTC), and peak bar velocity (PBV). Preliminary trends indicate that the control group (HD: +.02m, TTC: -2.15s, PBV: +.34m/s), 2D group (HD: +.06m, TTC: +.95s, PBV: +.37m/s), and 3D group (HD: +.09m, TTC: -2.49s, PBV: +.54m/s) all exhibited altered bar kinematics following AO relative to baseline. **CONCLUSION:** Results revealed the 3D group has the greatest improvement when comparing pre and post lifts. While, the 2D group had the absolute best improvement overall. Additionally, all three groups increased their horizontal displacement when comparing the pre and post lifts. Overall, preliminary results suggest VR improves learning, although 2D producing the best results.

## 52. SWACSM Abstract

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### Army Combat Fitness Test Performance by Sex in ROTC Cadets

KEVIN L. WITHROW<sup>1</sup>, J. JAY DAWES, Ph.D.<sup>2</sup>, ROBIN M. ORR, Ph.D.<sup>3</sup>, ROBERT G. LOCKIE, Ph.D.<sup>1</sup>

<sup>1</sup>Center for Sport Performance; Department of Kinesiology; California State University, Fullerton; Fullerton, CA, USA; <sup>2</sup>Tactical Fitness and Nutrition Lab; School of Kinesiology, Applied Health and Recreation; Oklahoma State University, Stillwater, OK, USA;

<sup>3</sup>Tactical Research Unit; Bond University; Robina, Qld, Australia

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*Category: Masters*

*Advisor / Mentor: Lockie, Robert (rlockie@fullerton.edu)*

#### ABSTRACT

The U.S. Department of Defense recently opened all combat jobs to women. The Army Combat Fitness Test (ACFT) is the U.S. Army's new assessment for measuring a soldier's ability to execute combat-related tasks. However, issues have been raised at a national level relative to the impacts of the ACFT on female personnel. As the Reserve Officers Training Corps (ROTC) is the initial entry point for many future Army officers, it is important to analyze how male and female cadets compare in their physical abilities. **PURPOSE:** To investigate the between-sex differences in ACFT performance in cadets from one program. **METHODS:** A retrospective analysis of ACFT data for 101 cadets (76 men and 25 women) from one Midwestern college was conducted. The six events in the ACFT were the three-repetition maximum (3RM) deadlift, standing power throw, hand release push-ups, sprint-drag-carry, leg tuck and 2-mile run. Total scores and scores for each of the six events were stratified by sex. Independent samples *t*-tests ( $p < 0.05$ ) calculated differences between men and women. Cohen's *d* calculated effect sizes between the sexes. **RESULTS:** Men scored significantly higher than women in total score and all six events ( $p < 0.001$ ). The effect sizes for the difference in total scores, sprint-drag-carry and standing power throw were very large ( $d = 2.06$ – $2.48$ ). For the 3RM deadlift and leg tuck, the effect sizes were large ( $d = 1.24$ – $1.69$ ); for the hand release push-up and 2-mile run, the effect sizes were moderate ( $d = 0.94$ – $1.08$ ). Female cadets failed to achieve a minimum passing score for the overall ACFT and the standing power throw, leg tuck and two-mile run events, with mean scores of 356, 56, 51 and 53 respectively. A minimum passing total score is 360, with at least 60 points in each event. **CONCLUSION:** At a micro-level, this ROTC program reflected the challenges present on a national-scale for the U.S. Army. Female cadets were not as physically capable as male cadets in the ACFT, which simulated combat-related tasks. The ACFT events where sex had the largest impact were tests in which strength was a major factor (sprint-drag-carry, standing power throw, 3RM deadlift, leg tuck). Training plans for female cadets should ideally prioritize developing strength, in addition to other fitness qualities (i.e., anaerobic and aerobic capacity) important for army personnel.