

**SOUTHWEST CHAPTER**  
**AMERICAN COLLEGE OF SPORTS MEDICINE**  
**2012 ANNUAL MEETING**



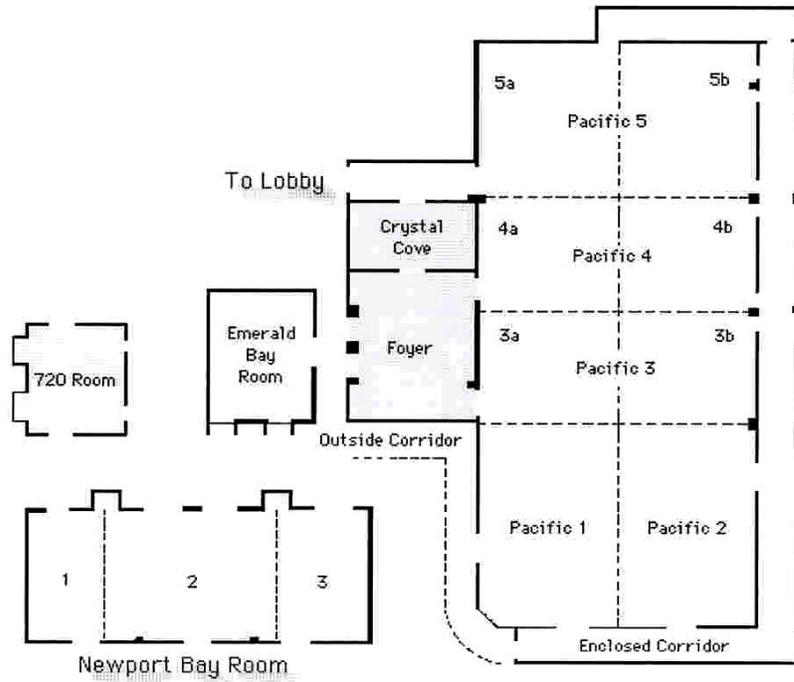
October 19-20, 2012

Radisson Newport Beach  
Newport Beach, California

Jointly sponsored by the American College of Sports Medicine  
and the Southwest Chapter of the American College of Sports Medicine



## Floor Plan



Radisson Newport Beach  
4545 MacArthur Blvd.  
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*Welcome to the*

32<sup>st</sup> Annual Meeting

of the

Southwest Regional Chapter

of the

**AMERICAN COLLEGE  
of SPORTS MEDICINE <sub>SM</sub>**

**October 19-20, 2012**

**Radisson Newport Beach  
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The Southwest ACSM annual meeting has been approved for 15 Continuing Education Credits by the American College of Sports Medicine. There is no separate fee for CECs. Please retain the Certificate obtained at registration.



**FRIDAY, 19 OCTOBER 2012, continued**

**Student Research Award**

**1:00 pm – 2:30 pm**

**Pacific 3**

Moderator: Marcella Raney, Ph.D., Occidental College

**1:00 Accuracy and Test-retest Reliability of Sensewear Armband, Actiheart and Actigraph in Assessing Exercise Energy Expenditure in Adults**  
Dharini M Bhammar, Arizona State University

**1:15 Intermittent Pneumatic Compression May Improve Bone Mineral Density at the Hip**  
Zakkoyya Lewis-Powell, Loyola Marymount University

**1:30 Effect of Rest Interval on Oxygen Consumption Following Resistance Exercise**  
David W. McMillan, California State University, Northridge

**1:45 Effects of Relative Humidity on Thermoregulation and Perception During Low Intensity Exercise in the Heat**  
Nicole E. Moyer, California State University, Fullerton

**2:00 Acute Affects of a Walking Workstation on Ambulatory Blood Pressure in Prehypertensive Adults**  
Zachary Zeigler, Arizona State University

**Concurrent Colloquia**

**1:00 pm – 2:45 pm**

**The Power of Words: Motor Control Principles to Maximize Athletic Performance**

**Pacific 1**

Will Wu, Ph.D., Jared Porter, Ph.D., & Scott Ducharme, Ph.D.  
California State University, Long Beach  
Southern Illinois University

**Hot Nutrients: An Update on Vitamin D and Omega 3**

**Pacific 2**

Antonio Santo, Ph.D., R.D. and Laura Kruskall, Ph.D., R.D., FACSM  
University of Nevada, Las Vegas

**FRIDAY, 19 OCTOBER 2012, continued**

**Concurrent Symposia**

**3:00 pm – 4:30 pm**

**Reducing Falls and Fall Risk Among Older Adults?  
The Solution Lays in Well Designed Exercise Programs**  
Debbie Rose, Ph.D., California State University, Fullerton

**Pacific 1**

**What Are Muscle Fiber Types**  
Andrew Galpin, Ph.D., California State University, Fullerton

**Pacific 2**

**Evidence Based Guidelines for Exercise Prescription:  
Using the ACSM Position Stand on Progression Models in  
Resistance Training for Healthy Adults**

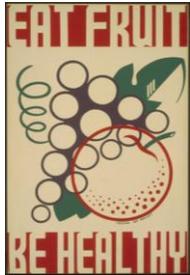
**Pacific 3**

Brent Alvar, Ph.D., FACSM, Rocky Mountain University of Health Professions

**SOCIAL EVENT**

**Pavilion**

**4:30 -7:00 PM**



**Poster Presentations**

**Graduate School Fair**

**No Host Wine/Cheese Reception**

**SPECIAL EVENT**

**Pacific 4 & 5**

**6:30 -8:00 PM**

***Student Jeopardy Bowl***

**SATURDAY, 20 OCTOBER 2012**

**Registration**

**Crystal Cove**

**7:30 am - 11:00 am**

**Student Colloquium**

**8:00 am – 9:30 am**

**Pacific 3**

**What is the Future of Kinesiology?**

**Ph.D., Jobs, Hot Topics**

Panel: ACSM, NSCA, NATA, NASSS, & NAK Presidents

Moderator: Dale Wagner, Utah State University

**Continental Breakfast; Give-a-Ways**

**Concurrent Colloquia**

**8:30 am – 9:30 am**

**Numbers Don't Always Tell the Truth; In Defense of  
Humanities Within Sport Science**

**Pacific 1**

Scott Tinley, Ph.D., San Diego State University

Andrew Harrington, Ph.D., Claremont Graduate University

John Gleaves, Ph.D., California State University, Fullerton

**Skeletal Muscle Design to Meet Functional Needs**

**Pacific 2**

Richard Lieber, Ph.D., University of California, San Diego

**Concurrent Colloquia**

**9:45 am – 11:15 am**

**Vibration Exercise: Concept to Implementation**

**Pacific 3**

Matt Rhea, Ph.D., AT Still University

**The Birds and the Bees and T Cells and the B Cells:  
Sex Differences in Post Exercise Immune Response**

**Pacific 2**

Trevor Gillum, Ph.D., California Baptist University

**Leadership...What EXACTLY is It?**

**Pacific 1**

Julie Max, M.S., NATA Past-President, California State University, Fullerton

**LUNCH**

**11:30 AM - 1:00 PM**

**SATURDAY, 19 OCTOBER 2012, continued**

**Concurrent Colloquia**

**1:00 pm – 2:15 pm**

**The Impact of Exercise and Diet on Bone Mineral Density  
During the Growth Period**

**Pacific 2**

Ken Sumida, Ph.D., Chapman University  
Hawley Almstedt, Ph.D., Loyola Marymount University  
S. Victoria Jaque, California State University, Northridge

**Coaching Excellence: Strategies for Optimizing Athlete  
Performance**

**Pacific 1**

Andrea Becker, Ph.D., California State University, Fullerton

**The Red Headed Stepchild of Environmental Physiology:  
Relative Humidity**

**Pacific 3**

Daniel Judelson, Ph.D., FACSM, California State University, Fullerton

**General Session**

**2:30 pm – 4:00 pm**

**Pacific 4 & 5**

Moderator: John Mercer, Ph.D., FACSM, President, SWACSM  
University of Nevada, Las Vegas

**Student Awards**

**Recognition of Host School:  
California State University, Fullerton**

**Business Meeting**

**Founders Lecture**

***Real Health Benefits of Resistance Training***

Steven Fleck, Ph.D., CSCS, FACSM, FNCSA  
President, National Strength and Conditioning Association  
University of Wisconsin - Parkside

## SOUTHWEST ACSM RECOGNITION AWARD

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1985	Fred Kasch
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1989	G. Lawrence Rarick
1990	Lawrence Morehouse
1991	William Haskell
1992	Ralph Paffenbarger
1993	Franklin Henry
1994	George Brooks
1995	James Skinner
1996	Christine Wells
1997	Lawrence Golding
1998	Ken Baldwin
1999	Robert Conlee
2000	Gail Butterfield
2001	R. James Barnard
2002	Gene Adams
2003	Vivian Heyward
2004	Fred Roby
2005	Marta Van Loan
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2007	Larry Verity
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**2012 SWACSM**

**Annual Meeting**

**ABSTRACTS**

**Student Research Award  
Poster Presentations**



# STUDENT RESEARCH AWARD

## 1. ACCURACY AND TEST-RETEST RELIABILITY OF SENSEWEAR ARMBAND, ACTIHEART AND ACTIGRAPH IN ASSESSING EXERCISE ENERGY EXPENDITURE IN ADULTS

Dharini M Bhammar, Brandon J Sawyer, Wesley J Tucker, Glenn A Gaesser, FACSM

Healthy Lifestyles Research Center, Exercise and Wellness, School of Health Promotion and Nutrition, Arizona State University

**Purpose:** Our aim was to estimate validity and reliability of the SenseWear Armband (SWA), Actiheart (AH) and Actigraph GT3X+ (AG) monitors for assessing physical activity energy expenditure (EE) in adults. **Methods:** Twenty four adults (ages  $29 \pm 9$  years; BMI:  $23.9 \pm 3.7$  kg/m<sup>2</sup>) underwent 96 minutes of exercise including walking, cycling, arm cranking, and simulated activities of daily living. Each activity lasted 8 minutes with a 4-minute seated rest period between activities. EE was measured by indirect calorimetry using the Oxycon Mobile™ (OM) and estimated by four activity monitors: SWA (version 7.0), AH software versions 2.0 (AH 2.0) and 4.0 (AH 4.0) and AG. Linear mixed models and intraclass correlation coefficients (ICC) were used for statistical analysis. **Results:** Total EE values for 96-min were not significantly different between SWA and OM ( $P = .084$ ). Total EE for AH 4.0, AH 2.0 and AG was significantly lower by  $62 \pm 63$  kcal,  $110 \pm 47$  kcal and  $129 \pm 60$  kcal respectively as compared to OM. During the steady-state (minutes 4 to 7), only AH 4.0 accurately predicted walking EE and only AH 2.0 accurately predicted jogging EE. SWA was the only device that accurately estimated EE during rest. ICC analysis between OM and the four activity monitors found high test-retest reliability for walking at 3mph (.824 to .943) and moderate-to-high reliability for walking at 4mph, jogging at 5mph, sweeping and loading and unloading groceries (.506 to .989). Low to moderate reliability was found for cycling, arm cranking and seated rest (.005 to .738). **Conclusions:** The SWA provides valid EE estimates for rest and total EE, while the AH provides valid and reliable estimates for walking and jogging EE. However, all devices were unreliable for estimating EE for activities with minimal or variable accelerometer input such as cycling, arm cranking or activities of daily living.

## 3. EFFECT OF REST INTERVAL ON OXYGEN CONSUMPTION FOLLOWING RESISTANCE EXERCISE

David W. McMillan<sup>1</sup>, Ashton Harvey<sup>1</sup>, Anna Gossett<sup>1</sup>, Sean Witikin<sup>1</sup>, Guillermo Casanada<sup>1</sup>, Richard Gavino<sup>1</sup>, Romyer Harvey<sup>1</sup>, and Michelle T. Barrack<sup>2</sup>

<sup>1</sup>Dept of Kinesiology, California State University, San Marcos

<sup>2</sup>Dept of Family and Consumer Sciences, California State University, Northridge

The role of rest interval during resistance exercise (RE) on post-exercise oxygen consumption (VO<sub>2</sub>) has yet to be established, and may contribute to body mass management. **PURPOSE:** Determine the effect of rest interval length on VO<sub>2</sub> following RE. **METHODS:** Eight men (age =  $23.0 \pm 0.76$  yrs, body mass =  $89.1 \pm 17.8$  kg) participated in this study. Subjects completed two trials of an 8 exercise resistance training regimen designed to target all major muscle groups. Lifts were performed at 3 sets of 8 repetitions at 65% 1RM. The short rest (SR) interval trial allowed for 30s rest between sets and 60s between exercises; the long rest (LR) interval trial allowed 90s and 180s, respectively. The measurement of VO<sub>2</sub> began immediately post-exercise and was continued for 60 min. **RESULTS:** There was a twofold difference in time to completion between SR ( $24.7 \pm 2.5$  min) and LR ( $55.3 \pm 0.9$  min). Recovery period VO<sub>2</sub> was greater in SR versus LR ( $4.9 \pm 0.9$  ml·kg<sup>-1</sup>·min<sup>-1</sup> vs.  $4.4 \pm 0.5$  ml·kg<sup>-1</sup>·min<sup>-1</sup>,  $p < 0.05$ ), this increased rate occurring primarily in the first 20 min post-exercise. Calorie expenditure during recovery was higher in SR compared to LR ( $116.9 \pm 10.7$  vs.  $107.8 \pm 13.1$  kcal,  $p < 0.05$ ). Heart rate was also greater in SR compared to LR during both exercise ( $141.1 \pm 20.1$  vs.  $124.0 \pm 15.9$  bpm,  $p < 0.05$ ) and recovery ( $81.6 \pm 10.7$  vs.  $68.3 \pm 6.0$  bpm,  $p < 0.05$ ). **CONCLUSION:** A threefold decrease in rest interval resulted in a 9.7% increase in 60 min post-exercise VO<sub>2</sub> and caloric expenditure. When body mass management is primary goal of exercise, short rest periods can be recommended for its ability to facilitate caloric expenditure.

## 2. INTERMITTENT PNEUMATIC COMPRESSION MAY IMPROVE BONE MINERAL DENSITY AT THE HIP

Zakkoyya Lewis-Powell and Hawley Almstedt, Ph.D., R.D.

Department of Health and Human Sciences, Loyola Marymount University

Osteoporosis is a major public health concern that results from low bone mineral density (BMD) which increases a person's risk of fracture. The ACSM suggests that to make the skeleton more resistant to fracture, individuals should maximize BMD early in life and minimize BMD loss after the age of 40. The dynamic adult skeletal tissue still experiences changes in BMD through remodeling in direct response to stress applied to bone, causing strain which may lead to structural skeletal changes. Recent studies suggest that intermittent pneumatic compression (IPC) may deliver this effect. To date, research has not investigated the effect of IPC treatment on nonfractured bone. **PURPOSE:** The present study evaluates the effect of IPC on BMD at the hip of individuals without injury. **METHOD:** Nine participants (3 male, 6 female) completed a pre-intervention screening, the IPC treatment, and a post-intervention screening. The intervention was preceded and followed by measurements of anthropometrics, BMD, physical activity and nutrient intake. The IPC treatment consisted of 5 hours per week of IPC treatment on one leg for 10 weeks. Pressure was set to 60mmHg and two different IPC models were used: PresSion (Chattanooga, Vista, CA) and FlowtronHydroven (HuntleighHelathcare, Eatontown, NJ). **RESULTS:** The average number of completed intervention sessions was  $43.4 (\pm 3.8)$  at an average duration of  $9.6 (\pm 0.8)$  weeks. A two-way, repeated measures analysis of variance indicated a significant difference in change in BMD between treated and nontreated limbs at the femoral neck ( $p=0.023$ ), trochanter ( $p=0.027$ ), and the total hip ( $p=0.008$ ). On average the treated hip increased  $0.5-0.9\%$ , while the nontreated hip displayed a  $0.8-1.8\%$  decline, depending on the bone site. **CONCLUSION:** The results of this preliminary investigation suggest that IPC may be osteogenic and compel further investigation of IPC as a means to reduce outcomes of osteoporosis.

## 4. EFFECTS OF RELATIVE HUMIDITY ON THERMOREGULATION AND PERCEPTION DURING LOW INTENSITY EXERCISE IN THE HEAT

Nicole E. Moyen, Carolyn L.V. Ellis, Anthony B. Ciccone, Taylor S. Thurston, Kristen C. Cochrane, Lee E. Brown FACS, Jared W. Coburn FACS, and Daniel A. Judelson FACS

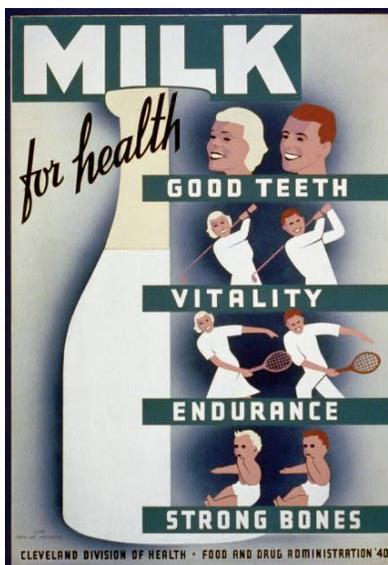
California State University, Fullerton; Department of Kinesiology, Center for Sport Performance

Limited research demonstrates increasing relative humidity (RH) impairs high intensity exercise performance in hot environments. As military personnel and day laborers sometimes work extended hours in hot humid climates, investigating RH's independent effects during prolonged, low intensity exercise also merits attention. Therefore, this study examined how RH influenced thermoregulation and perception during low intensity exercise in the heat. Thirteen healthy male recreational exercisers (age= $23 \pm 2$  y, mass= $83.1 \pm 13.3$  kg, height= $179.9 \pm 5.9$  cm, VO<sub>2</sub>max= $55.6 \pm 7.3$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, body fat= $12.6 \pm 4.4$  %) walked for 90 min at 35% VO<sub>2</sub>max in 35 °C, completing trials at 40% RH (40RH), 55% RH (55RH), 70% RH (70RH), and 85% RH (85RH). Investigators obtained 1) heart rate (HR), rectal temperature (T<sub>re</sub>), skin temperatures (T<sub>sk</sub>), rating of perceived exertion (RPE), thermal sensation (TS), thirst, and environmental conditions every 5 min, 2) pulmonary ventilation (VE) and absolute oxygen consumption (VO<sub>2</sub>) every 25 min, and 3) pre and post nude body masses. No differences existed in sweat rate (SWR) or hydration state between 40RH and 55RH or between 70RH and 85RH, but the higher RH trials elicited significantly greater SWR and percent hypohydration than the lower RH trials. Incremental increases in RH caused non-linear increases in T<sub>re</sub> such that: 1) 40RH and 55RH equaled throughout the trials, 2) 70RH exceeded 40RH and 55RH from 35-90 min, and 3) 85RH exceeded all other trials from 40-90 min. Increases in T<sub>re</sub> subsequently appeared to catalyze changes in T<sub>sk</sub>, HR, VE, VO<sub>2</sub>, RPE, and TS, which demonstrated similar patterns as T<sub>re</sub> with minor temporal variations. Thirst behaved differently, with 85RH exceeding all other trials after 40 min and no other differences among trials. In these conditions, a RH threshold for sufficient evaporative heat loss plausibly existed between 55-70% RH. Exceeding this RH threshold overwhelmed thermoregulatory abilities, resulting in higher perceptual ratings and potentially dangerous physiological stress.

## 5. ACUTE AFFECTS OF A WALKING WORKSTATION ON AMBULATORY BLOOD PRESSURE IN PREHYPERTENSIVE ADULTS

Zachary Zeigler, Amanda Gordon, DhariniBhammar, Pamela Swan, FACSM  
Arizona State University, Arizona, USA

Exercise performed at moderate or vigorous levels have been shown to cause a post exercise hypotensive response. However, whether this response is still seen with very low intensities is unclear. **PURPOSE:** To compare a worksite walking intervention (2.5 hours accumulated walking at 1mph on a walking workstation) to a normal sedentary work day and its effects on ambulatory blood pressure. **METHODS:** Participants were 7prehypertensive ( $127 \pm 8$  mmHg/ $83 \pm 8$  mmHg) men and woman (3 male, 4 female, age= $42 \pm 12$  yr) who participated in a randomized, two treatment cross-over study that included a control treatment and a walking treatment. The participants were required to wear an ambulatory blood pressure cuff (Oscar 2, SunTech Medical, Morrisville, NC) for 24-hours on the control treatment and the walking treatment day. These days were randomly assigned and were performed one week apart. During the walking treatment day the subjects were asked to walk periodically on a walking workstation device (Details, A Steelcase Company, Grand Rapids, MI). Total walking time was 2.5 hours over the course of an 8 hour work day. Walking speed was set at 1mph for each participant. Subjects were asked to resume normal daily activities on the control treatment day. Statistical analysis included ABP data collected from 9:00 am until 10:00 pm of the same day. Linear mixed models were used to detect differences in systolic and diastolic BP by treatment condition over the entire measurement period.**RESULTS:** Mean ( $\pm$  SE) systolic and diastolic BP were significantly lower during the walking treatment compared to the control day ( $126 \pm 7$ mmHg vs.  $124 \pm 7$ mmHg,  $p=.043$ ;  $80 \pm 3$ mmHg vs.  $77 \pm 3$ mmHg  $p<.001$ , respectively).**CONCLUSION:** Walking on the walking workstation at a speed of 1mph statistically reduced SBP and DBP when compared to a normal work day.



# POSTER PRESENTATIONS

## 1. THE EMG ACTIVITY OF FIGURE SKATING OFF-ICE SINGLE AND DOUBLE LOOP JUMPS.

Stephanie Adrian, Trevor Gillum  
California Baptist University, Dept of Kinesiology

The vertical jump is an important component in many sports; however the sport of figure skating is unique. The athlete must complete a designated number of rotations prior to landing. However there is little research characterizing the effects of rotation on the EMG activity with figure skaters. Purpose: To quantify the effect of the number of rotations on EMG activity of lower limb muscle during an off-ice loop jump. Methods: Six skaters volunteered to participate; 4 females and 2 males,  $20.2 \pm 3$  years old,  $161.8 \pm 7.1$  cm,  $57 \pm 6$  kg, and between Juvenile to Senior level skaters. EMG surface electrodes were placed over the bellies of the rectus femoris (RF), vastusmedialis (VM), biceps femoris (BF), tibialis anterior (TA) and gastrocnemius (GM) of the right leg. Subjects performed 6 jumps: 3 single rotation loop jumps with 1 minute rest, followed 3 double rotation jumps with 1 minute rest. EMG data recorded at take-off was used for analysis. Results: No significant difference in EMG activity between single and double rotation was found for any of the five muscles tested. The single rotation group showed a significantly greater activity in the RF ( $2.42E-04 \pm 8.21E-05$ ) compared to BF ( $1.36E-04 \pm 4.44E-05$ ) ( $p=0.008$ ) and GM ( $1.31E-04 \pm 3.63E-05$ ) ( $p=0.018$ ). The double rotation group showed greater activation in the RF ( $2.71E-04 \pm 8.13E-05$ ) compared to BF ( $1.59E-04 \pm 5.10E-05$ ) ( $p=0.011$ ) and GM ( $1.41E-04 \pm 3.47E-05$ ) ( $p=0.023$ ). Conclusion: Even with the increase of rotation there was no change in the muscular work performed at take off. Results suggest that by improving the take off of a single rotational jump, which is generally easier to perform, skaters will be able to see an similar improvement in the take-off of their double rotational jump since the intensity of the take-off is the same despite the number of rotations.

## 3. EFFECT OF BAND-RESISTED JUMPING AND SUBSEQUENT COUNTERMOVEMENT JUMP PERFORMANCE

Barker LA, DuBois AM, Brown LE, Coburn JW  
Center for Sport Performance, Human Performance Laboratory,  
Department of Kinesiology, California State University, Fullerton, CA

Post-activation potentiation resulting from a high-intensity stimulus improves performance eight to twelve minutes post stimuli. Resisted plyometric activity could elicit potentiation of the countermovement jump (CMJ) by altering ground reaction force, take off velocity or both, leading to an increase in jump height (JH). The time frame of the potentiating effects of resisted plyometrics is currently unknown. Therefore, the purpose of this study was to investigate the effect of different rest periods following band-resisted jumping on JH during bodyweight countermovement jumps. 22 recreationally active subjects (14 males:  $23.14 \pm 2.14$  yrs;  $86.50 \pm 14.99$  kg;  $179.25 \pm 7.92$  cm; 8 females:  $23.63 \pm 1.19$  yrs;  $58.58 \pm 4.43$  kg;  $161.40 \pm 6.77$  cm) performed three maximal baseline vertical jumps. On the treatment day, participants performed 5 consecutive band-resisted jumps at 130% of their body weight, followed by a single body weight CMJ at 30 seconds, 1, 2, 4, 6, 8, 10, and 12 minutes post stimulus. All CMJ were performed on an AMTI force plate sampling at 1000 Hz. Custom LabVIEW software calculated estimated JH. Peak JH occurred at 30 seconds for females ( $25.86 \pm 2.96$  cm), and at 2 minutes for males ( $36.22 \pm 5.20$  cm). Baseline JH (males:  $35.04 \pm 5.53$  cm; females:  $25.49 \pm 3.10$ ) was not significantly different ( $p>0.05$ ) from any rest time jump. However, there was a noticeable trend towards increased performance at four minutes post treatment. This trend demonstrates a need for further exploration into the manipulation of load and volume of band-resisted jumping as a potentiating stimulus.

## 2. THE ACUTE EFFECTS OF HEAVY DEADLIFTS ON VERTICAL JUMP PERFORMANCE IN MEN

Jerry C. Arias, Jared W. Coburn FACSM, Lee E. Brown FACSM,  
Andrew J. Galpin  
Exercise Physiology Laboratory and Center for Sport Performance,  
Department of Kinesiology, California State University, Fullerton

The purpose of this study was to investigate the acute effects of heavy deadlifts on vertical jump performance. Fifteen experienced men (age,  $23.9 \pm 4.2$  years; height,  $176.3 \pm 8.6$  cm; mass,  $76.1 \pm 16.3$  kg) participated in the study. Participants completed three testing sessions separated by at least 48 hours. At the first testing session, height, mass, and deadlift one repetition maximum (1-RM) were collected. Subjects then performed two experimental sessions in a random order and counter-balanced design: a control session (no deadlift) and a deadlift (5 repetitions using 85% 1-RM). Each day, subjects began with a dynamic warm-up, rested for five minutes, and then performed a single maximal counter-movement jump without an arm swing (CMJ). Subjects then either performed five repetitions of the deadlift using 85% of their 1-RM or stood still for ten seconds (control). Following either condition, subjects performed a single CMJ at the following intervals: 15 seconds, 2, 4, 6, 8, 10, 12, 14, and 16 minutes post condition. Peak vertical jump (VJ) height and peak ground reaction forces (GRF) were measured using a force plate. Two separate  $2 \times 10$  (condition  $\times$  time) repeated measures ANOVAs were used to assess VJ height and peak GRF. Results showed that for the deadlift condition, there was a significant ( $p < 0.05$ ) negative effect on VJ height 15 seconds following lifting. Performance of five repetitions of deadlifting did not affect GRF. Rest duration may have influenced the fatigue vs. potentiating effects. We speculate that if longer rest durations were given following the stimulus, subjects may have exhibited a potentiating effect or overcome the effects of fatigue.

## 4. INFLUENCE OF REST INTERVALS FOLLOWING ASSISTED JUMPING ON RELATIVE PEAK POWER

Vanessa L. Cazas, Lee E. Brown FACSM, Jared W. Coburn FACSM,  
Andrew J. Galpin, James J. Tufano, Joe W. LaPorta, Leah Truong  
Human Performance Laboratory, Center for Sport Performance,  
Department of Kinesiology, California State University, Fullerton,  
Fullerton, CA

**INTRODUCTION:** Increasing an athlete's relative peak power during jump performance is a crucial variable. As a result, the vertical jump is one of the most widely used and researched movements in sport. Assisted jumping is a relatively new training method and research is needed to determine how to optimally manipulate the program design variables to achieve the best training effect. **PURPOSE:** To determine the effect of rest interval on relative peak power (rPP) following assisted jumping. **METHODS:** Twenty healthy recreationally trained males (age:  $22.85 \pm 1.84$  yr, height:  $179.44 \pm 5.99$  cm, mass:  $81.73 \pm 9.51$  kg) attended five sessions. For all sessions, subjects performed the same dynamic warm up then executed one set of five consecutive assisted jumps at 30% body weight reduction. They then rested for 30 seconds (C0.5), one (C1), two (C2), or four (C4) minutes, followed by three body weight jumps with no assistance. Baseline jump height was measured without preceding assisted jumps. **RESULTS:** A  $1 \times 5$  repeated measures ANOVA revealed that rPP (W/kg) demonstrated a main effect with one minute being greater than all other conditions (C1:  $75.22 \pm 10.83$  W/kg; CB:  $73.04 \pm 9.00$  W/kg). **CONCLUSION:** It appears that one minute of rest may be appropriate to use to enhance vertical jump performance following assisted jumps. **PRACTICAL APPLICATION:** Athletes, who are exploring methods to acutely enhance their rPP, should warm-up utilizing five assisted vertical jumps with a one-minute rest, prior to performing body weight vertical jumps.

## 5. EFFECTS OF VARIOUS VEHICLES OF CAFFEINE INTAKE ON INTENSE MUSCLE PERFORMANCE IN WOMEN

Christina Cooper, Cheryl McMahan, Ethan Hughes, Cristine Diangelo, Ashley Estepa, Matthew Noel, Alexander Fortner, Moriah Scannell, Todd A. Astorino  
Department of Kinesiology, California State University--San Marcos

**Background:** Acute caffeine intake has been shown to reduce ratings of perceived exertion (RPE) which may increase exercise performance. However, there is less known about this effect during more intense, short-term exercise performance. **Aim:** The aim of the study was to examine the effects of two different forms of caffeine on muscle function and fatigability during intense lower-body exercise. **Method:** Ten active women (age =  $21.6 \pm 0.84$  yr, body mass =  $62.3 \pm 11.5$  kg) performed three trials of 80 repetitions of maximal knee extension/flexion on an isokinetic dynamometer, which followed a practice trial performed at least 24 h before the first treatment was ingested. Conducted as a randomized single-blind study in which subjects were deceived as to the composition of the drinks, subjects consumed 1 of 3 drinks 1 h before each trial. Treatment one consisted of a placebo (PL), treatment 2 consisted of Red Bull (RB) (1.5-2.3 mg/kg), and treatment 3 consisted of anhydrous caffeine (CAF) (2.5 mg/kg). There was a minimum of 48 h between all sessions, which were performed at the same time of day within subjects. All drinks were of similar volume and housed in identical opaque containers. **Results:** Mean  $\pm$  SD total work for PL, RB, and CAF was equal to 2,435.4  $\pm$  458.9 FT-LBS, 2,462.1  $\pm$  575.4 FT-LB, and 2,555.7  $\pm$  533.9 FT-LBS ( $P > 0.05$ ). Mean  $\pm$  SD work fatigue was similar ( $P > 0.05$ ) for PL (76.6  $\pm$  6.8%), RB (74.0  $\pm$  10.2%), and CAF (76.1  $\pm$  6.0%). RPE was higher ( $P < 0.05$ ) in RB (5.05  $\pm$  1.01) and CAF (5.5  $\pm$  1.0) versus PL (4.4  $\pm$  0.9). **Conclusion:** Previously-reported attenuations in RPE were not revealed in the present study, as RPE was increased in response to acute caffeine intake. Results also revealed no effect of caffeine intake on short-term muscular performance or fatigability in young, active women.

## 7. EFFECTS OF VARIED FREQUENCY OF INTERVAL TRAINING ON VO<sub>2</sub>MAX, SUBSTRATE METABOLISM, AND POWER OUTPUT

Raphael Dolojan, Dorian Deptuch, Anthony Jensen, Luis Morales, Andrew Ngo, Charlene Serbas, Todd A. Astorino  
Department of Kinesiology, CSU—San Marcos, San Marcos, CA

**Background:** High intensity training (HIT) represents completion of maximal, intermittent bouts of exercise. HIT significantly enhances energy metabolism and exercise performance, as demonstrated by increases in VO<sub>2</sub>max, fat oxidation, and power output. **Purpose:** This study assessed if differences in training volume and frequency of HIT elicit similar physiological adaptations. **Methods:** Eleven habitually active men were randomly assigned to one of two groups, HIT1 or HIT2. Men were instructed to maintain current physical activity during the course of the study. They performed 4 wk of HIT consisting of repeated 30 s Wingate tests (load = 8.5 % body weight) interspersed with a 5 min recovery. Men in HIT1 (n = 6, age =  $22.3 \pm 2.1$  yr; mass =  $72.7 \pm 10.7$  kg) performed 1 d/wk of HIT equal to 3 bouts in week 1, 4 bouts in week 2, 5 bouts in week 3 and 6 bouts in week 4, while men in HIT2 (n = 5, age =  $21.4 \pm 2.2$  yr; mass =  $72.88 \pm 10.1$  kg) performed 2 d/wk of HIT consisting of 1 - 3 bouts/d. Pre- and post-HIT, change in VO<sub>2</sub>max, power output, and substrate metabolism was assessed at the same time of day within subjects. **Results:** Men completing HIT 1 d/wk demonstrated a  $7.0 \pm 4.9$  % increase in VO<sub>2</sub>max compared to HIT2 (1.7  $\pm$  7.3 % change). Peak power and mean power did not change in either group ( $p > 0.05$ ). RER significantly decreased with HIT ( $p = 0.017$ ) reflecting enhanced fat utilization during exercise, but no significant changes were detected in RER between groups ( $p = 0.58$ ). **Conclusion:** HIT is a time-efficient means to improve VO<sub>2</sub>max and fat utilization in active men. Further study is merited to identify the optimal frequency of HIT to elicit maximal health and fitness-related benefits.

## 6. THE EFFECTS OF HAND POSITION AND CRANK CONFIGURATION ON MAXIMAL ARM-CRANK PERFORMANCE

Patrick W. Cottini, Ashleigh Huynh, Martin Frigaard and John L. Azevedo, Jr.  
Department of Kinesiology, California State University, Chico

Modern handcycles utilize a semi-vertical hand position and a synchronous crank configuration; however arm-crank ergometers utilize a prone hand position and asynchronous crank configuration. To assess the effects of hand position and crank configuration on maximal arm-crank performance, 10 subjects (5 male, 5 female) performed four separate trials to volitional fatigue. Trials were synchronous prone (hands horizontal, SP), synchronous vertical (hands in vertical position, SV), asynchronous prone (AP) and asynchronous vertical (AV, in random order). Maximal performance was assessed as maximal power output (PO<sub>max</sub>), oxygen consumption (VO<sub>2max</sub>), heart rate (HR<sub>max</sub>), respiratory exchange ratio (RER). Neither HR<sub>max</sub> nor RER<sub>max</sub> were different across all four trials nor between males and females (HR<sub>max</sub> = 175 bpm, RER<sub>max</sub> = 1.04). PO<sub>max</sub> was not significantly different across the four trials for all 10 subjects. However PO<sub>max</sub> was significantly greater in males than females for the respective trials ( $P < 0.001$ ). PO<sub>max</sub> for males was  $118 \pm 17.2$ ,  $112 \pm 14.4$ ,  $124 \pm 18.5$  and  $128 \pm 14.7$  watts for SP, SV, AP and AV, respectively. In females PO<sub>max</sub> was  $60 \pm 8.9$ ,  $64 \pm 4.9$ ,  $66 \pm 4.9$  and  $60 \pm 6.3$  watts for SP, SV, AP and AV, respectively. VO<sub>2max</sub> was not different across trials for all 10 subjects. However VO<sub>2max</sub> in males was  $2.1 \pm 0.2$ ,  $2.1 \pm 0.2$ ,  $2.2 \pm 0.3$  and  $2.2 \pm 0.4$  L/min in SP, SV, AP and AV, respectively. In females VO<sub>2max</sub> was  $1.1 \pm 0.2$ ,  $1.1 \pm 0.2$ ,  $1.2 \pm 0.2$  and  $1.1 \pm 0.1$  L/min in SP, SV, AP and AV, respectively. VO<sub>2max</sub> was significantly greater in males than females ( $P < 0.001$ ). VO<sub>2max</sub> was significantly correlated to PO<sub>max</sub> for all 10 subjects ( $P < 0.001$ ) and for males alone ( $P < 0.01$ ). There is no effect of hand position and crank configuration on maximal aerobic performance in males or females. There is no sex difference in HR<sub>max</sub> or RER<sub>max</sub>; however males had significantly greater PO<sub>max</sub>, VO<sub>2max</sub>. VO<sub>2max</sub> is primarily dependent upon PO<sub>max</sub> during arm crank exercise.

## 8. EFFECT OF RESISTED JUMPING ON VERTICAL JUMP IMPULSE

Andrea M. Du Bois, Leland A. Barker, Lee E. Brown, FACSM, Jared W. Coburn, FACSM  
Center for Sport Performance, Human Performance Laboratory, Department of Kinesiology, California State University, Fullerton, CA

Post-activation potentiation resulting from a traditional overload stimulus improves performance eight to twelve minutes post treatment. Plyometric activity could also elicit a potentiation effect on explosive performance by altering ground contact time, ground reaction force or both, leading to increases in vertical impulse. The potentiating time frame following overload of plyometric movements is currently unknown; therefore, the purpose of this study was to investigate the effect of different rest periods following resisted jumping on net relative impulse during bodyweight vertical jumps. 22 recreationally active subjects (14 males:  $23.14 \pm 2.14$  yrs;  $86.50 \pm 14.99$  kg;  $179.25 \pm 7.92$  cm; 8 females:  $23.63 \pm 1.19$  yrs;  $58.58 \pm 4.43$  kg;  $161.40 \pm 6.77$  cm) performed three maximal baseline vertical jumps. On the treatment day, they performed five resisted plyometric vertical jumps at 130% of their body weight followed by a single maximal body weight vertical jump at 30 seconds, 1, 2, 4, 6, 8, 10 and 12 minutes post treatment. All vertical jumps were performed on an AMTI force plate sampling at 1000 Hz. Custom LabVIEW software analyzed relative net vertical impulse (males:  $2.75 \pm 0.18$  N·s<sup>-1</sup>·kg<sup>-1</sup>; females:  $2.33 \pm 0.17$  N·s<sup>-1</sup>·kg<sup>-1</sup>) which was strongly and significantly ( $r = 0.963$ ;  $p < 0.01$ ) correlated to vertical jump height. There was no significant potentiation effect on relative net vertical impulse at any rest time. However, there was a noticeable trend towards increased relative net vertical impulse at four minutes post treatment. This trend could result in a potentiating effect with further manipulation of the resisted jump overload and/or repetition number.

## **9. EFFECT OF BRANCHED-CHAIN AMINO ACIDS AND CARBOHYDRATE SUPPLEMENT TIMING WITH RESISTANCE TRAINING ON STRENGTH IN WOMEN**

Kimberly N. Ellington, Will F. W. Wu, Lee E. Brown, FACSM, Jared W. Coburn, FACSM  
Department of Kinesiology, California State University, Fullerton and California State University, Long Beach, CA

Fueling and replenishing the body along with resistance training can enhance muscle strength. There is limited research available on how the timing of supplement ingestion affects strength gains in women. The purpose of this study was to investigate the effect of supplement timing with resistance training on strength in women. Five resistance trained women ( $25.00 \pm 2.82$  yrs;  $61.36 \pm 4.57$  kg;  $161.50 \pm 5.23$  cm) performed squat and chest press exercises three times per week for four weeks in one of two different supplement timing groups: during training or post training. The iso-caloric supplement contained 35 grams of carbohydrate and five grams of branched chain amino acids suspended in 12 oz. of non-caloric flavored water. One repetition maximum strength was measured pre and post training. The during group consumed the supplement after completing half of the workout while the post group consumed the supplement within 20 minutes after completing the workout. Both groups lifted with a modified periodized program at 75% week one, 85% week two, 90% week three and 85% week four. Results indicated there was no interaction involving group but there was a main effect for time. Squat (pre  $145.00 \pm 11.18$  lbs; post  $171.00 \pm 15.57$  lbs) and chest press (pre  $80.00 \pm 22.36$  lbs; post  $97.20 \pm 18.32$  lbs) strength were both significantly greater at post training. These results support strength gains in women following carbohydrate and branched chain amino acid supplementation regardless of timing. Future research should investigate extended training periods along with a resistance training and placebo group.

## **11. EVALUATING ACUTE CHANGES IN JOINT RANGE-OF-MOTION USING SELF-MYOFASCIAL RELEASE, POSTURAL ALIGNMENT EXERCISES, AND STATIC STRETCHES**

James D. George, FACSM, Derek S. Roylance, Adam M. Hammer, Nicole Rencher, Gilbert W. Fellingham, Ronald L. Hager, and William J. Myrer  
Department of Exercise Sciences, Brigham Young University

This study was designed to compare the acute effect of self-myofascial release (SMR), postural alignment exercises, and static stretching on joint range-of-motion. Our sample included 27 participants ( $n = 14$  males and  $n = 13$  females) who had below average joint range-of-motion (specifically a sit-and-reach score of 13.5 inches or less). All were university students 18–27 years randomly assigned to complete two 30–40-minute data collection sessions with each testing session consisting of three sit-and-reach measurements (which involved lumbar spinal flexion, hip flexion, knee extension, and ankle dorsiflexion) and two treatments. Each treatment included foam-rolling, postural alignment exercises, or static stretching and participants were assigned to complete session 1 and session 2 on two separate days no more than 48 hours apart. The data were analyzed so carryover effects could be estimated and showed that no single acute treatment significantly increased posterior mean sit-and-reach scores. However, statistically significant gains were realized with both postural alignment exercises and static stretching when used in combination with foam-rolling. For example, the posterior means equaled 1.71 inches when postural alignment exercises were followed by foam-rolling; 1.76 inches when foam-rolling was followed by static stretching; 1.49 inches when static stretching was followed by foam-rolling; and 1.18 inches when foam-rolling was followed by postural alignment exercises. Our results demonstrate that an acute treatment of foam-rolling significantly increased joint range-of-motion in participants with below average joint range-of-motion when combined with either postural alignment exercises or static stretching.

## **10. NO EFFECT OF A SINGLE REMOTE VOLUNTARY CONTRACTION ON PERFORMANCE IN WOMEN SOCCER PLAYERS**

Bryna K. Gallegos, Lee E. Brown, FACSM, Jared W. Coburn, FACSM, Andrew J. Galpin, and Vanessa L. Cazas  
Center for Sport Performance, Human Performance Laboratory, Department of Kinesiology, California State University, Fullerton, CA

Remote voluntary contractions (RVC) are defined as muscle contractions remote from, yet concurrent with, the prime mover. Previous studies suggest this phenomenon may produce an ergogenic effect on performance. Currently, little research has examined the effects of RVC on the performance of women athletes. The purpose of this study was to examine the effect of RVC on kick velocity and throw-in velocity in women soccer players. Fourteen women with competitive soccer experience in the past two years participated. Subjects performed three maximal effort kicks and three maximal effort throw-ins with and without RVC. The RVC condition consisted of maximal jaw clenching on a mouth guard during the concentric phase of each kick and each throw-in. During the control condition (CON), subjects were instructed to keep their mouths open and no mouth guards were used. Analyses demonstrated RVC had no effect on kick velocity (CON:  $40.79 \pm 5.21$  mph, RVC:  $41.57 \pm 5.84$  mph) or throw-in velocity (CON:  $30.79 \pm 3.51$ , RVC:  $30.64 \pm 2.37$  mph). In conclusion, RVC via jaw clenching does not appear to enhance kick or throw-in velocity in women athletes.

## **12. EFFECTS OF STATIC STRETCH DURATION ON ECCENTRIC MUSCULAR STRENGTH**

Jackie Godinez, Scott Johnson, Danielle Joseph, Alexandra Mora, Brianna Stewart, Monika Valenzuela, Tiffany Vansoest, and Todd A. Astorino  
Department of Kinesiology, CSU—San Marcos

Limited evidence exists regarding the effects of short-duration static stretching on eccentric muscular strength. Current data support reductions or no effect on force production of the lower extremities following static stretching. The primary aim of this study was to examine the effects of static stretch duration on eccentric muscular strength of the hamstrings in athletic women. Eight female athletes (mean age, height, and body mass =  $20.0 \pm 1.2$  yr,  $169.5 \pm 7.4$  cm, and  $62.4 \pm 8.8$  kg, respectively) participating in collegiate track and field completed the study. Exercise consisted of 1 set of 5 reps of maximal voluntary isokinetic muscle contraction following two assisted hamstring stretch protocols. An initial familiarization trial was completed on day 1, followed by three subsequent trials at the same time of day separated by at least 48 h. After a 3 min warm-up on a cycle ergometer, a 20 s protocol (total stretch time = 2 min), a 90 s protocol (total stretch time = 9 min) or no stretch protocol was performed. Order was randomized across trials. Stretching exercises consisted of two sets of assisted seated and supine hamstring stretch that were held for 20 or 90 s. Peak torque, average peak torque, and time to peak torque were obtained at a fixed velocity of  $60^\circ \cdot s$ . One-way ANOVA with repeated measures was used to examine differences in torque across stretching duration. Data displayed no effect ( $P > 0.05$ ) of stretch duration on peak torque, average peak torque or time to peak torque. For example, peak torque was similar between 20 and 90 s of stretching compared to no stretching ( $132.17 \pm 24.24$ ,  $129.37 \pm 25.27$ , and  $130.3 \pm 27.15$  ft/lb). Results conclude that eccentric hamstring torque during maximal isokinetic contraction is unaffected following static stretch durations of 20 or 90 s.

### 13. GLUCOSE AND FRUCTOSE INGESTION FOLLOWING HIGH INTENSITY EXERCISE DOES NOT AFFECT SUBSEQUENT EXERCISE CAPACITY

Adam Gutierrez and Marcella Raney  
Department of Kinesiology, Occidental College

Previous studies have suggested that ingestion of glucose+fructose prior to and during long duration endurance exercise may benefit performance more than ingestion of glucose alone. The purpose of this study was to investigate the effects of glucose+fructose ingestion on short duration high intensity exercise capacity. Eight trained male college athletes performed three randomized experimental trials consisting of a 20 minute run at 90% VO<sub>2</sub> max, a 5 minute recovery period, and a time-to-exhaustion (TTE) run at 90% VO<sub>2</sub> max. During the recovery period, subjects ingested a beverage containing glucose + fructose (G+F), glucose only (GLU), or placebo (PLA) matched for taste and electrolyte content. Carbohydrate (CHO) beverages each contained ~20g of carbohydrate. Subjects' blood glucose was measured immediately before and after each run period. Heart rate (HR) and Rating of Perceived Exertion (RPE) was recorded every 2 minutes during TTE. Blood glucose levels standardized to baseline values were significantly greater in the G+F trial both prior to and after TTE relative to PLA ( $P < 0.05$ ). However, there was no significant difference in HR, RPE, and TTE performance (G+F: 22.15±5.88min, GLU: 18.27±4.18min, PLA: 17.75±3.26min) between trials ( $P > 0.05$ ). Results from this study suggest that ingestion of glucose and fructose following high intensity exercise lasting 20 min does not enhance subsequent performance capacity more than glucose alone or placebo. Future studies are needed to determine if a stronger reliance on endogenous versus exogenous CHO in the early stages of high intensity exercise can account for the lack of performance benefits seen in this study.

### 15. A KINEMATIC AND ELECTROMYOGRAPHIC ANALYSIS OF THE "HIGH KNEES" AND "BUTT KICKS" RUNNING FORM DRILLS COMPARED TO RUNNING AT AN 8 MINUTE MILE PACE

Marnie Kinnaid and Stuart Rugg  
Department of Kinesiology, Occidental College

The purpose of this study was to perform a kinematic and electromyographical analysis of two common running form drills compared to running at an 8 minute mile training pace. Eight female collegiate track runners (average age, height, and weight of 21.2 years, 65.4in, and 125.9lb, respectively) participated in this study. Subjects performed the running portion and the "high knees" and "butt kicks" running form drills on a Life Fitness 95T treadmill. Video recordings were obtained using a Sony HDR-HC9 camcorder and analysed using Dartfish 5.5 Pro-Suite software. Muscle activity was measured using a standard non-invasive electromyographic (EMG) system (BIOPAC Systems, Inc.). Surface electrodes were placed on the left rectus femoris, vastuslateralis, biceps femoris long head, and gastrocnemius during each exercise. Results showed that subjects spent a similar percentage of time in both the stance (33-35%) and swing (65-68%) phases per gait cycle across all three movements. Compared to running, both hip and knee range of motion (ROM) increased by 41% during the "high knees" and "butt kicks," respectively. Because of variations in how each subject performed the running form drills, no consistent EMG pattern emerged for direct comparison across the runners. Based on the kinematic findings of this study, and in particular the similar timing of both the stance and swing phases of each gait cycle across exercises, these data help support the inclusion of form drills in training programs for runners looking to enhance running form.

### 14. DOES FOOTWEAR MATTER WHEN WALKING ON AN INCLINE?

Horsch, S.E., Dufek, J.S. FACSM  
Department of Kinesiology and Nutrition Sciences University of Nevada, Las Vegas

**Purpose:** The purpose of the study was to examine leg impact during treadmill walking at 0% and 5% incline with rounded outsole (ROS) and traditional outsole (TOS) shoes. **Methods:** Twelve participants, 7 males (75.13±9.34 kg, 173.60±3.63 cm, 22.86±3.53 yrs) and 5 females (56.54±5.13 kg, 158.26±4.51 cm, 25.40±11.10 yrs) granted written consent and preferred walking speed was determined. Next, an accelerometer was attached to the distal part of the leg to measure leg impact. Participants walked on a treadmill in each of two randomized conditions: 1) ROS 2) TOS. For each test condition, participants were asked to walk at 10% greater than preferred pace for up to three minutes at 0% grade and then 5% grade (slight incline). The dependent variable, maximum leg impact (MLI), was extracted from the average of five right foot contacts for each condition. A 2 (shoe) x 2 (incline) mixed model ANOVA was conducted ( $\alpha = 0.05$ ). *Post hoc* paired *t*-tests were performed for significant within subject main effects. **Results:** ANOVA results revealed significant differences in MLI between 0% and 5% incline ( $F = 8.476, p = .014$ ). The *post hoc* paired *t*-test identified a significant reduction in MLI for 5% (0.688±0.254) vs 0% (0.821±0.225) in ROS ( $t = 3.221, p = .008$ ). MLI was not significantly different at 5% vs 0% incline in TOS ( $t = 2.003, p = .070$ ). There were no significant differences in MLI between footwear conditions at either incline. **Discussion:** Walking in ROS on an incline vs level ground was shown to decrease MLI while a similar effect was not observed walking in TOS. It is suggested that if ROS are worn, one could walk on an incline to reduce MLI. However, additional research is warranted at different inclines to draw definite conclusions before advocating for either ROS or TOS to be worn while walking on an incline.

### 16. THE EFFECTS OF 8 WEEKS OF CROSSFIT® EXERCISE TRAINING ON POWER AND ENDURANCE IN YOUNG ADULTS

C. LoJacono, Z. Miller, K. Fertala, D. Willems, H. MacRae, and P. MacRae, FACSM  
Natural Science Department, Sports Medicine, Pepperdine University, Malibu, CA

This study examined the effects of 8-weeks of CrossFit® (CF), i.e. high intensity, constantly varied, functional training vs. Active Control (C) on measures of lower and upper body power and endurance in young adults. The CF group was composed of students in a CrossFit® course ( $n = 11, 20.0 \pm 1.6$  yrs) which met for two, 50 minute exercise classes per week. The CF group also completed a third CrossFit® workout on their own each week while continuing their "usual exercise". The C group ( $n = 16, 18.4 \pm 1.0$  yrs) were students who continue their "usual exercise" i.e. primarily jogging, over the 8 weeks primary. All participants completed daily physical activity logs. Upper body power (push-ups in 1 min), lower body power (run, carry, sled drag for time), and cardiorespiratory function (1 ½ mile run) were measured before and after 8 weeks of training. A two-way ANOVA for repeated measures was performed on each dependent measure. There was a significant Time x Group interaction for upper and lower body power but not for cardiorespiratory endurance:

- Upper body power ( $F_{1,25} = 27.4, P \leq 0.000$ ) CF ↑ 18%  
C ↑ 1%
- Lower body power ( $F_{1,25} = 15.0, P \leq 0.001$ ) CF ↑ 15%  
C 0%
- Cardiorespiratory endurance ( $F_{1,25} = 1.87, P = 0.18$ ) CF ↑ 10%  
C ↑ 4%

We conclude that 8 weeks of CF training improved upper and lower body power to a greater extent than 8 weeks of "usual exercise".

## 17. EFFECT OF TRAINING MODE ON POST-EXERCISE HEART RATE RECOVERY OF TRAINED CYCLISTS

Kelia G. McDonald, Silvie Grote, and Todd C. Shoepe  
Department of Health and Human Sciences, Loyola Marymount University

Exercise causes various physiological changes to compensate for the stress on the body. During exercise the sympathetic nervous system plays a dominant role in regulating body function, but after exercise the sympathetic nervous system withdraws and the parasympathetic nervous system helps the body return to a resting state. One way to observe the rate at which this happens is to measure heart rate recovery ( $HR_{Rec}$ ). **PURPOSE:** The goal of this study was to compare recovery heart rates of anaerobically trained and aerobically trained cyclists. **METHODS:** Anaerobically trained track cyclists ( $n = 10$ , age =  $25.9 \pm 6.0$ , weight (kg) =  $82.7 \pm 7.1$ , % body fat =  $10.0 \pm 6.3$ ) and aerobically trained road cyclists ( $n=15$ , age =  $39.9 \pm 8.5$ , weight (kg) =  $75.3 \pm 9.9$ , % body fat =  $13.1 \pm 4.5$ ) underwent a maximal oxygen uptake test and heart rates were recorded at 1 and 2 minutes after exercise. Heart rate recovery ( $HR_{Rec}$ ) was calculated by  $(HR_{max}-HR_{min1/2})/(HR_{max}-HR_{resting})$  to obtain a relative change and as a simple difference between max HR at HR at minutes 1 and 2. **RESULTS:**  $HR_{Rec}$  at minute one was  $22 \pm 8$  bpm for the track cyclists and  $25 \pm 12$  bpm for the road cyclists. At minute two,  $HR_{Rec}$  for the track cyclists was  $52 \pm 15$  bpm and  $64 \pm 11$  bpm for the road cyclists. Statistical significance was seen at minute two ( $p = 0.028$ ), with trends at minute one. **CONCLUSION:** Training mode showed statistically significant effects on the speed of heart rate recovery in trained cyclists. Aerobically trained cyclists were observed to recover faster than anaerobically trained cyclists. Training dependent divergence of recovery rates seen at two minutes compared to one minute of recovery suggests heart rate should be monitored longer than one minute of recovery for a better analysis of post-exercise autonomic shift.

## 19. THE EFFECTS OF KINESIO® TAPE ON VERTICAL JUMP AND DYNAMIC POSTURAL CONTROL

Mikiko Nakajima and Carolann Baldrige  
Department of Kinesiology, California State University, Long Beach

**Purpose:** The purpose of this study was to determine whether application of Kinesio® Tape had an effect on vertical jump and dynamic postural control for healthy young individuals. **Methods:** 52 healthy subjects free of ankle or lower extremity problems (28 males and 24 females; age:  $22.12 \pm 2.08$  years; height:  $170.77 \pm 8.69$ cm; weight:  $69.90 \pm 12.03$ kg) participated in the study. Subjects were randomly assigned to either the experimental group (Kinesio® Tape with proper tension) or the control group (Kinesio® Tape without proper tension). Vertical jump was measured using the VertiMetric and dynamic postural control was assessed using the Star Excursion Balance Test (SEBT) under three conditions: (1) without taping; (2) immediately after taping; (3) 24 hours after taping with the taping remaining in situ. **Results:** Two-way repeated measure ANOVA was conducted to identify differences between the experimental group and the control group. Overall, there were no differences between the Kinesio® Tape and the placebo group in vertical jump maximum height, vertical jump average height, or the SEBT scores for the three time periods (pre-test, post-test, 24hrs-post-test). However, the main effect of Kinesio® Tape was moderated by a significant gender interaction, resulting in a statistically significant effect of Kinesio® Tape for the SEBT scores in the posterior-medial direction,  $F(1.72, 82.57) = 4.50$ ,  $p = .018$ , and in the medial direction,  $F(1.76, 83.81) = 4.27$ ,  $p = .021$ . Follow-up analyses indicated that female subjects in the Kinesio® Tape group had increased SEBT scores between three time periods when compared to the placebo group. **Discussion:** Kinesio® Tape on the ankle neither decreased nor increased vertical jump height in healthy non-injured young individuals, but did increase dynamic postural control in females for certain directions. Additional study is warranted using different measures of balance to further investigate the effect of Kinesio® Tape on dynamic postural control.

## 18. EFFECT OF SALAMBA SIRSASANA ON HEART RATE VARIABILITY IN ADVANCED YOGA PRACTITIONERS

Steven Munassi, Silvie Grote  
Department of Health and Human Sciences, Loyola Marymount University

The effects of yoga practice have shown increased vagal modulation but there is limited information on which specific parts of yoga practice enhance autonomic control of the heart. **PURPOSE:** The goal of this study was to evaluate effect of acute inversion, salambasirsasana (supported headstand), on heart rate variability (HRV). **METHODS:** Advanced yoga practitioners ( $n = 16$ , 14 female and 2 male, age 21 to 58 years) completed 3 trials consisting of 5-minute phases of shavasana (resting pose), salambasirsasana, and shavasana. Breathing was paced during both trials of shavasana at 5 breaths per minute, but not during salambasirsasana. The trials were divided between two days within a one-week period. Each trial was carried out in the most comfortable environment for the individual (i.e. their studio, office, house etc.) or if unable to utilize those areas, in the Human Performance Lab at Loyola Marymount University. Heart Rate Variability measurements were assessed using the Polar RS800CX G5. **RESULTS:** Paired t test revealed statistically significant difference in HRV in very low frequency power (VLF) of trial 1 ( $p = 0.22$ ) and trial 2 ( $p = 0.21$ ). Statistical significance was also found in high frequency (HF) range of post phases of 2 trials performed on the same day ( $p = 0.043$ ). No trends were seen in low-frequency (LF) ranges. **CONCLUSION:** Salambasirsasana results in significant increases in VLF power of HRV in advanced yoga practitioners as seen in pre and post assessments of trial 1 and trial 2. Significant increases of HF ranges in post phases of 2 trials repeated in one day suggest increased vagal tone with repeated inversions. Future studies should examine the effect of inversions on HRV in non-practitioners.

## 20. EXAMINING LOWER EXTREMITY JOINT RANGE OF MOTION VARIABILITY DURING LANDING

Andrew D. Nordin & Janet S. Dufek, FACSM  
Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas

Investigations of movement variability examine the ability of the motor system to vary or broadly distribute internal loads, potentially reducing the risk of injury and increasing adaptation to a wider array of stimuli. Landing provides a movement with a high incidence of injury and the ability to control task demands. The purpose of this investigation was to examine changes in lower extremity movement variability during landing. Seven female participants (age  $21.14 \pm 2.34$  years; height  $1.66 \pm 0.10$ m; mass  $61.09 \pm 9.71$ kg) were used in examining flexion-extension and varus-valgus range of motion variability at the hip, knee, and ankle joints. Landing height was increased as a proportion of maximum vertical jump height (MVJH; 20%, 60%, 100%, 140%, 180%), measured using a Vertec apparatus. Kinematic and kinetic data were simultaneously acquired using a 12-camera system (Vicon MX T40-S; 200Hz) and two synchronized force platforms (Kistler 9281CA, 9281B; 2000Hz). Landing phase was defined from ground contact to the point vertical center of mass velocity reached zero. Variability was expressed using coefficient of variation (CV%). Comparisons were made using  $2 \times 3 \times 5$  (Side x Joint x Height) Mixed Model ANOVAs, with repeated measures on height ( $\alpha=0.05$ ), for each dependent variable. Flexion-extension variability significantly decreased at, and in excess of, 100% MVJH,  $F(1.9, 66.6)=10.298$ ,  $p<.001$ ,  $\eta^2=.222$  (20% MVJH:  $13.2 \pm 2.7\%$ , 60% MVJH:  $9.7 \pm 1.1\%$ , 100% MVJH:  $8.4 \pm 1.3\%$ , 140% MVJH:  $5.3 \pm 2.2\%$ , 180% MVJH:  $6.3 \pm 1.9\%$ ). Varus-valgus variability differed between joints,  $F(2,36)$ ,  $p=.006$ ,  $\eta^2=.949$ , where the hip ( $34.8 \pm 5.9\%$ ) exceeded the knee ( $27.6 \pm 5.9\%$ ,  $p=.042$ ) and ankle joints ( $25.8 \pm 6.0$ ,  $p=.008$ ). A significant decrease in varus-valgus variability was observed between 60% ( $36.1 \pm 7.2\%$ ) and 140% MVJH ( $23.0 \pm 4.8\%$ ,  $p=.003$ ) in the leg that made initial ground contact. These results may suggest susceptibility to lower extremity injury among female participants at increased landing heights. Future investigations should examine changes in movement variability for kinetic parameters, landing asymmetries, and gender differences during landing.

## 21. WEIGHT SHIFT DURING THE SHOT PROCESS OF ARCHERS

Hannah E. Peltzer, James J. Tufano, and Lee E. Brown, FACSM  
Center for Sport Performance, Human Performance Laboratory,  
Department of Kinesiology, California State University, Fullerton, CA

Balance plays a large role in shooting sports. Furthermore, shifting weight between feet is important for bracing against the shot and to increase accuracy. The purpose of this study was to examine weight shift during the shot process of archers. Seven collegiate archers participated ( $21.29 \pm 3.73$  years;  $91.69 \pm 24.62$  kg). In order to measure weight shift, each subject stood on an AMTI force plate and completed two archery shot conditions. They performed two visualization shots without a bow: one shot with the front foot on the plate (VF) and one with the rear foot on the plate (VR) as well as three live-fire shots with the front (LF) and rear foot (LR) on the force plate. Shots were completed in random order, but all three live-fire shots were performed consecutively for each foot. Ground reaction forces were directly measured and sampled at 1000Hz. Ground reaction forces were divided by body mass to obtain relative weight shift values. ANOVA revealed no differences for rear-foot force between visualization ( $32.74 \pm 12.11\%$ ) and live-fire ( $35.91 \pm 10.87\%$ ) conditions. However, front-foot force was significantly greater in the live-fire condition ( $70.48 \pm 13.41\%$ ) when compared to the visualization condition ( $62.83 \pm 12.04\%$ ). These data show that weight shift during visualization and live-fire conditions was not identical. Therefore, it may be suggested that archers perform physical movements in a specific manner relative to the mental task when shooting.

## 22. EFFECT OF ANKLE SUPPORTS ON VERTICAL JUMP AND MENTAL PERCEPTION

Ramirez, DA\*, Brown LE, FACSM†, Almstedt, HC\*, Kersey RD†, Shoepe, TC\*

\*Loyola Marymount University, Los Angeles, CA, †California State University, Fullerton, Fullerton, CA

Taping and bracing are commonly used by athletes to prevent injury. Although they have been shown to decrease ankle range of motion, ankle support research is inconclusive regarding their effects on vertical jump (VJ) and mental perception. Twenty-four males (age  $20.38 \pm 1.10$  yrs, height  $178.97 \pm 8.50$  cm, and mass  $76.54 \pm 7.58$  kg) and 14 females (age  $20.71 \pm 1.20$  yrs, height  $166.36 \pm 5.93$  cm, and mass  $62.85 \pm 7.73$  kg) recreationally trained basketball or volleyball players participated. Three ankle support conditions were applied: control (C), taping (T), and bracing (B). All participants completed three maximal efforts of the VJ on three separate days under the three different randomized conditions. Mental perception was measured using three questions prior to and following each day of VJ. All measurements and support applications were administered by the same certified athletic trainer. With significance set at  $p < .05$  for all analysis, a  $3 \times 2$  (condition and sex) mixed factor repeated measures analysis of variance (ANOVA) was used to determine differences in VJ and a  $3 \times 2 \times 2$  (condition  $\times$  sex  $\times$  time) mixed factor repeated measures ANOVA was used to determine perception survey differences. The VJ ANOVA revealed no interaction of condition by sex but there were significant main effects for condition and sex. T ( $50.51 \pm 13.42$  cm) and B ( $51.13 \pm 12.61$  cm) resulted in significantly lower VJ than C ( $53.65 \pm 12.63$  cm) while T and B were not significantly different from each other. Although not significant, the interaction ANOVA for perception revealed main effects for condition, such that T and B were perceived to be significantly less comfortable and affected performance more negatively than C. In the support survey, T and B were perceived to offer a significantly greater amount of support than C. While injury prevention must be addressed, VJ and perception should not be compromised unless dictated by previous pathologies.

## 23. EFFECTS OF FOUR WEEKS OF SQUAT, HANG CLEAN OR COMBINATION TRAINING ON VERTICAL JUMP IN COLLEGE FEMALES

Anthony W. Skinner, Lee E. Brown, FACSM, Jared W. Coburn, FACSM  
Center for Sport Performance, Human Performance Laboratory,  
Department of Kinesiology, California State University, Fullerton

Success in athletics often depends on explosive leg power, which is perhaps best exemplified by the vertical jump. The purpose of this study was to investigate the effect of squat, hang clean or combination training on vertical jump, squat and hang clean. 34 college female kinesiology student volunteers were randomly assigned to either a squat, hang clean, or squat/hang clean combination group that trained two days a week for four weeks. Each subject performed a pre and post-test vertical jump (via Vertec), 1RM squat and 1RM hang clean. Weight lifting percentages increased from 60% to 90% throughout the study. Three  $3 \times 2$  (group  $\times$  time) mixed factor repeated measures ANOVA were used to determine the difference between pre and post-training test scores. Alpha was set a-priori at 0.05. For the vertical jump, there was no interaction but there was a significant main effect for time showing an increase in height [pre- $14.52(2.5)$ ; post- $16.22(2.4)$  in]. For the hang clean, there was no interaction but there was a significant main effect for time showing an increase in strength [pre- $70.16(12.91)$ ; post- $81.27(13.27)$  lbs]. For the squat, there was a significant group  $\times$  time interaction. A significantly greater increase was found for the squat group [pre- $120.83(32.81)$ ; post- $141.25(32.27)$  lbs] and combination group [pre- $113.00(24.52)$ ; post- $135.00(28.77)$  lbs] when compared to the hang clean group [pre- $138.33(42.98)$ ; post- $148.33(39.39)$  lbs]. Results from the present study suggest that either squat, hang clean or combination training twice a week for four weeks can increase vertical jump performance in novice college females. Improvements in the hang clean can be obtained through either type of training, while squat training alone or in combination with hang cleans appears to achieve the greatest improvements in squat strength.

## 24. EFFECTS OF AN ACUTE BOUT OF LOWER BODY AEROBIC EXERCISE ON MUSCLE ACTIVATION AND PERFORMANCE DURING SINGLE SETS OF LOWER AND UPPER BODY RESISTANCE EXERCISE WORKOUTS

Jeremy G. Tan, Jared W. Coburn FACSM, Lee E. Brown FACSM, Daniel A. Judelson FACSM  
Exercise Physiology Laboratory and Center for Sport Performance,  
Department of Kinesiology, California State University, Fullerton

We previously reported that a lower body aerobic workout negatively affects performance during a subsequent lower body workout, but muscle activation or performance during a subsequent upper body resistance exercise workout is unaffected. However, these results were determined with multiple sets of exercise. Effects of aerobic exercise may be most evident during the first set following aerobic activity. Therefore, the purpose of this study was to determine the effects of an acute bout of lower body aerobic exercise on muscle activation and performance of single sets of lower and upper body resistance exercises. Twelve men (mean  $\pm$  SD age =  $24.1 \pm 2.3$  y, height =  $180.8 \pm 6.9$  cm, body mass =  $91.9 \pm 16.4$  kg) completed four visits in random order. Two visits involved thirty minutes on the elliptical machine at 70% of age-predicted maximum heart rate prior to single sets of either the back squat (ES) or bench press (EB), performed to failure with 75% 1RM. Two additional trials consisted of the back squat (SO) or bench press (BO) exercises. Surface EMG electrodes were placed on the vastus lateralis (ES and SO) or pectoralis major (EB and BO). Acute lower body aerobic exercise didn't reduce the number of repetitions completed during subsequent performance of a single set of the squat (ES =  $12.7 \pm 3.8$  repetitions; SO =  $14.4 \pm 4.2$  repetitions) or bench (EB =  $13.9 \pm 2.4$  repetitions; BO =  $13.8 \pm 3.1$  repetitions). For the bench and squat, muscle activation, determined by normalized EMG amplitude, increased significantly between the first and final repetitions (squat, first repetition =  $0.99 \pm 0.17$ , final repetition =  $1.24 \pm 0.21$ ; bench, first repetition =  $0.63 \pm 0.05$ , final repetition =  $1.05 \pm 0.70$ ), regardless of whether or not the workouts were preceded by exercise on the elliptical. It's concluded that an acute bout of lower body aerobic exercise doesn't have different effects on the first set of subsequent lower and upper body resistance exercises.

## 25. UPPER-BODY SURF-SPECIFIC FITNESS ASSESSMENT AND COMPARISON IN NOVICE AND ADVANCED SKILL LEVEL RECREATIONAL SURFERS

Morgan Tapper, Mark Gorelick and Marialice Kern  
Department of Kinesiology at San Francisco State University

The professionalization and increased popularity of surfing has increased the interest in the role physical fitness plays in surfing performance. This study will attempt to elucidate how surf specific upper-body physical fitness differs in recreational surfers. It was hypothesized that the upper-body fitness measures would be different in surfers of different skill levels with advanced surfers performing better than novice surfers. The majority of the activity in surfing is intermittent board paddling of various intensities and times (Meir, Lowdon, and Davie 1991). Current research shows that blood lactate concentration measured during incremental upper-body ergometry correlates with more skilled surfers and may be a good indicator of surf-specific fitness (Mendez-Villanueva et al 2005, Loveless and Minahan 2010). This study assessed paddling fitness in recreational surfers and compared two groups of recreational surfers of different skill levels. Nine male surfers (25.33±2sd years old) participated and were divided into two groups based on self-reported skill level using a modified surfing skill scale (Hutt, Black, and Mead 2001). Participants performed an incremental prone arm crank  $VO_{2peak}$  test (Kimura, Yeater and Martin 1990). Oxygen consumption and blood lactate concentration was assessed during the arm crank test. Statistical significance between groups was accepted at  $P < 0.05$ . There were no significant differences between groups in time to exhaustion,  $VO_2$ , HR or blood lactate concentration during the arm crank test. Time to exhaustion was nearly significant at  $P < 0.08$ . Overall the trends indicated that advanced skill level surfers had superior upper-body fitness, but limitations due to small sample size and incomplete data sets prevented any significant findings. Further testing of more participants and more statistical analysis will be necessary to determine if this mode of upper-body arm ergometry can measure differences in surf-specific upper-body fitness in surfers of different skill levels.

## 27. EFFECTS OF ISOMETRIC SQUATS ON VERTICAL JUMP IN MALE RECREATIONAL CLUB ATHLETES

Whiteford, S., Sevene, T., Berning, J.M., and K.J. Adams, FACSM.  
Exercise Physiology Lab, Kinesiology Department, California State University Monterey Bay, Seaside, CA

Warm-up strategies are designed to positively impact performance. Past research supports that heavily loaded contractile actions (e.g., squats) may enhance subsequent power production (e.g., vertical jumps). **Purpose:** The purpose of this study was to investigate the effects of a 3 second maximal isometric squat (3/4 position) on the counter movement vertical jump (CMVJ) of male recreational club athletes. **Methods:** Fourteen male, recreational club athletes (height  $180.3 \pm 10.7$  cm, mass  $92.7 \pm 22.0$  kg, age  $21 \pm 2$  yrs) were tested. Subjects completed three randomly ordered warm-up protocols followed by five minutes of rest and a CMVJ test on separate days. The protocols tested were no warm-up (Cold), a five minute jog (Standard), and 3 maximal isometric back squats (Isometric). **Results:** No significant difference ( $p = 0.72$ ) occurred between any warm-up protocol; mean  $\pm$  SD = Cold CMVJ ( $56.7 \pm 9.5$  cm), Standard CMVJ ( $58.5 \pm 10.2$  cm), and the Isometric CMVJ ( $58.3 \pm 11.2$  cm). The isometric and standard warm-ups resulted in 2.7 and 3.1% improvements respectively as compared to the Cold CMVJ. **Conclusions:** 1) A 3 second maximal isometric squat did not significantly improve CMVJ performance in recreational club athletes; and 2) no significance difference in CMVJ was observed between the 3 different warm-up protocols tested (Cold (no warm-up), standard (5 minute jog) and maximal isometric squats).

## 26. EFFECT OF AEROBIC ACTIVITY ON DELAYED-ONSET MUSCLE SORENESS AND PERFORMANCE

James J. Tufano, Lee E. Brown, FACSM, Jared W. Coburn, FACSM, Kavin K. W. Tsang, Vanessa L. Cezas and Joe W. LaPorta  
Center for Sport Performance, Human Performance Laboratory, Department of Kinesiology, California State University, Fullerton, CA

Due to the performance decrements associated with delayed-onset muscle soreness (DOMS), a treatment to alleviate its symptoms is of great interest. The purpose of this study was to investigate the effect of low vs. moderate-intensity cycling on DOMS. Twenty-six females ( $22.11 \pm 2.49$  yrs;  $60.33 \pm 8.37$  kg;  $163.83 \pm 7.29$  cm) performed a DOMS-inducing protocol followed by one of three recovery interventions: moderate-intensity cycling (MIC), low-intensity cycling (LIC), or rest (CON) immediately after the eccentric protocol. Pain scale (PS), pressure-pain threshold (PA), leg volume (RLV), vertical jump height (VJH), isometric strength (ISO), and dynamic strength (PT240) were recorded immediately post (IP), 24- (24h), 48- (48h), 72- (72h), and 96- (96h) hours after exercise. Neither PA, RLV, nor VJH were different between groups at any time point. Additionally, there were no interactions for PS, PS, RLV, VJH or PT240, but there was for ISO. For PT240, PRE, 48h, 72h, and 96h were significantly ( $p < 0.05$ ) greater than IP, but not different than 24h. For PS, IP ( $4.83 \pm 0.36$ ) was greater than all other time periods while 24h ( $2.91 \pm 0.42$ ), 48h ( $2.62 \pm 0.53$ ), and 72h ( $1.97 \pm 0.49$ ) were all greater than PRE ( $0.44 \pm 0.19$ ). Also, 24h and 48h were not different, but were both greater than 72h and 96h ( $1.13 \pm 0.32$ ) while 72h was greater than 96h. For ISO, neither CON nor LIC showed any significant difference across time while MIC showed no difference between PRE ( $189.88 \pm 40.68$ ), IP ( $193.75 \pm 47.24$ ), 24h ( $186.52 \pm 53.55$ ), or 48h ( $195.36 \pm 55.06$ ), but 72h ( $210.05 \pm 53.57$ ) and 96h ( $207.78 \pm 59.99$ ) were significantly greater than 24h. 72h was also greater than IP. Moderate-intensity cycling may have enhanced blood flow and elicited a short-term training effect, thereby increasing isometric strength.

## 28. STATIC STRETCHING VS. DYNAMIC WARM-UPS: A COMPARISON OF THE EFFECTS OF MAXIMAL ISOMETRIC CONTRACTIONS ON TORQUE, AND EMG OUTPUT OF QUADRICEPS MUSCLES

Nicole L. Williams, Trevor L. Gillum  
Department of Kinesiology, California Baptist University

Pre-exercise warm-up routines are a common practice among sports and rehabilitation programs. This study assessed what protocol may lead to peak muscular performance. It is not known if different warm-up routines affect torque and motor-unit recruitment (EMG) differently when completing isometric contractions. **Purpose:** The purpose of this study was to determine if different warm-up protocols affect torque and EMG output of quadriceps muscles when completing a fatiguing task. **Methods:** Healthy female ( $n=8$ ) and male ( $n=2$ ) college students were tested in three different testing sessions (no stretching (c), dynamic-movements (d), and static-stretching (s)) randomly assigned on non-consecutive days. Subjects warmed up before completing 5 static-stretches, 5 dynamic-movements, or no stretches, respectively. They were asked to complete eight isometric leg extensions at a  $110^\circ$  angle at the knee on an Isokinetic Machine for time intervals of 5-sec, 20-sec, 40-sec, and 60-sec and were given 20-sec rest in-between each contraction. **Results:** All stats were analyzed by running a repeated measures ANOVA and pairwise comparisons. When compared to static-stretching a significant decrease was found for torque c ( $p=0.00$ ), d ( $p=0.02$ ), Rectus Femoris (RF) RMS c ( $p=0.03$ ), VastusMedialis (VM) RMS c ( $p=0.01$ ) and d ( $p=0.00$ ). A significant decrease was found for RF RMS in d ( $p=0.01$ ) and VM RMS in d ( $p=0.00$ ) when compared to the control. All groups decreased torque after the 60-sec fatiguing task (c  $p=0.00$ , s  $p=0.03$ , and d  $p=0.01$ ) compared to the 5-sec non-fatiguing task. The VM RMS was significantly increased after the fatiguing task for the c ( $p=0.04$ ) only. **Conclusion:** Stretching exercises are thought to allow muscle fibers to slide past each other with less resistance due to a decrease in the viscosity of the tendon structures, generating an increase in muscle compliance. This may have application in rehabilitating patients as well as coaching athletes.

## EXERCISE TESTING

### 29. FUEL UTILIZATION OF HEALTHY INDIVIDUALS DURING LEVEL TREADMILL LOCOMOTION

Ashleigh M. Huynh, John L. Azevedo, Jr. and Melissa A. Mache  
Department of Kinesiology, California State University, Chico

Prehistoric man relied greatly on migration by foot, hence the human body's inherent need to minimize energy expenditure. Through self-selecting a preferred walking speed humans are capable of minimizing their energy expenditure. The purpose of this study was to measure energetic cost of locomotion and to assess any gait kinematics that may occur as a result of changes in walking speed. Fourteen (8 females, 6 males) eligible California State University, Chico students participated in the study. Preferred walking speed (PWS) was collected during session 1. During session 2 subjects walked on a treadmill at 3.22 km/hr for 10 minutes, then speed was increased by 0.8 km/hr every 10 minutes up to 7.24 km/hr. Metabolic responses were collected during the last 2 minutes of each speed. Stride length and stride frequency were assessed during the first and last minutes of each trial. PWS was  $4.33 \pm 0.56$  km/hr. Statistical significances were found between walking speeds and  $\text{VO}_2$  (L/min) ( $p < 0.05$ ), RER ( $p < 0.05$ ), HR ( $p < 0.05$ ), and RPE ( $p < 0.05$ ). Absolute (L/min) and scaled (ml/kg min)  $\text{VO}_2$  showed a curvilinear rise as walking speed increased. There were significant differences of  $\text{O}_2$  cost of transport between 3.22 km/hr and speeds of 4.02 km/hr ( $p < 0.05$ ), 4.83 km/hr ( $p < 0.05$ ), 5.63 km/hr ( $p = 0.006$ ), and 7.24 km/hr ( $p = 0.038$ ). Step rate at 3.22 km/hr was  $1.59 \pm 0.03$  steps and  $2.26 \pm 0.04$  steps at 7.24 km/hr. Step length also increased from  $1.26 \pm 0.60$  m to  $1.99 \pm 0.19$  m from 3.22 km/hr to 7.24 km/hr. The body's metabolic response to increasing walking speeds is to increase  $\text{VO}_2$ , RER, and HR, and its kinematic response is to both increase the length of each stride taken and quicken the frequency of each stride.

### 31. THE RELATIONSHIP OF BMI AND EXPERIENCE ON ANAEROBIC POWER IN MARTIAL ARTISTS, A PILOT STUDY

Narvaez, M.  
Kinesiology Program, Western New Mexico University

**Purpose:** To explore the effects of BMI and experience in martial arts on anaerobic power, by comparing results of Wingate and broad jump test. **Methods:** Participants were recruited through flyers placed around campus and received no monetary benefits for participating in the project. IRB approval was granted by Saint Bonaventure University for a prior study. Participants were asked to complete a demographics questionnaire which included questions pertaining martial art style, frequency of training and years of experience. Height and weight were measured to calculate BMI. Flexibility of the lower back and lower extremities was assessed via sit-and-reach test. The broad jump and Wingate tests were used to determine explosive power and anaerobic power respectively. **Results:** The pilot group was integrated by 4 male and 1 female adult martial artists. Participants' mean age was 22 years old (range 19 to 26). BMI mean was 26.33 (range 22.58 to 34.84). Mean Experience (in months) was 100.80 (range 30.0 to 204.0) Broad jump mean was 1.92 m (range 1.32 to 2.57). Absolute power mean was 724.36 W (range 547.56 to 1006.80). High correlations were observed between experience and broad jump (0.733) and BMI and absolute power (.951). Moderate correlations were observed between experience and absolute power (-.450) and BMI and broad jump (-.637). **Conclusions:** These results, although limited by the sample size, suggest that anaerobic power testing via broad jump may be affected negatively by a high BMI, whilst Wingate does not. The conflicting results on this research call for further study of anaerobic power of lower extremities, particularly of a sport-specific nature. Additionally, the testing of more participants is needed to have a deeper understanding of the relationships/interactions among the measured variables.

### 30. COMPARISON BY WEIGHT OF THE IMPACT OF VARYING STANCE WIDTHS ON THE NUMBER OF BODYWEIGHT SQUATS PERFORMED IN COLLEGE AGED FEMALES

King, SR and Keeley, DW  
Department of Human Performance, Dance, and Recreation

**Purpose:** Although the back squat is a common squat exercise utilized to strengthen the lower extremities, the impact of varying stance widths on the number of squats performed is not currently known. Thus the purpose of this study was to determine how stance width and Body Mass Index (BMI) impact the number of squats individuals are able to perform. **Methods:** Thirty-one injury free college-aged female volunteered to participate. Participants completed three single day testing sessions separated by a minimum of two days and a maximum of four day. During the initial testing session participant height, mass, and shoulder width were collected. Also, during each of the testing sessions, participants performed a series of body weight squats with their feet positioned at varying percentages of their measured shoulder width (60%, 100%, and 140%). **Results:** There was no interaction between BMI and the number to squats performed at the various stance widths ( $F_{(1,29)} = 1.143$ ,  $p = 0.294$ ,  $1-\beta = 0.179$ ). There were, however, two main effects ( $F_{(2,28)} = 9.825$ ,  $p = 0.001$ ,  $1-\beta = 0.973$ ) for the overweight/obese group. This result indicates that participants in the overweight/obese group were able to perform significantly more squats at 100% of shoulder width when compared to either 60% or 140% of shoulder width. **Conclusion:** The normal weight subjects were able to perform a consistent number of squats regardless of stance width. The overweight/obese subjects were able to consistently perform the highest number of squats in the shoulder width stance. Thus, it may be more beneficial for people in the overweight/obese group to perform squats at either 60% or 140% of shoulder width to maximize efficiency in calorie burn and time spent exercising, since inefficient movements burn a larger number of calories.

### 32. THE IMPACT OF GREENFIELDS OUTDOOR GYM EQUIPMENT ON CARDIORESPIRATORY AND MUSCULAR FITNESS: A LONGITUDINAL STUDY

Caroline Nguyen and Marcella Raney  
Department of Kinesiology, Occidental College

Outdoor gyms in Los Angeles public parks provide an alternative to costly indoor gyms for low-income populations. The purpose of this study was to examine the effectiveness of training with Greenfields nonadjustable outdoor gym equipment. Six healthy, untrained Hispanic women ( $36.2 \pm 3.0$  years) completed a six-week progressive resistance and cardiorespiratory training program. Muscular fitness (repetitions to fatigue on gym equipment and functional push-up, squat, and crunch tests), cardiorespiratory fitness (one-mile walk), and general health parameters (body weight (BW), resting heart rate (rHR), blood pressure (BP), percent body fat (%BF)) were estimated pre- and post-training. A post-training survey determined perceived training benefits. Training increased the number of repetitions performed on the leg press ( $161.8 \pm 20.0$  vs.  $99.2 \pm 19.4$ ), right leg extension ( $38.8 \pm 7.1$  vs.  $20.7 \pm 5.3$ ), left leg extension ( $40.2 \pm 7.7$  vs.  $18.3 \pm 3.0$ ), chest press ( $43.3 \pm 12.7$  vs.  $17.5 \pm 3.4$ ), lat pull-down ( $40.5 \pm 10.3$  vs.  $18.7 \pm 3.5$ ), shoulder press ( $10.0 \pm 2.5$  vs.  $2.0 \pm 1.1$ ), push-up test ( $26.3 \pm 3.6$  vs.  $13.5 \pm 2.0$ ), and crunch test ( $51.0 \pm 21.7$  vs.  $25.2 \pm 7.9$ ) ( $P < 0.05$ ), but did not change squat test repetitions ( $84.2 \pm 12.5$  vs.  $71.5 \pm 12.8$ ,  $P > 0.05$ ). Training resulted in a decrease in BW (2.3%) and %BF (4.9-6.1%) ( $P < 0.05$ ), but no difference in fat-free mass, rHR, BP, or  $\text{VO}_2\text{max}$  ( $P > 0.05$ ). All participants agreed that training made daily tasks easier to perform and that equipment use resulted in improved mood and reduced stress most or all of the time. Participation in the study resulted in increased motivation to exercise. Indeed, 5/6 participants were still using the equipment regularly six weeks after study completion. In combination with previous research, these results suggest that although training with Greenfields gym equipment is unlikely to improve cardiorespiratory fitness or muscular strength, it can potentially increase muscular endurance, general health, and motivation to exercise in previously sedentary middle-aged women. Further research is necessary to determine if greater adaptations occur for longer training programs.

### 33. LEG PRESS 1-RM AND STAIR CLIMBING POWER CAN BE PREDICTED BY HIP AND KNEE BUT NOT ANKLE STRENGTH IN YOUNG MEN AND WOMEN

Mikael W. Redmond, Stephen T. Lenz, Karen Murata, and Taylor J. Marcell  
Department of Kinesiology, California State University Stanislaus

Traditional methods of measuring muscle strength and power can be difficult, time consuming, and require expensive laboratory equipment. Small hand-held manual muscle testing (MMT) devices have been suggested for field measures of muscle function. Purpose: The purpose of this study was to determine if the individual strength of the hip, knee, or the ankle could predict lower-body muscular strength and/or power using traditional measures. Methods: There were 36 subjects (18 men & 18 women) with an average ( $\pm$  SD) age of  $23.6 \pm 3.6$  yr, height  $170.2 \pm 8.0$  cm, weight  $71.6 \pm 14.8$  kg, and BMI of  $24.6 \pm 3.8$  kg/m<sup>2</sup> who participated. They completed an isotonic bilateral 1RM leg press, 70% RM leg press to determine muscle power, 4-step stair climb test for stair climb power, and an isometric unilateral MMT of the hip, knee, and ankle. Results: Using a stepwise regression analysis, only hip strength was significantly related to 1-RM leg press strength ( $r = 0.46$ ,  $p = 0.007$ ) while the other two measures (knee and ankle) fell out of the formula. Whereas, only knee strength was significantly related to stair climb power ( $r = 0.342$ ,  $p = 0.48$ ). Both 1RM ( $r = 0.61$ ) and 70%RM power ( $r = 0.72$ ) were significantly related to stair climb power. Discussion: These data suggest that the traditional measure of 1RM for muscle strength or 70% RM for muscle power were better at predicting stair climb power in young adults as compared to a hand-held isometric MMT device. The limitations to measuring strength using a MMT may have impacted our findings.

### 34. EFFECTS OF CAFFEINE ON THE RELIABILITY OF MAXIMAL ISOMETRIC TORQUE MEASURES OF THE ELBOW FLEXORS

Michael A. Trevino, Jared W. Coburn FACSMM, Lee E. Brown FACSMM, Daniel A. Judelson FACSMM, Moh H. Malek FACSMM  
Exercise Physiology Laboratory and Center for Sport Performance, Department of Kinesiology, California State University, Fullerton

The purpose of this study was to determine the influence of caffeine on the reliability of maximal isometric torque measures from the forearm flexors. Fourteen men ( $22 \pm 2$  y,  $173 \pm 7$  cm,  $85 \pm 12$  kg) came to the laboratory four times. Visit one served as a familiarization visit. During visits two, three, and four, subjects ingested their assigned drink (0, 5, or 10 mg·kg<sup>-1</sup> of body mass in a randomized, repeated measures design), rested for 60 min, and performed three maximal isometric muscle actions of the elbow flexors for the determination of maximal isometric torque. The results indicated high intraclass reliability coefficients for each of the three conditions ( $R = 0.975$ ,  $0.978$ , and  $0.951$  for the 0, 5, and 10 mg·kg<sup>-1</sup> of body mass caffeine conditions, respectively). It's concluded that maximal isometric torque may be reliably determined from the elbow flexors following ingestion of either 0, 5, or 10 mg·kg<sup>-1</sup> of body mass of caffeine.

### 35. ACCURACY OF SenseWear® Pro Armband IN ASSESSING ENERGY EXPENDITURE DURING STEADY STATE AND NON-STEADY STATE ACTIVITIES IN YOUNG AND OLDER ADULTS

Wesley J Tucker, Dharini M Bhammar, Brandon J Sawyer, Glenn A Gaesser, FACSMM  
Healthy Lifestyles Research Center, Exercise and Wellness, School of Health Promotion and Nutrition, Arizona State University

**Purpose:** Our aim was to estimate the accuracy of the SenseWear® Pro Armband (SWA) (Version 7.0) for assessing energy expenditure during steady state (SS) and non-steady state (non-SS) activities in young and old adults. **Methods:** 74 adults (age:  $50.2 \pm 20.0$  years; BMI:  $27.7 \pm 5.5$  kg/m<sup>2</sup>) performed the following: a 90-min SS routine consisting of 8-min bouts of walking, cycling, arm ergometry, and simulated activities of daily living (ADL), separated by 4 min of rest and a 65-min non-SS routine including 5-min bouts of 12 different activities including walking, cycling, rowing, simulated sports, and ADL with no rest between. EE was measured by indirect calorimetry using the Oxycon Mobile™ (OM) and estimated by SWA. Accuracy of SWA EE estimates was compared between the younger (< 60 years,  $n=35$ ) and older adults ( $\geq 60$  years,  $n = 39$ ). Inter-class correlation coefficients (ICC) and linear mixed models were used for statistical analyses. **Results:** ICCs for energy expenditure (kcal/min) during exercise revealed a moderate overall agreement during SS ( $r=0.76$ ) and non-SS activities ( $r=0.60$ ). SWA significantly overestimated EE compared to the OM for SS ( $3.72 \pm 0.09$  kcal/min vs.  $2.98 \pm 0.09$  kcal/min) and Non-SS ( $4.40 \pm 0.12$  kcal/min vs.  $3.47 \pm 0.12$  kcal/min,  $p < 0.05$ ) routines. SWA yielded greater error in older compared to younger adults for the SS (34% vs. 28%,  $p < 0.05$ ) and non-SS (42% vs. 36%,  $p < 0.05$ ). EE overestimation was significantly greater in older adults for walking, loading and unloading boxes, sweeping, and arm ergometry ( $p < 0.05$ ) during both routines. **Conclusions:** SWA overestimates EE during SS and non-SS physical activity in both young and old adults. Furthermore, the estimation of EE was less accurate in older compared to younger adults.

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### 36. ESTIMATING VO<sub>2</sub>MAX USING A PERSONALIZED STEP TEST

Pat R. Vehrs, FACSMM, Catherine Webb, James D. George, Ron Hager  
Department of Exercise Sciences, Brigham Young University, Provo UT

**PURPOSE:** The purpose of this study was to develop a personalized step test and a valid VO<sub>2</sub>max regression model using both non-exercise data and data collected during a multistage step test. **METHODS:** Male and female participants ( $N=80$ ) 18 to 30 years of age successfully completed a step test with the starting step rate and step height being determined by their self-reported perceived functional ability (PFA) score and their measured height, respectively. All participants completed a maximal graded exercise test to measure VO<sub>2</sub>max. **RESULTS:** Multiple linear regression analysis yielded the following equation:  $45.938 + 9.253(G) - 0.140(KG) + 0.670(PFA) + 0.429(FSR) - 0.149(45sRHR)$  to predict VO<sub>2</sub>max (mL/kg/min;  $R = 0.90$ ,  $SEE = 3.43$  mL/kg/min) where: G is gender (0=female;1=male), KG is body mass in kilograms, PFA is the sum of the two PFA questions, FSR is the final step rate (step-ups/min), and 45sRHR is the recovery heart rate 45 seconds following the conclusion of the step test. Each independent variable was significant ( $p < 0.05$ ) in predicting VO<sub>2</sub>max and the resulting regression equation accounted for roughly 83% ( $R^2=0.828$ ) of the shared variance of measured VO<sub>2</sub>max. Based on the standardized  $\beta$ -weights, gender (0.606) explained the largest proportion of variance in VO<sub>2</sub>max values followed by PFA (0.315), body mass (-0.256), FSR (-0.248), and the 45sRHR (-0.238). The cross validation statistics show minimal shrinkage ( $R_{PRESS} = 0.88$ ,  $SEE_{PRESS} = 3.57$  mL/kg/min) in the accuracy of the regression model. **CONCLUSION:** VO<sub>2</sub>max can be accurately predicted from this multistage submaximal personalized step test that is easy to administer and can be completed in about 6 minutes.

**37. COMPARISON OF BONE HEALTH PARAMETERS USING QUALITATIVE ULTRASOUND AND DUAL-ENERGY X-RAY ABSORPTIOMETRY**

Wherry, S.J.; Swan, P.D., FACSM  
School of Nutrition and Health Promotion, Arizona State University,  
Phoenix, AZ

Dual-Energy X-Ray Absorptiometry (DXA) is widely considered to be the gold standard for evaluating bone health. However, the cost of buying and maintaining the equipment is expensive, and not always feasible for smaller institutions. Qualitative ultrasound (QUS) of the OsCalcis was developed to screen patients for fracture risk in clinical settings, but little is known about its use as a research tool in comparison to DXA. **PURPOSE:** To compare bone health parameters produced by GE Achilles Insight Ultrasonometer with those from GE Lunar DXA in healthy adult women with no history of ankle injuries. **METHODS:** 26 healthy women between the ages of 20-43 years underwent QUS of the right (R) and left (L) foot, followed by a DXA scan. QUS T and Z-scores of bone density and stiffness index (calculation of ultrasound parameters) were correlated with DXA Z-scores of total body bone density. Data were analyzed using partial correlations controlling for body fatness. **RESULTS:** There were significant moderate correlations between R foot QUS T-score, R foot QUS Z-score, and R foot QUS stiffness index with DXA Z-scores ( $r = .430, p = 0.006$ ;  $r = .428, p = 0.007$ ;  $r = .429, p = 0.006$  respectively). There were no significant associations between L foot and any DXA parameters. **CONCLUSIONS:** It appears that there are relationships between bone health values from QUS and DXA. The association existed only for the R foot, which may be related to R-side dominance. These data suggest that QUS of the R OsCalcis may be sensitive to the same bone health parameters as those elicited by the DXA, which would enable its use in research in addition to fracture screening. Further research using larger sample sizes and more diverse study populations is needed to determine the sensitivity of QUS to changes in bone density long-term.

**39. MINERAL INTAKE RELATIVE TO THE DRIs IN YOUNG ADULTS (AGE 18-24)**

Angela Harvel, Samantha Coogan, Jessica Evans, Laura Kruskall,  
FACSM, and Jack Young, FACSM  
Department of Kinesiology & Nutrition Sciences, University of Nevada,  
Las Vegas

**Introduction.** This study evaluated dietary mineral intake in college age individuals in relation to the Dietary Reference Intakes and comparative data found in the National Health and Nutrition Examination Survey (NHANES, 1999-2000). Because this younger subset of the adult population has different dietary needs and habits than the older adult population, quantifying mineral intake may identify risk of deficiency in this age group. **Methods.** Participants were males ( $n=271$ ) & females ( $n=436$ ), ages 18-24, BMI  $25.4 \pm 4.8$  for males &  $23.1 \pm 4.9$  for females, who were students in an introductory nutrition course. Participants quantified and recorded their food intake for four consecutive days as a class assignment. Data were entered into nutrition assessment software (NutritionCalcPlus 3.0) which generated a report of mineral intake relative to the DRIs. **Results.** The prevalence of inadequate mineral intake was higher in females than in males for every mineral measured (calcium, iron, magnesium, phosphorous, potassium, sodium, and zinc). Males had adequate intake ( $\geq 100\%$ ) for iron, phosphorous, and sodium. Females had adequate intake ( $\geq 100\%$ ) only for sodium. **Conclusion.** Adequate mineral intakes for males (iron, phosphorous, sodium) and females (sodium) reflect a high intake of meat, soda, and processed foods. The minerals in which both males (calcium, magnesium, potassium, zinc) and females (calcium, iron, magnesium, phosphorous, potassium, zinc) were deficient are minerals that are abundant in most plant foods including fruits, vegetables, nuts, legumes, and whole grains indicating an insufficient intake of fresh, nutrient-dense foods necessary for health. These results suggest poor food choices in the young adult population. These results are also in agreement with larger scale studies such as the NHANES which use different methodology (dietary recall).

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**38. PHYSIOLOGICAL RESPONSES TO A THERMOGENIC NUTRITIONAL SUPPLEMENT DURING REST, LOW-INTENSITY EXERCISE, AND RECOVERY**

Haley C. Bergstrom,<sup>1</sup> Terry J. Housh (FACSM),<sup>1</sup> Daniel A. Traylor,<sup>1</sup> Robert W. Lewis Jr.,<sup>1</sup> Glen O. Johnson (FACSM),<sup>1</sup> Richard J. Schmidt,<sup>1</sup> and Dona J. Housh (FACSM).<sup>2</sup>  
<sup>1</sup>University of Nebraska-Lincoln, Lincoln, NE  
<sup>2</sup>University of Nebraska Medical Center, College of Dentistry, Lincoln, NE

**PURPOSE:** This study examined the physiological responses to a thermogenic nutritional supplement at rest, during low-intensity exercise, and recovery from exercise. **METHODS:** Thirty-three participants (mean  $\pm$  SD; age,  $23.3 \pm 2.8$  years) were recruited for this randomized, double-blinded, placebo-controlled, crossover study. The nutritional supplement capsules included caffeine, capsicum extract, piperine, boswellia serrate extract, dried ginger root, cinnamon bark, niacin, and macunapurriens. Each testing session consisted of 30 min of initial resting measures, followed by ingestion of the placebo or thermogenic nutritional supplement, 50 min of post-supplementation resting, 60 min of walking ( $3.2 - 4.8 \text{ km}\cdot\text{hr}^{-1}$ ), and 50 min of post-exercise resting. Energy expenditure (EE) and oxygen consumption rate ( $\dot{V}O_2$ ) were recorded as 10 min averages. Rating of perceived exertion (RPE) was recorded every 15 min. Statistical analyses included separate 2-way repeated-measures ANOVAs (condition  $\times$  time), 1-way repeated-measures ANOVAs, and paired *t*-tests ( $p < 0.05$ ). **RESULTS:** There were no significant differences for any of the measures between the supplement and placebo groups during the initial 30 min resting. The EE, however, was 4% greater for the supplement than the placebo group at 40 min post-supplementation. During exercise, EE was 3 to 4% greater for the supplement than the placebo group at each 10 min average, with no significant differences in RPE. Post-exercise, EE was 7 to 9% greater for the supplement than the placebo group at 10, 20, and 50 min and  $\dot{V}O_2$  was 3 to 5% greater at 10, 20, 40 and 50 min. **CONCLUSION:** The current findings indicated that the thermogenic nutritional supplement increased EE and  $\dot{V}O_2$  with no effect on RPE. These findings suggested the thermogenic nutritional supplement may aid in a weight management program that includes long duration (60 min) low intensity (walking) exercise. This study was supported by a clinical trial grant from General Nutrition Corporation.

**40. VITAMIN INTAKE IN A YOUNG ADULT POPULATION (AGE 18-24)**

Jessica Evans, Samantha Coogan, Angela Harvel, Jack Young, FACSM,  
and Laura Kruskall, FACSM  
Department of Kinesiology & Nutrition Sciences, University of Nevada,  
Las Vegas

**Introduction.** This project is to evaluate the vitamin intake of college students in comparison with the Dietary Reference Intakes developed by the *Institute of Medicine's Food and Nutrition Board*. Currently, there is a lack of nutrient intake data available specific to the college age group. Quantifying vitamin intakes may identify potential deficiencies in this population. **Methods.** Participants were males ( $n=270$ ) & females ( $n=441$ ), ages 18-24, BMI  $25.3 \pm 4.7$  for males &  $23.1 \pm 4.9$  for females, who were students in an introductory-level nutrition course. Participants recorded their food intake for four consecutive days as a class assignment. The data were entered into nutrition assessment software (NutritionCalcPlus 3.0) which generated a report on vitamin intake relative to the DRIs. **Results.** Except for folate, both male and female subjects had adequate intakes of the water-soluble vitamins. All subjects were deficient in the fat-soluble vitamins A, D, & E. However, it should be noted that there is still very limited information regarding sources of vitamin D in foods. Therefore, food records may not be indicative of vitamin D status. **Conclusion.** The discrepancy between water-soluble and fat-soluble intakes may be due to the inclusion of fortified or enriched convenience/package foods in the diet with a limited intake of foods high in fat soluble vitamins. These results illustrate the importance of a daily multivitamin supplement for this population. These results are also consistent with results from the NHANES which uses different methodology (dietary recall) to evaluate dietary intakes.

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#### 41. EATING BEHAVIOR PATTERNS OF AESTHETIC AND NON-AESTHETIC SPORT NCAA ATHLETES

Jonathan Kurka; Barbara E. Ainsworth, FACSM; Beth Gevirtz; Matthew Buman; Steven Erickson; Amy Overlin  
Arizona State University

**Introduction:** Some athletes may be at risk for developing adverse health outcomes due to poor eating behaviors during collegiate sport. This study identified eating behavior patterns of aesthetic (AS) and non-aesthetic sport (NAS) NCAA Division-I athletes at a large southwestern university and their associations with body mass index (BMI). **Methods:** The Rapid Eating Assessment for Patients (REAP) was adapted and completed by consenting student athletes (n=86 males; n=64 females) as part of their mandated annual physical examination. Principal component analysis for ordinal responses (PCA) was conducted on the 25 eating-frequency questions. Sampling adequacy was verified and a scree plot suggesting four factors was retained. Eight questions were removed due to cross-loading and low communality estimates (<.30). Post-PCA scores were comprised of the sum of answers loading on each component. **Results:** The resulting principal components were unhealthy eating habits (UEH); healthy eating habits (HEH), high-fat meat consumption (HFM), and unhealthy fat and oil consumption (UFO<sub>n</sub>). BMI was associated with HEH ( $r = -0.17$ ,  $p = .04$ ) and HFM ( $r = -0.20$ ,  $p = .01$ ). AS males had significantly higher HEH scores ( $\eta^2 = .062$ ,  $p = .02$ ) and lower BMI ( $23.6 \pm 3.3$ ,  $27.7 \pm 5.7$ ) than NAS males. AS females had significantly higher UEH ( $\eta^2 = .090$ ,  $p = .02$ ), HFM ( $\eta^2 = .129$ ,  $p = .003$ ) and total eating behavior scores ( $\eta^2 = .077$ ,  $p = .03$ ) than NAS females. For males and females combined, AS athletes had significantly higher HFM ( $\eta^2 = .060$ ,  $p = .003$ ), total eating behavior score ( $\eta^2 = .044$ ,  $p = .01$ ) and BMI ( $23.2 \pm 3.4$ ,  $26.3 \pm 5.4$ ) than NAS athletes. **Conclusion:** Four distinct eating behavior patterns were observed among a sample of Division-I collegiate athletes. Collectively these data indicate more favorable eating behavior patterns and lower BMIs among AS than NAS athletes. These analyses suggest that the aesthetic nature of the athlete's sport may be an important factor impacting personal eating habits. Further research involving college athletes and their eating behavior patterns on more specific health parameters warrants investigation.

### METABOLISM

#### 43. RESTING ENERGY EXPENDITURE AND PHYSICAL ACTIVITY LEVELS DURING PREGNANCY

Alyssa and Todd Hagobian  
Kinesiology Department, California Polytechnic State University, San Luis Obispo

Previous studies have shown that resting energy expenditure is higher late in pregnancy compared to early in pregnancy. However, the potential influence of physical activity remains unclear. The purpose of this study was to determine the relationship between resting energy expenditure and physical activity levels during pregnancy. Fifteen healthy, pregnant women ( $31 \pm 4$  years,  $25.7 \pm 4.2$  kg/m<sup>2</sup>) were assessed early in pregnancy (<16 weeks gestation), and at 24 and 32 weeks gestation. Resting energy expenditure was assessed using a ventilated hood and physical activity levels using the validated IPAQ questionnaire. Resting energy expenditure significantly increased from early in pregnancy to 24 and 32 weeks gestation ( $1553 \pm 277$ ,  $1672 \pm 303$ ,  $1910 \pm 434$  kcal, respectively;  $p < 0.05$ ) while physical activity levels remained unchanged ( $2019 \pm 1938$ ,  $1562 \pm 1308$ ,  $1236 \pm 1575$  METS\*min/week, respectively;  $p > 0.05$ ). Moreover, physical activity levels were not significantly related to changes in resting energy expenditure ( $P > 0.05$ ). Ongoing research will examine whether that higher resting energy expenditure late in pregnancy is related to objective measures of physical activity and/or other factors (e.g. fetal growth).

#### 42. EFFECT OF ACUTE SLEEP DEPRIVATION ON FREE-LIVING DIETARY INTAKE IN NORMAL-WEIGHT AND OBESE WOMEN

L Romney, M Larson, BW Bailey, JD LeCheminant, FACSM  
Exercise Science, Brigham Young University

**Purpose:** Sleep deprivation has been proposed as a potential correlate of obesity, particularly influencing energy intake. The purpose of this study was to compare energy intake in normal-weight and obese women under two separate sleep conditions: 1) sleep-restricted (<5 hours) and 2) recommended sleep (~8 hours). This study used a cross-over design with treatment condition order counter-balanced. **Methods:** Twenty-two normal-weight ( $30.9 \pm 9.5$  y,  $22.0 \pm 1.6$  kg/m<sup>2</sup>) and 18 obese ( $29.7 \pm 10.7$  y,  $36.4 \pm 5.3$  kg/m<sup>2</sup>) women completed both sleep conditions. To confirm sleep levels, participants wore a wrist and hip actigraph, and logged bedtime and awake-time. Following each condition, participants reported to the laboratory under the same fed condition (energy shake ~10% of total daily needs) and to confirm they followed the sleep protocol. Subsequently, participants continued their normal routine but asked to record all energy intake using weighed food scales. There were no instructions or limitations on dietary intake. Analyses included total next day energy intake and energy intake by several periods of the day. **Results:** Participants averaged  $4.7 \pm 0.4$  hours of sleep during the sleep-restricted condition and  $7.7 \pm 0.3$  hours during the recommended sleep condition. Next day total energy intake did not differ by group or condition ( $F = 1.81$ ;  $P = 0.187$ ). When participants were pooled, there was also no difference in energy intake by sleep condition ( $F = 0.00$ ;  $P = 0.953$ ). However, when participants energy intake was analyzed during the lunch period (following testing to 1:30pm) there was a significant group\*condition interaction ( $F = 6.12$ ;  $P = 0.018$ ). The obese women ate significantly more (~300 kcal) during the sleep condition compared to the recommended condition whereas the normal-weight women did not. **Discussion:** Compared to suggested levels of sleep, sleep restriction and obesity do not influence total next day energy intake. However, sleep restriction and obesity may influence feeding during certain portions of the day.

#### 44. INTERACTIVE VIDEO GAMING: BENEFICIAL TO HEALTH OR JUST FUN?

Michael Jarrett<sup>1</sup>, Paul Hafen<sup>1</sup>, Krystina Moschella<sup>1</sup>, Jacob Barkley FACSM<sup>2</sup>, Janet S. Dufek<sup>1</sup>, James Navalta<sup>1</sup>, Richard Tandy<sup>1</sup>, and Antonio S. Santo<sup>1</sup>  
<sup>1</sup>Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas  
<sup>2</sup>Exercise Science, Kent State University

**Purpose:** The purpose of this study was to determine the energy cost of playing select games on the Nintendo Wii for 30 contiguous minutes and whether or not the physical interaction of the participant with the gaming system and subsequent physiologic intensity diminishes with playing time. In addition, ratings of perceived exertion (RPE) and hedonics (liking or enjoyment) of playing the games were analyzed. **Methods:** Four apparently healthy adults (n = 3 females) aged  $23.3 \pm 5.0$  y, with a height, mass, and percent body fat of  $165.1 \pm 6.6$  cm,  $63.6 \pm 9.3$  kg, and  $25.0 \pm 6.5$  %, respectively, were voluntarily recruited. Resting metabolic rate was obtained at baseline followed by continuous VO<sub>2</sub> and HR measurements during 30 minutes of game play of 3 Wii games (Tanks!, Basic Run, and Basic Step) completed in a random order. RPE and hedonics were recorded at minutes 15 and 30. Continuous VO<sub>2</sub> and HR data were reduced by calculating averages in 5-minute intervals for each gaming session. A repeated measures factorial ANOVA was used to determine differences in VO<sub>2</sub> and HR, while t-tests were used to determine changes in RPE and hedonics ( $\alpha = 0.05$ ). **Results:** VO<sub>2</sub> was significantly lower while participants played Tanks! ( $p = 0.045$ ,  $\eta^2 = .64$ ), [M(SD) = 5.1 (0.2)], compared with Basic Step [11.8 (3.4)] and Basic Run [13.8 (6.4)]. HR approached significance ( $p = 0.09$ ,  $\eta^2 = .7$ ); [Tanks! M(SD) = 81.0 (12.3), Basic Step [103.4 (11.2)], Basic Run [103.4 (15.7)] **Conclusion:** It does not appear that participants alter their physical interaction with the gaming system or hedonics and therefore do not diminish physiologic intensity over consistent, repeated game play. However, it is plausible that these findings are due to the small sample size and broad standard deviation. Further testing of additional participants is warranted.

#### 45. THE EFFECTS OF TWO DIFFERENT RESISTANCE EXERCISE INTENSITIES ON GLYCEMIC RESPONSE

Cameron Kisst, Melissa Mache, Martin Frigaard and John L. Azevedo, Jr  
Department of Kinesiology, California State University, Chico

Classically aerobic exercise has been recommended for individuals with type 2 diabetes because it involves large muscle groups for extended periods of time. However, aerobic exercise can be difficult for many individuals with T2D as many have problems with mobility. Recently resistance exercise has been employed as an alternative to aerobic exercise as resistance exercise is a modality in which many individuals that have difficulty moving can be successful. The effects resistance exercise appear to be equivocal. However many of the resistance protocols employed have either used low intensity and/or "circuit-training" type resistance exercise. To assess whether resistance exercise intensity has an effect on glycemic response, an oral glucose tolerance test (OGTT) was carried out rest (baseline, B) or immediately after two different intensities of resistance exercise. Nine male subjects performed 65% or 85% of their respective 1RM for each exercise (lift). The exercise trials were in random order. The lifts were squat (S), deadlift (DL), bench press (BP), overhead press (OP) and lat pull-down (LP). Blood glucose concentrations at times 0, 30, 60, 90 and 120 minutes were 92.5, 92.5 and 95.5 mg/dl; 115.5, 104.8 and 114.7 mg/dl; 109.6, 104.2 and 99.8 mg/dl; 101, 99.2 and 97.2 mg/dl; 89.7, 91.8 and 94.3 mg/dl for B, 65% and 85% respectively for each time point. There were no statistical differences in blood glucose at any of the time points. Area under the curve (AUC) for the entire 120 minutes of the OGTT was 32% and 46% lower after 65% and 85% resistance exercise compared to baseline. The present study did not show an effect of resistance exercise intensity on glycemic response at any time point during the OGTT or over the entire 120 of the OGTT (AUC). Further research is warranted.

### REHABILITATION

#### 47. VENTILATORY PREDICTORS OF CHANGE IN DIASTOLIC FUNCTION IN HEART FAILURE WITH PRESERVED EJECTION FRACTION

Angadi SS<sup>1</sup>, Tucker WJ<sup>2</sup>, Mookadam F,<sup>3</sup> Lee CD,<sup>2</sup> Gaesser GA<sup>2</sup>  
<sup>1</sup>Exercise and Metabolic Disease Research Lab, University of California Los Angeles, <sup>2</sup>Healthy Lifestyles Research Center, Arizona State University, <sup>3</sup>Mayo Clinic Arizona

Heart failure with preserved ejection fraction (HFPEF) is a major cause of morbidity and mortality in elderly patients and is associated with significant ventilatory abnormalities during exercise. Peak  $\dot{V}O_2$ , overall  $\dot{V}E/\dot{V}CO_2$  slope, peak  $\dot{V}E/\dot{V}CO_2$ , minimum  $\dot{V}E/\dot{V}CO_2$  and oxygen uptake efficiency slope (OUES) have all been shown to be of prognostic value in patients with HF. However, the ability of ventilatory parameters to predict change in left ventricular diastolic dysfunction (LVDD) in HFPEF is unknown. **Methods:** Patients with HFPEF (n=15) were randomized to 4-weeks (3 days/week) of either, 1) high intensity interval training (HIIT, n=9; 4x4 minutes at 85-90% peak heart rate with 3 minutes of active recovery between exercise bouts) or 2) traditional moderate intensity aerobic exercise (MOD, n=6; 30 minutes at 60-70% peak heart rate). Subjects underwent  $\dot{V}O_{2peak}$  testing and 2D-echocardiography for assessment of LVDD before and after exercise training. Linear regression analyses were used to examine the relationships between change in LVDD and change in ventilatory parameters. **Results:** HIIT resulted in significant reductions in LVDD grade (pre =  $2.1 \pm 0.3$ , post =  $1.3 \pm 0.7$ ;  $p = 0.02$ ) whereas no significant changes in LVDD were observed following MOD. Only change in peak exercise  $\dot{V}E/\dot{V}CO_2$  predicted change in LVDD across both groups ( $R^2 = 0.359$ ,  $p = 0.024$ ;  $\beta = 2.73$ ). Change in overall  $\dot{V}E/\dot{V}CO_2$  slope, peak  $\dot{V}O_2$ , minimum  $\dot{V}E/\dot{V}CO_2$  and oxygen uptake efficiency slope (OUES) were not associated with changes in LVDD. **Conclusion:** Improvements in peak  $\dot{V}E/\dot{V}CO_2$  slope appear to be related to improvements in left ventricular diastolic function in patients with HFPEF and may be indicative of improved ventilation-perfusion matching following exercise training.

#### 46. EFFECT OF TWO DOSES OF CHRONIC INTERVAL TRAINING ON MAXIMAL FAT OXIDATION AND BODY COMPOSITION IN SEDENTARY WOMEN

Elyse Palumbo, David McMillan, Douglas Stirling, Jackie Godinez, Matt M. Schubert, Christina Cooper, Todd Astorino  
<sup>1</sup>Department of Kinesiology, California State University San Marcos;  
<sup>2</sup>Griffith University, Gold Coast, Australia

**Background:** High intensity interval training (HIT) has been proven to alter cardiovascular fitness and substrate metabolism similar to endurance exercise. The impact of this training in sedentary populations requires further examination. **Aim:** To compare the effect of two doses of high intensity interval training on change in fat oxidation and body composition in a population of sedentary females. **Methods:** Seventeen sedentary women (age and  $\dot{V}O_{2max} = 24.2 \pm 6.2$  yr and  $30.3 \pm 5.2$  mL/kg/min) completed either high (HI) (80 – 90 % maximal workload (Wmax)) or moderate (MOD) intensity (60 – 80 % Wmax) HIT on a cycle ergometer 3 d/wk for a 12 wk period. Training consisted of 6 – 10 60 s bouts separated by active recovery. Every 3 wk, substrate oxidation was assessed during progressive exercise via indirect calorimetry to determine whole body fat oxidation via respiratory exchange ratio (RER), maximal fat oxidation (MFO) and minimum fat oxidation (FATmin). Body composition was assessed every 6 wk. Repeated measures analysis of variance was used to examine changes in substrate oxidation in response to training, with training group used as a between-subjects variable. **Results:** Compared to pre-training, results revealed decrease in RER ( $p = 0.001$ ) as well as increases in MFO ( $p = 0.048$ ) and FATmin ( $p = 0.001$ ) in both training conditions. However, the magnitude of improvement was similar ( $p > 0.05$ ). No change ( $p > 0.05$ ) in body weight, percent body fat, or waist/hip circumference was revealed in response to training. **Discussion:** Data suggest that 12 wk of either moderate or strenuous interval training similarly enhance fat oxidation in sedentary women, but do not alter body weight or body composition.

#### 48. EFFECT OF ACTIVITY-BASED THERAPY ON CHANGE IN NEUROTROPHINS IN INDIVIDUALS WITH SPINAL CORD INJURY

Todd A. Astorino<sup>1</sup> and Eric T. Harness<sup>2</sup>  
<sup>1</sup>Department of Kinesiology, CSU—San Marcos, San Marcos, CA;  
<sup>2</sup>Project Walk Spinal Cord Injury Recovery Center, Carlsbad, CA

Research shows that chronic exercise after spinal cord injury (SCI) may increase neuroplasticity (regain of nervous function) in the rat and human spinal cord. Brain-derived neurotrophic factor (BDNF) is commonly induced in response to acute exercise and has been shown to augment neural growth, yet it is relatively unresolved whether exercise in persons with SCI also elicits this response. **Aim:** This study examined alterations in neuroplasticity-related proteins during activity-based therapy in men and women with SCI. **Method:** Twelve men and three women with chronic SCI (age =  $31.8 \pm 10.9$  yr) completed one bout of activity-based therapy consisting of standing load bearing, body weight supported treadmill training, whole body vibration, and functional electrical stimulation after a 2 h fast. Each modality was performed to subject tolerance and lasted approximately 30 min. Blood samples were obtained at baseline and immediately after each exercise mode to determine serum BDNF, prolactin, and cortisol which were assessed via ELISA. One-way ANOVA with repeated measures was used to examine changes in neurotrophins in response to exercise. **Results:** Results revealed no change in BDNF ( $p = 0.97$ ) or cortisol ( $p = 0.07$ ), although prolactin was significantly reduced ( $p = 0.001$ ) in response to exercise. **Conclusion:** Despite the relatively prolonged duration of this bout, its intensity may be too low to elicit significant changes in BDNF as previously demonstrated. Funded by NIH NCMRR/NINDS 5R24 HD050846 (Integrated Molecular Core for Rehabilitation Medicine)

#### 49. RELATIONSHIP BETWEEN MUSCLE FIBER TYPE AND LATENCY DURING DYNAMIC BALANCE

Andrew I. Miller<sup>1</sup>, Edward M. Heath FACSM<sup>2</sup>, Eadric Bressel<sup>2</sup>

<sup>1</sup>Arizona State University, Exercise and Wellness, <sup>2</sup>Utah State University, Exercise Science

Research with respect to aging and dynamic balance is critical to achieve healthy independent aging. Healthy dynamic balance benefits daily functional living in older adults and directly reduces health care costs by preventing injuries that result from falling. Better understanding of the mechanisms behind dynamic balance is important for developing interventions that improve balance in the elderly. Researchers have demonstrated that aging individuals lose muscle mass and have a marked decrease in type II fibers and maximal force capability. The extent of which decreasing type II fibers correlates to dynamic balance decline has not been established. **PURPOSE:** To quantify the relationship between type II muscle fiber composition and recovery latency resulting from controlled perturbations. **METHODS:** Healthy, community dwelling adults (n = 30, age = 23 ± 4, height = 173.6 ± 10.2cm, weight = 74.4 ± 15.7kg, BF% = 16.5 ± 6.4%) performed a Thorstenson test on a Biodex isokinetic dynamometer to indirectly determine muscle fiber composition (50 maximal isokinetic knee extensions at 180 degrees·sec<sup>-1</sup>). On a subsequent day, dynamic balance (motor control test) was measured on a SMART Balance Master to measure latency time required to accommodate three (large, medium, small) controlled perturbations. Pearson correlation coefficients were used to test the relationship between fiber type (% type II) and latency times. **RESULTS:** Type II fibers had a strong negative correlation with latency caused by a large perturbation (r = -0.62, p = .001). Type II fiber correlation with latency for medium and small perturbation were r = -0.34, p = .077 and r = 0.116, p = .557 respectively. **CONCLUSION:** Muscle composition, specifically the percentage of type II fibers, had a moderate to strong relationship with the dynamic balance required to accommodate medium to large perturbations.

### BODY COMPOSITION

#### 51. THE ASSOCIATION BETWEEN SHORT-TERM NIGHT EATING RESTRICTION AND PHYSICAL ACTIVITY LEVEL IN YOUNG MEN; A RANDOMIZED AND COUNTER-BALANCED STUDY

E Christenson, BW Bailey, LA Tucker, FACSM, JD LeCheminant, FACSM  
Department of Exercise Sciences, Brigham Young University

**Purpose:** This study examined the effects of two weeks of night eating restriction on physical activity and various intensities of physical activity in young adult men. **Methods:** Using a cross-over design, 21 college-aged men completed two weeks of normal eating (NE) and two weeks of night eating restriction (NER) in counter-balanced fashion. There was a one week wash-out period between conditions. During NE, participants were asked to consume their normal diet, ad libitum. During NER, participants were asked to avoid all dietary consumption from 7pm-6am but there were no restrictions on type or amount of food/beverage consumed during eating hours. To assess diet, participants were asked to complete three randomly assigned dietary recalls during each week of the study. The National Cancer Institute's Automated Self-administered 24-hour Dietary Recall (ASA24) was used to collect and analyze energy and macronutrient intake. Physical activity was assessed during the second week of each condition using accelerometry. Sedentary time, light-, moderate-, and vigorous-intensity activity time was determined using accelerometer cut points from Troiano et al (*Med Sci Sports Exerc*, 2008). **Results:** During NE, participants consumed 2,771±793 kcal/d and during NER 2,450±846 kcal/d (F=7.11; P=0.015). Total physical activity during NE was 435,339±230,077 and during NER was 457,386±176,047; however, the difference was not significant (F=1.09; P=0.310). Similarly, there was no statistical difference in sedentary time, light-, moderate-, or vigorous intensity time between conditions (P>0.05). **Discussion:** Restriction of energy intake after 7pm may result in lower energy intake over the short-term but does not appear to significantly influence short-term physical activity level in young men.

#### 50. SIDE BY SIDE TREADMILL WALKING WITH INTENTIONALLY DESYNCHRONIZED GAIT

Jeff A. Nessler, David McMillan, Michael Schoulten, Teresa Shallow, Brianna Stewart, & Charles Deleone  
Kinesiology Department, California State University, San Marcos

Humans demonstrate an innate desire to synchronize stepping when walking side by side. This behavior requires modification of each person's gait, which may increase for pairings with very different walking patterns. The purpose of this study was to compare locomotor behavior for conditions in which partners exhibited similar and substantially different walking patterns. Twenty-six unimpaired subjects walked on a motorized treadmill at their preferred walking speed for 3 trials: by themselves (SOLO), next to someone on an adjacent treadmill (PAIRED), and next to someone who purposely avoided synchronization by altering stride times and/or lengths (DeSYNC). Means, coefficients of variance, approximate entropy (ApEn), rate of autocorrelation decay ( $\alpha$ ), and estimates of maximal Lyapunov exponents ( $\lambda^*$ ) were calculated for several dependent variables taken from sagittal plane kinematic data. Few differences in behavior were noted when the PAIRED condition was compared to the SOLO condition. However, the DeSYNC condition resulted in several alterations in ApEn,  $\alpha$ , and  $\lambda^*$ . These results suggest that greater differences in walking pattern between partners will facilitate greater modification to an individual's gait. Additional study of side by side walking may hold implications for understanding the control of gait in humans and may have application in a clinical setting.

#### 52. RELIABILITY OF BodPod MEASURES BASED ON BLAND AND ALTMAN ANALYSIS

Roper, J. L., Huynh, T. N., Faria, E., Leyba, G., and Gibson, A. L.  
Department of Health, Exercise, and Sport Sciences  
University of New Mexico

**INTRODUCTION:** Air displacement plethysmography (ADP, BodPod) is being increasingly used to measure body density (Db) because of ease of use compared to hydrostatic weighing. There is increased subject comfort and the error is minimized because of the decreased subject participation necessary to complete the test. However, few studies exist that determine the reliability of the BodPod measurements and personal observations have identified very divergent test-retest results for adults. **PURPOSE:** To determine the reliability of the BodPod when used as an alternative to measuring Db in adults. **METHODS:** 25 male (37.96±12.91 yrs; 176.97±7.06 cm; 78.05±12.46 kg) and 25 female (40.80±13.36 yrs; 166.14±6.06 cm; 60.19±9 kg) adults participated in this study. Participants underwent two Db trials (ADP1 and ADP2) at measured thoracic gas volume (TGVm) in the BodPod. A paired t-test was applied to the sample and each sex to compare means of ADP1 and ADP2. The Bland and Altman technique was used to investigate the individual differences (ADP1-ADP2) and methodological trends across the range of Db values. **RESULTS:** There was no significant difference between the means of the trials for the sample (1.049 vs 1.0478 g/cc, t=-.238; p=.813) or by sex (women: 1.0389 vs 1.0392 g/cc, t=-.517, p=.610; men: 1.0578 vs 1.0573 g/cc, t=-1.261, p=.221). The individual Db differences for women and men ranged from -.00960 to .00450 g/cc and -.00190 to .00540 g/cc, respectively. There was no systematic bias in individual Db estimation at the extremes of the Db distribution (r = -.018, p = .905). **CONCLUSION:** Test-retest Db measures via ADP have good agreement with each other, for both male and female subgroups in our sample. Given individual body fat differences ranging -6.68% to 4.38% for women and -2.32% to 0.86% for men, we recommend the average of duplicated Db measurements at TGVm for adults similar to those in our study.

### 53. PREDICTORS OF COMPENSATION TO EXERCISE-INDUCED WEIGHT LOSS IN WOMEN

Brandon J Sawyer, Dharini M Bhammar, Siddartha S Angadi, Dana M Ryan, Justin R Ryder, Elizabeth J Sussman, Farryl MW Bertmann, Glenn A Gaesser, FACSM  
Arizona State University, School of Nutrition and Health Promotion, Phoenix, AZ

**Background:** A large percentage of women who undergo aerobic exercise training exhibit energy compensation and do not lose body fat as expected. Factors that predict compensation are not well understood. **Methods:** 40 sedentary women (age: 30.5±7.5 yrs; ht: 164.6±7.7 cm; wt: 68.5±17.6 kg; %fat: 37.4±9.1) underwent Dual X-ray Absorptiometry (DXA) before and after a 12-wk supervised exercise program of treadmill walking 3 times/wk for 30 min at 70% of  $VO_{2max}$ . Target heart rate was adjusted according to maximal exercise testing at 4 and 8 weeks. Steps/day were measured continuously by pedometers. Using estimated exercise energy expenditure ( $ExEE = [1.7 \times VO_{2peak} \{L/min\}] \times 4.86 \text{ kcal/L} \times 30 \text{ min} \times 36 \text{ exercise sessions}$ ) we calculated predicted weight loss (7700 kcal/kg). By comparing predicted weight loss to actual weight loss we identified 28 compensators (C) and 12 non-compensators (NC). Independent t-tests and step-wise regression were used for statistical analyses. **Results:** The group as a whole showed no significant changes in weight, lean mass, or fat mass ( $P>0.05$ ). NC decreased lean mass (NC: -0.70±1.58 and C: 0.40±0.69 kg,  $P=0.003$ ), total body fat % (NC: -1.13±1.83 and C: 0.39±0.99%,  $P=0.002$ ), and fat mass (NC: -1.62±1.76 and C: 0.63±1.08 kg,  $P<0.001$ ), significantly more than C. Significant predictors of the magnitude of weight loss compensation included ventilation during low-intensity walking (first 3 min of  $VO_{2peak}$  test;  $R^2=0.341$ ,  $P<0.001$ ) and weight change at 4 weeks ( $R^2=0.223$ ,  $P<0.001$ ). The combined regression model accounted for 52% of the variance in weight loss compensation (Compensation =  $VE \times 0.218 - \text{Weight change at 4 wks} \times 0.842 - 6.52$ ). **Conclusions:** The ventilatory response to submaximal exercise and weight change during the first 4 weeks may be useful in identifying women prone to energy compensation during exercise training.

## BIOMECHANICS

### 55. KINEMATIC EFFECTS OF STRIDE LENGTH PERTURBATIONS ON SYSTEM COM HORIZONTAL VELOCITY DURING LOCOMOTION

Bailey, J.P., Nordin, A.D., Lee, D., & Dufek, J.S.  
Department of Kinesiology and Nutrition Science  
University of Nevada, Las Vegas

**Purpose:** To investigate the kinematic effect on the systems' center of mass horizontal velocity in response to stride length perturbations. **Methods:** Twelve healthy adults (23.1±7.71 yrs; 1.69±0.11m; 66.82±12.6kg; leg length 894.7±66.1 mm) performed 5 trials of preferred speed walking (PW) and running (PR) trials followed by 5 stride length perturbations based on percentages of leg length (60%, 80%, 100%, 120%, and 140%). 3D kinematic analysis was completed using a 12-camera infrared motion capture system (Vicon, 200hz). Dependent variables computed for each condition included: center of mass horizontal velocity at the highest vertical position (COMHVhi), and at the lowest vertical position (COMHVlo). Statistical analysis included correlation matrices across levels of perturbation for each dependent variable ( $\alpha = .05$ ). **Results:** COMHVhi demonstrated significant correlations with greater than 50% shared variance for PR vs 100% ( $r=.742$ ), 60% vs 80% ( $r=.824$ ), 60% vs 100% ( $r=.748$ ), 60% vs 120% ( $r=.709$ ), 80% vs 100% ( $r=.896$ ), 100% vs 120% ( $r=.887$ ), and 100% vs 140% ( $r=.728$ ), and 120% vs 140% ( $r=.895$ ). COMHVlo demonstrated significant correlations with greater than 50% shared variance for PR vs 100% ( $r=.753$ ), PW vs 80% ( $r=.794$ ), 60% vs 80% ( $r=.814$ ), 60% vs 100% ( $r=.735$ ), 60% vs 120% ( $r=.748$ ), 80% vs 100% ( $r=.902$ ), 80% vs 120% ( $r=.751$ ), 100% vs 120% ( $r=.892$ ), and 120% vs 140% ( $r=.710$ ). **Discussion:** Results suggest PR and PW have a greater relationship to stride length less than or equal to leg length, and thus extending stride length begins to diminish mechanical efficiency. It is a well-established mechanical relationship that horizontal velocity is a product of stride length and stride rate. Study results suggest that increases in stride length beyond 100% of leg length may be less than optimal mechanically. **Conclusion:** Stride lengths greater than 100% leg length during walking may be inefficient, perhaps owing to changes in lower extremity stiffness.

### 54. THE EFFECTS OF A SIX-MONTH Pedometer-BASED PHYSICAL ACTIVITY INTERVENTION ON BODY COMPOSITION CHARACTERISTICS IN A U.S. UNIVERSITY WORKSITE SETTING: THE ASUKI STEP STUDY

Jenelle Walker,<sup>12</sup> Ali Soroush<sup>3,4,5</sup>, Michael Belyea,<sup>1</sup> Barbara E. Ainsworth, FACSM<sup>2</sup>, Pamela D. Swan, FACSM<sup>2</sup>, Agneta Yngve,<sup>3,5</sup>  
<sup>1</sup>College of Nursing and Health Innovation, Arizona State University, USA; <sup>2</sup>School of Nutrition and Health Promotion, Arizona State University, USA; <sup>3</sup>Karolinska Institutet, Sweden; <sup>4</sup>Kermanshah University of Medical Sciences (KUMS), Iran; <sup>5</sup>Department of Health, Nutrition and Management, Oslo and Akershus University College of Applied Sciences, Oslo, Norway

**Background:** Physical activity is important for weight maintenance and improvements in health.

**Purpose:** This study determined the effects of a six month pedometer-based walking intervention on body composition (BC) characteristics in 712 employees at Arizona State University. **Methods:** Randomly selected employees (n = 142) from the walking cohort participated in BC testing. Measurements [height, weight, waist circumference (WC), body fat percentage (BF), and sagittal abdominal diameter (SAD)] were taken at months one, three, and six. A multi-level growth modeling approach was used to explore change over time and predict change for BC measures. Each BC measure was analyzed as an unconditional model (1), conditional models [age (2), gender (3)] and in a final conditional model (4) (with steps taken, age groups, gender, and initial body fat as predictors of BC changes). **Results:** In the unconditional model (1), individual differences were observed in all BC variables at the start of the study (reflected by the intercepts) ( $p < .05$ ). Significant individual differences in linear slopes (rate of change over time) were observed for WC ( $t = -2.41$ ,  $p = 0.0168$ ) and SAD ( $t = 2.08$ ,  $p = 0.0387$ ). There was a significant reduction in SAD for all participants over time ( $t = -2.19$ ,  $p = 0.0295$ ). In conditional models (2 & 3) significant differences were shown in the intercepts by age and gender for all BC measures. In the final conditional model (4), intercepts were significant for gender and body fat categories ( $p < .05$ ). No changes in BC measures were observed over time when age, gender, steps taken, and body fat categories were included in the model ( $p > .05$ ). **Conclusion:** The program resulted in changes in abdominal adiposity measures in the unconditional models. Despite differences in initial descriptive and BC measures, no differences were observed after accounting for the predictor variables.

### 56. A BIOMECHANICAL COMPARISON OF CYCLING SPRINT POSITIONS AND ITS EFFECT ON LOWER BODY KINEMATICS

Kevin L. Buechler, Guillermo J. Noffal, Bahar Y. Hamedani, Kenten B. Harris, Taylor S. Thurston  
Biomechanics Lab, Center for Sport Performance, Department of Kinesiology, California State University, Fullerton, Fullerton CA

In cycling sprints, it is essential to produce as much power as possible while remaining aerodynamic. Greater hip muscle involvement can lead to increases in maximum power output. **PURPOSE:** To determine the effects of cycling sprint positions on joint velocities and torso angles. **METHODS:** Seven healthy competitive cyclists (age: 25.28 ± 3.77 yr, height: 179.16 ± 9.83 cm, mass: 73.59 ± 13.19 kg) performed a five-minute warm up prior to three randomized maximal sprints in the seated position (SE), standing position (ST), and aerodynamic position (AE). Five minutes of active rest was given between trials. Angular kinematic variables were derived from motion capture software. **RESULTS:** A repeated measures ANOVA determined that both hip extension and flexion velocities differed significantly between the three positions ( $P<0.05$ ). Post hoc tests using the Bonferroni correction revealed greater hip flexion angular velocities (303.42 ± 32.70 deg/s vs. 250.96 ± 28.25 deg/s, respectively) from ST to SE, as well as greater hip extension velocities (349.25 ± 54.24 deg/s vs. 296.47 ± 52.15 deg/s, respectively). The position of the trunk in AE (10.03 ± 4.98 deg) was found to be significantly different from SE (18.51 ± 6.75 deg) and ST trials (20.65 ± 5.41 deg). **CONCLUSION:** ST requires greater involvement of the hip musculature due to greater hip joint velocities. **PRACTICAL APPLICATION:** A medium must be found between ST and AE, as a reduced torso angle will decrease drag and increase maximum velocities in sprint cycling. AE sprints shouldn't come at the cost of maintaining hip joint velocity. A rider that picks the ST position should focus their training to accommodate greater hip joint involvement.

## 57. EFFECTS OF FATIGUE AND GENDER ON ASYMMETRY OF LOWER EXTREMITY KINEMATICS IN DROP JUMP LANDINGS

Morgan Fippingger, Hunter Horn, Steven Hawkins, FACSM, Michele LeBlanc  
Exercise Science Department, California Lutheran University

Previous research has identified several factors that predispose an individual to ACL injury during landings, including gender, fatigue, and lower extremity joint angle asymmetry. **Purpose:** The purpose of this study was to determine the effects of gender and fatigue on the asymmetry of landing mechanics during bilateral drop jump landings. **Methods:** Twenty healthy recreationally active subjects (9 male, 11 female) aged 18-29 years, with no previous jump training participated in this study. Quadriceps and hamstring strength were determined with a Biodex isokinetic dynamometer. Drop jumps were performed from a 60 cm box while lower extremity kinematics were obtained with a Vicon motion capture system collecting at 240 Hz. Subjects were fatigued by doing 50% 1RM leg presses until exhaustion. Drop jumps and strength measurements were repeated after the fatigue protocol. Sagittal and frontal plane angles for right and left legs at their respective touchdowns (TD), at maximum knee flexion, and the corresponding ROM were compared between genders, fatigue conditions and legs using t-tests ( $p < 0.05$ ). **Results:** A significant reduction in quadriceps and hamstring strength demonstrated that fatigue did occur, but only hip flexion at TD for males was altered. Both genders exhibited a lack of symmetry, but only in the sagittal plane, primarily with the ROM. Female hip and knee flexion ROM were asymmetrical pre-fatigue ( $62.5 \pm 14.3^\circ$  vs.  $57.1 \pm 21.4^\circ$  for R and L hip, respectively,  $p=0.011$ ;  $79.4 \pm 21.4^\circ$  vs.  $71.3 \pm 30.5^\circ$  for R and L knee, respectively,  $p=0.005$ ) and post-fatigue ( $60.4 \pm 11.3^\circ$  vs.  $54.9 \pm 19.2^\circ$  for R and L hip, respectively,  $p=0.014$ ;  $80.8 \pm 17.3^\circ$  vs.  $73.6 \pm 28.9^\circ$  for R and L knee, respectively,  $p=0.033$ ). Males possessed asymmetry only in post-fatigue hip flexion ROM ( $71.0 \pm 13.0^\circ$  vs.  $65.6 \pm 10.8^\circ$  for R and L hip, respectively,  $p=0.004$ ). **Conclusion:** To prevent injury, landing training should focus on sagittal plane symmetry for females, regardless of fatigue state, and in males, when fatigued.

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## 59. THE EFFECT OF FOOTWEAR ON FOOT STRIKE PATTERN

Jacob Nelson, Iain Hunter, Rike Mitchell, Wayne Johnson, Sarah Ridge  
Department of Exercise Science, Brigham Young University

**Purpose:** It has been shown in recent studies that a runner with a fore-foot strike (FFS) experiences lower ground reaction peak forces than a rear-foot strike (RFS) runner. This study examined the foot strike patterns of runners in three separate scenarios including: barefoot, shod and minimalist shoe. **Method:** 28 subjects completed running trials in three conditions. Each subject was an experienced recreational runner who had never previously trained barefoot or in minimalist running shoes. During the running trials, position data was collected from 32 markers using 10 Vicon cameras. Each trial run was done at a target pace of 7min per mile. These conditions included shod (Nike Air Pegasus), minimalist (Vibram FiveFingers), and barefoot running. 3 runs were collected for each foot. The angle of the vector between the heel and toe marker and the ground was calculated and compared with literature to determine whether the runner was a FFS, RFS, or mid-foot striker (MFS). **Results:** Out of 28 total runners who completed the trials, 19 of these runners were RFS in the control running shoe. Of the 19 runners who were RFS, 4 of the runners were observed to be MFS or FFS in the minimalist shoe. Out of the 28 runners, 22 were MFS and 5 were FFS while running barefoot. **Discussion/Conclusion:** This study shows that only 21% of rear-foot strikers in running shoes will immediately change their foot strike to a mid-foot or fore-foot strike when moved to a minimalist shoe. This may lead to a greater risk of injury due to impact collision forces in the runners who remained rear-foot strikers because of the lack of cushioning in the minimalist shoe compared with the running shoe. Biomechanical adaptations may take place after continued training in the minimalist shoe.

## 58. KINETIC KNEE DIFFERENCES DURING A DROP VERTICAL JUMP ONTO DIFFERENT SURFACES

Bahar Y. Hamedani, Guillermo J. Noffal, Scott K. Lynn, Melinda B. Pittman, Kevin L. Buechler  
Biomechanics Laboratory, Centers for Sport Performance, Department of Kinesiology, California State University Fullerton, Fullerton, CA

The forces transmitted to athlete's joints and tissues while jumping and performing high velocity movements are varied among different surfaces and absorptive materials. With continuous advancements and development in field turf production, measurement of kinetic differences occurring at the knee may help reduce the incidence of knee injuries. **PURPOSE:** To examine the kinetic differences at the knee on different contact surfaces during a drop vertical jump. **METHODS:** Twenty healthy, recreationally trained males and females (age:  $22.3 \pm 3.15$  yr, height:  $1.73 \pm .09$  m, mass:  $68.78 \pm 13.03$  kg) were fitted with retro-reflective markers and performed a dynamic warm up. Subjects performed a series of five drop vertical jumps from a height of 30 cm onto each of the three contact surfaces: Packed Grass (PG), Tiger Turf (TT), and Tile (T). Initial peak landing knee moments were obtained through inverse dynamics with motion capture and ground reaction force data. **RESULTS:** A one-way repeated measures ANOVA revealed that knee valgus moments were significantly different across the three surfaces ( $p < .05$ ). Post hoc tests showed significant differences in knee valgus moments between TT ( $2.04 \text{ Nm/Kg} \pm 0.37$ ) and T ( $1.91 \text{ Nm/Kg} \pm 0.35$ ) conditions;  $t(19) = -2.57 \text{ Nm/Kg}$ ;  $p = .019$ . Additionally, there was a significant difference in knee valgus moments for PG ( $2.05 \text{ Nm/Kg} \pm 0.44$ ) and T ( $1.91 \text{ Nm/Kg} \pm 0.35$ ) conditions;  $t(19) = -2.27 \text{ Nm/Kg}$ ,  $p = .035$ . **CONCLUSION:** There is a difference in knee moments in various contact surfaces. However, further research needs to be conducted in order to determine which surface may be deemed safest for athletes as well as other factors which may affect landing. **PRACTICAL APPLICATION:** By determining how contact surfaces affect knee loads in a landing paradigm, athletes may be able to accommodate their training or equipment to decrease knee moments.

## 60. THE RELIABILITY OF KNEE VALGUS MOMENTS DURING A DROP VERTICAL JUMP

Melinda B. Pittman, Bahar Y. Hamedani, Guillermo J. Noffal, Scott K. Lynn  
Biomechanics Laboratory, Center for Sport Performance, Department of Kinesiology, California State University, Fullerton, Fullerton, CA

**INTRODUCTION:** To our knowledge, the consistency of valgus moments (VM) obtained through motion capture has not been validated. Research has relied on the VM obtained during motion capture to determine their link to knee injuries. These moments need to be reliable so that changes can be attributed to an intervention or movement pattern. **PURPOSE:** To analyze the VMs obtained during the initial landing of a drop vertical jump (DVJ) before and after an eight week time period. **METHODS:** Pre- and post-testing was identical and consisted of a light warm-up prior to three DVJ trials. All participants ( $N=11$ , female,  $21.82 \pm 1.60$  yrs,  $1.63 \pm 0.07$  m,  $60.76 \pm 10.41$  kg) performed a dynamic warm-up which consisted of jumping rope for 45s, jogging in place for 30s, 50m each of and high knee pulls, Frankenstein walks, and forward gate swings. Participants performed three DVJs at a height of 30cm with full arm swing. Initial peak landing VMs were obtained through inverse dynamics with motion capture and ground reaction force data collected with eight-high speed cameras and two force plates. **RESULTS:** An intraclass correlation of the average VM means across the three trials indicated that the left knee was not reliable ( $R_L = .504$ ,  $p = .06$ ); however, the right knee was found to be reliable ( $R_R = .759$ ,  $p = .001$ ). **CONCLUSION:** These results may be attributed to differences in movement patterns between dominant and non dominant limbs. Although much effort was made to have the participant land simultaneously, the differences seen may also be due to participants dropping off the box with their dominant foot, and subsequently landing on that foot first. **PRACTICAL APPLICATION:** Researchers can rely on the VM data acquired through inverse dynamics when examining the right knee.

## 61. ARCH HEIGHT CHANGES AFTER 10 WEEK TRANSITION TO MINIMALIST RUNNING SHOES

Sarah Ridge, Iain Hunter, Rike Mitchell, Wayne Johnson  
Department of Exercise Sciences, Brigham Young University

**Purpose:** Conflicting reports have been presented regarding the relationship of arch height to injury rate in runners. It is theorized that running barefoot causes an increase in activity of the foot muscles and may result in an increase in arch height. The purpose of this study was to determine if transitioning to minimalist running shoes has an effect on arch height in experienced recreational runners. **Methods:** Thirty nine experienced recreational runners, ages 18-45, participated in this study. All runners had been running 15-30 miles per week for the past 6 months and were free from lower extremity injury. Arch height was measured from both feet of each runner in both standing and seated positions (foot in subtalar neutral with the knee in at a 90 degree angle) using the VariFit Pin-Casting Matrix and Accu-Pin scanner before and after 10 weeks of running. Runners were randomly assigned to the Vibram (VFF) or Control group (VFF n=19, C n=20). The control group was instructed to maintain their typical running regimen for 10 weeks. The VFF group transitioned from traditional running shoes to Vibram FiveFinger shoes by gradually replacing mileage in traditional shoes with mileage in VFF. An ANCOVA was used to analyze differences between groups from pre- to post-tests using the pre-test measurement as the covariate to adjust for body size differences. **Results:** No significant differences were reported for the change in either foot in either condition (standing and neutral) between groups (Vibram and Control) – LNAH ( $p=.618$ ); LSAH ( $p=.693$ ); RNAH ( $p=.935$ ); RSAH ( $p=.829$ ). **Conclusions:** Although some evidence exists that suggests that arch height may increase after running barefoot, our results did not show a change in arch height after 10 weeks of running in minimalist running shoes. It is possible that 10 weeks is not enough time to see a significant change.

## AGING

## 63. INVESTIGATING THE EFFECTIVENESS OF A PARK-BASED PHYSICAL ACTIVITY PROGRAM FOR OLDER ADULTS

Liane E. Fujita-Ahmed and Kim Henige  
Department of Kinesiology, California State University Northridge

The barriers and challenges older adults are confronted with significantly hinder their ability or willingness to engage in physical activity. A community-based environment such as local parks aid in overcoming many of those barriers and provide an opportunity for engagement in physical activity. The purpose of the study was to investigate the effectiveness of a park-based physical activity program for the older adult population. The program consisted of three components: 1) park-based instructor-led physical activity, 2) ancillary home exercises, and 3) education and group discussion. Participants attended structured group physical activity sessions, 3 days a week, 1 hour each day at San Fernando Recreation Park, for 9 weeks. Twenty-nine older adults aged 55-81 met eligibility requirements. Participants completed a pre- and post-test assessment for two measures: 1) increased physical fitness levels and 2) reduced fall risk. The Senior Fitness Test was used to assess overall physical fitness and the Fullerton Advanced Balance scale was administered to assess fall risk. Data were analyzed with a paired sample t-test with a significance level set at  $p<.05$ . Due to a small sample size and potential threats to internal validity, a definitive correlation cannot be made. However, a rather important statement can be made regarding the program retention and participant adherence. Thirteen participants adhered to 50% or more of the program and interestingly 15 of the participants are still engaging in the program today. Through utilization of a community park a physical activity program specifically tailored to a special population can be developed. Parks provide opportunities for physical activity yet researchers know little about the specific characteristics that are most related to physical activity (Frumkin, 2003). Further research should focus on the associations between physical activity levels and these specific park characteristics.

## 62. EFFECT OF PREFERRED AND NON-PREFERRED FOOT STRIKE PATTERNS ON ANKLE BIOMECHANICS DURING SHOD RUNNING

Lisa R. Wilson, Scott K. Lynn, Guillermo J. Noffal, Dan A. Judelson  
Biomechanics Laboratory, Center for Sport Performance, Department of Kinesiology, California State University, Fullerton

There has been much controversy recently regarding the appropriate way to strike the ground with your foot while running. Two basic foot striking patterns have generally been investigated: a rear foot strike (RFS) pattern, when the heel hits the ground first; and a fore foot striking pattern (FFS), where the mid to front part of the foot hits the ground first. The purpose of this study was to determine how these foot strike patterns affected ankle moments during a shod running condition. A total of 21 (11 rear foot strikers and 10 front foot strikers) came into lab for two total visits. The first visit entailed a 5K treadmill trial in which the preferred foot strike pattern was determined. For the second visit, the participants ran across a force plate with five front foot strike trials (FFS) and five rear foot strike trials (RFS) in random order. A Qualisys® motion capture system was used to collect kinematic data and Visual 3D was used for processing and kinetic calculations. The results indicated a significant difference ( $p<0.05$ ) for all within subjects effects, but no between subject effects ( $p>0.05$ ). The peak external plantar-flexion moment was significantly greater ( $p<0.05$ ) when the participants performed the RFS (FFS =  $0.0125 \pm 0.0126$  Nm/kg ; RFS =  $0.2327 \pm 0.01073$  Nm/kg) while the peak external dorsiflexion moment was significantly greater ( $p<0.05$ ) in the FFS condition (FFS =  $-3.0910 \pm 0.3179$  Nm/kg; RFS =  $-2.6017 \pm 0.3047$  Nm/kg). These results suggest that different musculature is being loaded while absorbing the impact from the ground during running and this could have an effect on injury development. It also suggests that if a runner is going to adopt a more mid to forefoot striking pattern, proper flexibility at the ankle is a necessity to help prevent injury.

## 64. HEALTHY AND UNHEALTHY DIETARY INTAKE AND CAROTID INTIMA MEDIA THICKNESS

Ron Hager, Kelsey Da Silva, Jim George (FACSM), Pat Vehrs  
Department of Exercise Sciences, Brigham Young University, Provo, UT

**Background**—CVD is a premature killer of adults and is linked to modifiable factors including dietary intake. Diet assessment tools can be costly, and complicated. This study investigated the relationship between diet quality and CVD risk indicated by carotid intima-media thickness (cIMT) using a validated food screener. **Methods**—Participants were 51 male and 33 female adults (mean age 67y). Carotid intima-media thickness (cIMT) was assessed with ultrasound. Unhealthy and healthy diet intake was assessed using a 22 item rapid food screener. Other potentially confounding variables were assessed and included lipid profile, BMI, and resting blood pressure. **Results**—Correlation showed a significant relationship for unhealthy diet pattern and cIMT for average and maximum region cIMT ( $r = 0.218$ ,  $p = .023$ ;  $r = 0.197$ ,  $p = .037$  respectively). There were no significant correlations related to healthy diet pattern. ANOVA results did indicate significant differences in cIMT means (average cIMT and maximum region cIMT) when highest intakes of fruits and vegetables were compared with lowest intakes (average cIMT, (F (1,30) 4.54,  $p = .041$ ; maximum region cIMT, (F (1,30) 5.41,  $p = .027$ ). Average cIMT was 0.729mm vs 0.853mm respectively for highest vs lowest fruit and vegetable intake. Maximum region cIMT was 0.864mm vs 1.023mm comparing highest vs lowest fruit and vegetable consumers. **Conclusion**—Results of this study are similar to other studies that have indicated a relationship between diet and CVD/cIMT. Dietary intakes in the present study were assessed with an easy to use, rapid food screener. This is an important aspect of the study considering previous studies have used lengthier, complicated tools. Because the rapid food screener can be self-administered and is inexpensive it may be used as an indicator of CVD/cIMT risk by health promotion professionals and even individuals themselves.

## 65. PREDICTIVE VALIDITY OF THE COMPREHENSIVE FALLS RISK SCREENING INSTRUMENT

Samantha Johnson, Lainey Widner, Krystyna Gonzalez, Robert Wood  
Department of Human Performance, Dance and Recreation at New Mexico State University

There are many instruments available to screen for falls, but none are particularly impressive in predicting falls. The Comprehensive Falls Risk Screening Instrument (CFRSI; Fabre et al., 2010) has been validated to distinguish fallers from non-fallers. The purpose of this study is to explore the predictive validity of CFRSI scores with respect to subsequent falls within 12 months. **Methods:** Participants: 67 older adults were recruited from community health centers in LA and NM. Exclusion criteria: age < 50 years old, non-ambulatory, and without significant cognitive impairment. Each participant completed the CFRSI. The CFRSI provides risk scores in several domains including History, Physical Function, Medications, Vision, and Environment. The instrument also provides a Total Falls Risk Score that is the average of the domain scores. Approximately 12 months after the initial screening, the participants were questioned regarding whether they had fallen within those 12 months. Discriminant function analysis was used to test the hypothesis that CFRSI domain and total scores can predict falls within 12 months. Follow-up t-tests were used to explore differences in CFRSI scores between participants who fell and those who did not. Alpha was set a-priori at .05 **Results:** Discriminant Function Analysis using all domain scores revealed statistically significant ability to predict falls over 12-months. Stepwise Discriminant Analysis revealed that the history score was the strongest predictor and that adding other domain scores did not enhance the predictive validity of the CFRSI. Follow-up t-tests revealed significantly higher risk scores for the History, Physical Function, Medication, and Total Risk Scores among those who fell in comparison to those who did not over the 12-month period. **Conclusion:** These data suggest that even in a limited number of participants, the CFRSI can predict falls occurring within 12 months of screening.

## SPORTS MEDICINE

### 67. THE EFFECT OF MORNING VERSUS AFTERNOON CONDITIONING IN STRESS LEVELS AND URTI SYMPTOMS IN COLLEGE SOFTBALL PLAYERS

Devin Bennett, Trevor Gillum  
California Baptist University, Dept of Kinesiology

**Introduction:** Analyzing stress levels and their effect of the immune system can increase our understanding of performance. Cortisol levels peak during the morning and are at the lowest in the afternoon. Cortisol has been shown to suppress the immune system. **Purpose:** The purpose of this study was to compare college softball player's stress levels in teams that condition in the morning compared to teams that condition in the afternoon. **Methods:** Subjects were 38 female NCAA Division II college softball players. Team 1 had 18 subjects that condition in the afternoon. Team 2 had 20 subjects that condition in the morning. The Daily analyses of life demands for athletes (DALDA) and Wisconsin upper respiratory symptoms surveys (WURSS-21) were used to assess stress during the season. **Results:** DALDA Part A did not differ between teams ( $p>0.05$ ) or across the season ( $p>0.05$ ). DALDA Part B showed a significant increase in scores for the afternoon team and week\*team ( $p<0.05$ ). The severity of symptoms, according to the WURSS, was not different in teams or weeks. **Discussion:** Results suggest that the best time for conditioning is the morning. The findings also showed that the athletes in the earlier weeks of the season (Feb-Mar) are more likely to have a weaker immune system than near the end of the season. The lowered stress levels during the morning training sessions may reflect a more structured routine that facilitates rest compared to afternoon teams. Since teams did not differ on WURSS, diurnal variations in cortisol levels may not be a primary factor in sickness in collegiate athletes.

## 66. INTERACTIONS AMONG FALLS RISK FACTORS IN OLDER WOMEN

Lainey Widner<sup>1</sup>, Samantha Johnson<sup>1</sup>, Robert Wood<sup>1</sup>, Tonghui Wang<sup>2</sup>  
New Mexico State University, Las Cruces, NM  
1. Department of Human Performance, Dance, and Recreation, 2. Department of Mathematics

Several risk factors for falls have been identified in older women, including: physical function, medications, and vision problems. However, we are not aware of any studies that have simultaneously examined multiple risk factors and placed on emphasis on exploring interactions among various risk factors. The purpose of this study was to investigate the extent to which selected risk factors interact with each other with respect to falls in older women. In particular we are interested in the extent to which interactions between medication usage, physical function, environment safety, and vision acuity and care can discriminate fallers from non-fallers, **Methods:** *Participants:* 543 older women were recruited from community health centers in LA, GA, and NM. Exclusion criteria: age < 50 years old, non-ambulatory, men, and MMSE <19. Each participant completed the Comprehensive Falls Risk Screening Instrument. This instrument includes risk scores in several domains: History, Physical Function, Medications, Vision, and Environment. Information was recorded about the number and type of medications taken by each individual, in addition, if side-effects were experienced from any medication. Physical function was measured using a Timed-Get-Up-and-Go test and a Functional Reach test. Vision risk was assessed with questions pertaining to frequency of vision care, correct use of lenses, and a Snellen visual acuity test. After eliminating incomplete data and univariate and multivariate outliers, 382 cases were analyzed using Logistic Regression on whether the participant had reported having fallen in the past three years. **Results:** Of the 382 valid cases, 117 were fallers and 265 were non-fallers. Logistic Regression revealed a significant interaction between Medication risks and Timed-Get-Up-and-Go (TUGO) scores ( $p = .0036$ ). **Conclusion:** The protective effect of maintaining positive physical function appears to be of increasingly greater importance in older women taking medications associated with falls.

### 68. LUMBAR AND THORACIC SPINE KINEMATICS IN LOW HANDICAP GOLFER WITH AND WITHOUT LOW BACK PAIN

Brett S. Frazier, Scott W. Carver, Scott K. Lynn, Guillermo J. Noffal, Lee E. Brown FACS  
Biomechanics Laboratory, Department of Kinesiology, California State University, Fullerton, Fullerton, CA

The lower back is a common site of golf-related injury. A variety of studies have been conducted pertaining to low back pain (LBP) in golfers. Despite this research undertaking, the exact source of golf-related LBP remains unclear. According to the joint-by-joint theorem the lumbar spine should remain stable and golfers should move through the thoracic spine and hips (Cook, 2010). Therefore, the purpose of this study was to identify differences in lumbar and thoracic spinal kinematics between low-handicap golfers who experience LBP and those who do not after practicing or playing a round of golf. 21 male golfers were selected as subjects, ten with LBP and eleven without (NLBP). 20 individual retro-reflective markers (1.0 and 1.3 cm) and a rigid body containing a cluster of 4 retro-reflective markers (1 cm each) were attached to each subject's body for calibration (i.e. static) trials and golf swing trials. Subjects performed a short warm-up, then proceeded to hit 5 balls with their own driver for recording. Results for the lumbar spine back swing rotation showed the NLBP group with  $-29.9^{\circ}(8.4)$  and LBP  $-34.3^{\circ}(6.0)$ ,  $p=0.19$ . Lumbar Spine downswing and follow-through; NLBP  $43.4^{\circ}(11.4)$  and LBP  $50.4^{\circ}(10.3)$ ,  $p=0.16$ . Thoracic spine rotation for the backswing for NLBP  $-34.0^{\circ}(11.0)$  and LBP  $-31.3^{\circ}(6.0)$ ,  $p=0.50$ . Thoracic rotation for downswing and follow-through were as follows, NLBP  $54.8^{\circ}(16.2)$  and LBP  $49.6^{\circ}(10.6)$ ,  $p=0.41$ . Though no significance was found in this study, there was a trend supporting our hypothesis that the LBP group would have more movement through the lumbar spine and less through the thoracic spine as compared to the NLBP group. Sample size calculations revealed that increasing the number of subjects to  $N=20$  for each group would provide enough statistical power to reveal significant differences between groups.

## 69. AN 8.3 MILE RUN DECREASES ACHILLES' TENDON THICKNESS IN COLLEGIATE MALE CROSS COUNTRY RUNNERS

Coulter Neves, A. Wayne Johnson, J. William Myrer, Iain Hunter, Katy A. Neves, Jarom Bridges

Department of Exercise Sciences, Brigham Young University

**Background/significance:** In runners, the Achilles' tendon is the most frequently ruptured tendon and it is prone to overuse injury. Individuals suffering Achilles' tendon injury are often very physically active with a high rate of sports participation prior to injury. It is important to understand the effects of running on Achilles' tendon thickness in understanding injury risk in runners and in developing improved training protocols. **Purpose:** To investigate acute changes in the Achilles' tendon thickness and cross-sectional area in male cross-country runners after an 8.3 mile run. **Methods:** The Achilles' tendon of 14 male collegiate cross-country runners (age: 22.2±2 years, height: 182.5±6.7 cm, weight: 67.9±5.5 kg) was measured 8 cm from the plantar surface of the calcaneus using ultrasound imaging. Both longitudinal and transverse images were taken before and after an 8.3 mile training run, while maintaining appropriate alignment and positioning of the ultrasound probe. A mark was placed on the skin to ensure the same portion of tendon was measured pre and posttest. The ankle of the runners was maintained at a fixed position of 90 degrees and held in place by a strap attached to a treatment table. The data was analyzed using a paired T-test. **Results:** There was a significant decrease in tendon thickness of 11.4% ( $p < 0.001$ ) and there was also a significant decrease in overall cross-sectional area of 4.4% ( $p = 0.012$ ). **Conclusion:** There appears to be a thinning of the tendon due to running. It is not known if the magnitude of thinning or lack of thinning or difference in the rate of thinning is associated with the risk of Achilles' tendon injury in runners. It would be beneficial if future research would investigate the correlation between Achilles' tendon thinning and training parameters and Achilles tendon injury in male runners.

## 71. AN ANALYSIS OF SUDDEN DEATH IN YOUNG COMPETITIVE ATHLETES IN THE UNITED STATES DURING 2011

Stephanie Perez\*, Russell T. Baker†, Jeff Seegmiller‡, and Jayme Bakert

\*Loyola Marymount University, Los Angeles, CA, †California Baptist University, Riverside, CA, ‡University of Idaho, Moscow, ID

**Context:** Sudden death in young competitive athletes has recently garnered increased media attention and intensified efforts for athlete safety legislation. The frequency with which these catastrophes occur is largely unknown. **Objective:** To develop reliable incidence data of sudden death in young competitive athletes. **Design:** Prospective surveillance study. **Setting:** Cases of sudden athlete death (SAD) were documented through news media reports identified using internet search engines (Google, Yahoo, Ask, and Bing) and Foundation websites (Parent Heart Watch, Sudden Cardiac Arrest Association, and Hypertrophic Cardiomyopathy Association). **Patients or Other Participants:** Athletes (Elementary School through College) participating in athletic practices, competitions, events, or physical education classes in the United States. **Data Collection and Analysis:** Cases of SAD were verified using two different media reports. To be included, the case had to involve a school aged athlete participating in traditional athletic events without evidence of recreational drug use. Causes of death were only included when autopsy results were cited. **Results:** In 2011, 80 SAD's were identified (mean age of 15.9). Of these, 37 (46.2%) were explained by sudden cardiac arrest, 6 (7.5%) by traumatic brain injury, and 3 (3.75%) by heat illness. The most common sports involved were basketball (24 cases, 30%), football (18 cases, 22.5%), and track/cross-country (12 cases, 15%). Collapse commonly occurred during or immediately after an academic institution sponsored practice, formal athletic contest, or physical education course (45 cases, 56%). Collapse also occurred while athletes participated in recreational (youth league, intramural sport, health club, or sport camp) activities (25 cases, 29%) or during the evening following participation in an athletic event (10 cases, 15%). **Conclusions:** The 2011 incidence of SAD was higher than previous reports examining a similar population. These data support the need for mandatory reporting of SAD's to a national registry and highlight the importance of increased awareness to reduce the risk.

## 70. A 4 MILE RUN DECREASES ACHILLES' TENDON THICKNESS AND CROSS-SECTIONAL AREA IN COLLEGIATE FEMALE CROSS COUNTRY RUNNERS

Katy A. Neves, A. Wayne Johnson, J. William Myrer, Iain Hunter, Coulter Neves, Jarom Bridges

Department of Exercise Sciences, Brigham Young University

**Background/significance:** Recently, there has been interest in using ultrasound imaging of tendons and muscles to assess injury and recovery. In runners, the Achilles' tendon is the most frequently ruptured tendon. Individuals suffering Achilles' tendon rupture are often very physically active with high rate of sports participation pre-injury. It is important to understand the effects of running on Achilles' tendon thickness to better understand injury risk and to develop training protocols. **Purpose:** To investigate acute changes in Achilles' tendon thickness and cross-sectional area in female cross-country runners after a 4 mile run. **Methods:** The Achilles' tendon of 12 female collegiate cross-country runners (age: 19.3±1.5 years, height: 168.4±4.8 cm, weight: 55.2±4.8 kg) was measured 8 cm from the plantar surface of the calcaneus using ultrasound imaging (GE Logic e). Both longitudinal and transverse images were taken before and after a 4 mile training run. A mark was placed on the skin to ensure the same portion of tendon was measured pre and post-test. The ankle of the runners was maintained at a fixed position of 90 degrees and held in place by a strap attached to a treatment table. The data was analyzed using a paired T-test. **Results:** There was a significant decrease in tendon thickness of 7.4% ( $p < .0001$ ) and there was also a significant decrease in overall cross-sectional area of 9.6% ( $p < .0001$ ). **Conclusion:** There appears to be a thinning of the tendon due to running. It is not known if the magnitude of thinning or lack of thinning or difference in the rate of thinning is associated with the risk of Achilles' tendon injury in runners. Further research should be undertaken to investigate correlations between Achilles' tendon thickness and the type of workout (e.g. hilly versus flat), foot-strike pattern, and running season (i.e. cross-country versus track) and risk of injury.

## 72. SKELETAL MUSCLE FUNCTION AND BONE MASS IN WEIGHT BEARING VS. NON-WEIGHT BEARING ATHLETES

Jessica Reid, Michele LeBlanc, and Steven Hawkins., FACSM

Exercise Science Department, California Lutheran University

The purpose of the study was to compare the muscle-bone relationship in weight bearing and non-weight bearing athletes. Male cyclists ( $n=35$ ) and runners ( $n=40$ ) 18-35 yrs of age were tested for body composition and bone mineral density (BMD) by DXA. Muscle strength was determined by 1RM leg press, muscle power by a vertical jump test, and muscle endurance by an isokinetic leg extension/flexion test. Independent t-tests were used to compare variables between cyclists and runners, while Pearson correlation was used to investigate muscle-bone relationships ( $p < 0.05$ ). Normalized muscle strength ( $5.13 \pm 0.94$  vs.  $4.80 \pm 0.84$  BW) and muscle power ( $929.8 \pm 77.0$  vs.  $837.7 \pm 150.3$  W) were not different between runners and cyclists, respectively, whereas muscle endurance ( $38.1 \pm 23.0$  vs.  $43.9 \pm 13.0$  % decline) was significantly greater in the cyclists ( $p \leq 0.05$ ). Despite cyclists being significantly heavier ( $76.3 \pm 12.4$  kg vs.  $66.5 \pm 6.7$  kg, respectively,  $p \leq 0.05$ ) runners had greater BMD in their hip ( $1.050 \pm 0.090$  vs.  $0.980 \pm 0.130$  g/cm<sup>2</sup>, respectively,  $p \leq 0.05$ ), while spine BMD did not differ ( $0.990 \pm 0.100$  vs.  $1.020 \pm 0.120$  g/cm<sup>2</sup>, respectively). For cyclists, there was a significant relationship between peak muscle power and spine BMD ( $r=0.39$ ,  $p \leq 0.05$ ) as well as total BMD ( $r=0.41$ ,  $p \leq 0.05$ ). No relationships between muscle function and bone were noted for runners. In conclusion, weight bearing exercise appears to significantly impact hip, but not spine, bone strength. Research supported by the Swenson Summer Research Fellowship Program

### 73. RELATIVE RISK OF CONCUSSIONS IN YOUTH, FEMALE SOCCER PLAYERS

Sarah Strand, David Lechuga, Thomas Zachariah, Kathryn Beaulieu  
Department of Health and Human Sciences, Loyola Marymount  
University; Rocky Mountain University of Health Professions; The  
Neurobehavioral Clinic and Counseling Center

The purpose of this research is to determine the relative risk of concussions in 11-13 year old, female soccer players. This was determined with surveys completed by soccer players compared to their age-matched controls. The soccer players were asked if they experienced a blow to the head that resulted in a sign or symptom of concussion in the previous season and the controls were asked about the previous six months. The study had 342 participants: 195 were involved in an organized soccer team/club and 147 were not involved in organized soccer, but were allowed to participate in any other sport. A total of 94 of the 195 soccer players, or 48%, reported at least one symptom consistent with a concussion, A total of 34 of the 147 non-soccer players, or 23%, reported at least one symptom consistent with a concussion. These results determined that the relative risk of probable concussions among 11-13 year old, female soccer players is 2.09. ( $P < .001$ ,  $\alpha = .05$ ,  $CI = 95\%$ ).

### OTHER

### 75. ELECTROMYOGRAPHIC RATIO ANALYSIS OF THE GLUTEUS MAXIMUS, BICEPS FEMORIS, AND RECTUS FEMORIS DURING VARIATIONS OF THE GLUTE BRIDGE EXERCISE

Adam P. Capilouto, Brett S. Frazier, Guillermo J. Noffal, Scott K. Lynn, Leland Barker  
Biomechanics Laboratory, Center for Sport Performance, Department of  
Kinesiology, California State University, Fullerton, Fullerton, CA

**INTRODUCTION:** It has been suggested that improving the function of the muscles which produce hip extension, primarily the gluteus maximus, could help improve the efficiency of human movement patterns. Clinical use of various glute bridge techniques have attempted to address this issue, however no studies have determined how various alterations in glute bridge techniques alter glute, hamstring and quadriceps activation ratios. **PURPOSE:** To determine the effects of various glute bridge techniques on glute to hamstring activation ratio. **METHODS:** Twenty healthy recreationally trained males (age:  $22.89 \pm 1.91$  yr, height  $1.77 \pm 6.50$  m, mass  $76.38 \pm 8.75$  kg.) attended a single data collection session. Maximum voluntary contraction (MVC) EMG data was collected for the gluteus maximus, rectus femoris and biceps femoris. Subjects then performed three repetitions of three conditions in random order with one minute rest between trials: Normal glute bridge on a forceplate; Band, subject abducted the legs against a Thera-Band® wrapped around the knees; and Shear, the subject created a shear force by pushing the toes against a stopper connected to the force plate. EMG and Force Plate data were collected. **RESULTS:** A repeated measures ANOVA revealed no significant differences for Glute to hamstring ratio ( $P > .05$ ) across all three conditions (Normal M  $1.49 \pm 1.56$ ; Band M  $3.77 \pm 8.86$ ; Shear M  $.99 \pm .73$ ). There was however, significantly greater glute activation ( $P < .05$ ) for the Band condition over both the Normal and Shear conditions. **CONCLUSION:** Neither the use of a Thera-Band® or applying a shear force altered the glute to hamstring ratio, however the Thera-Band® did elicit greater glute activation due to its external rotation component. The shear condition was effective in changing the force application onto the ground however it did not result in glute/hamstring ratio alterations. **PRACTICAL APPLICATION:** Professionals working in a clinical situation can use Thera-Band® glute bridges to increase glute activation in their patients.

### 74. THE EFFECT OF ORAL GLUTAMINE SUPPLEMENTATION ON GASTROINTESTINAL PERMEABILITY AND HEAT SHOCK PROTEIN REGULATION IN ENDURANCE RUNNERS

Micah Zuhl<sup>1</sup>, Katherine Lanphere<sup>1</sup>, Len Kravitz<sup>1</sup>, Christine Mermier<sup>1</sup>,  
Suzanne Schneider<sup>1</sup>, Karol Dokladny<sup>2</sup>, and Pope Moseley<sup>2</sup>

<sup>1</sup> Department of Health, Exercise, and Sport Science, University of New Mexico, Albuquerque, NM, <sup>2</sup> Department of Internal Medicine, University of New Mexico, Albuquerque, NM

The purpose of this study was to determine whether seven days of oral glutamine supplementation reduces exercise induced permeability and the inflammatory cascade that may be the cause of exercise related gastrointestinal distress. The mechanism may be through up-regulation of heat shock protein 70 (HSP70) in peripheral blood mononuclear cells (PBMCs). **METHODS:** Eight subjects (5 male, 3 female) completed baseline testing, and two 60-minute treadmill runs at 70% of maximal aerobic capacity after seven days of glutamine (GLN) or placebo (PLA) supplementation. Baseline measurements included, maximal aerobic capacity, intestinal permeability, and PBMCs levels of HSP70 and nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, alpha (IKB- $\alpha$ ). During each exercise trial core temperature, heart rate, and perceived exertion were measured. PBMCs contents of HSP70 and IKB- $\alpha$  were measured pre-exercise, post-exercise, 2hrs post-exercise, and 4hrs post-exercise. Lactulose and rhamnose were ingested 20-minutes into exercise and intestinal permeability was measured in the urine. **RESULTS:** Core temperature was not different between trials ( $39.40 \pm .39$  vs.  $39.54 \pm .22$  for PLA vs. GLN, respectively,  $p > 0.05$ ). The ratio of lactulose to rhamnose was significantly higher in the PLA trial when compared to BASE ( $.0604 \pm .0470$  vs.  $.0218 \pm .0084$ , respectively,  $p < 0.05$ ). Permeability was not statistically different between GLN trial and BASE ( $.0272 \pm .0074$  vs.  $.0218 \pm .0084$ , respectively,  $p > 0.05$ ). Permeability was higher in the PLA versus the GLN trial ( $.0604 \pm .0470$  vs.  $.0272 \pm .0074$ , respectively,  $p < 0.05$ ). Both IKB- $\alpha$ , and HSP70 expression were higher at the 4hr mark in the GLN trial when compared to the 4hr mark in the PLA ( $p < 0.05$ ). **CONCLUSION:** Seven days of glutamine supplementation reduced exercised induce GI permeability. In addition, GLN supplementation reduced the inflammatory cascade through up-regulation of HSP70 and IKB- $\alpha$ . This indicates that glutamine protects the gut, and may reduce GI related distress.

### 76. OBJECTIVELY MEASURED HABITUAL PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR IN A REPRESENTATIVE SAMPLE OF TODDLERS

Blake Carney<sup>1</sup>, Spencer Wendt<sup>1</sup>, Jonathan Decker<sup>2</sup>, Louise A. Kelly<sup>1</sup>  
<sup>1</sup>Department of Exercise Science, California Lutheran University,  
<sup>2</sup>Department of Kinesiology, California State University, Monterey Bay

**Background:** Recent increases in the prevalence of pediatric obesity have increased awareness of physical inactivity as a public health problem. The absence of evidence of increased energy intake over the same time period among children implies that habitual physical activity has declined and sedentary behavior has increased in recent years. While a plethora of data exists for preschoolers, but data on toddlers under the age of 3 years is limited. **Purpose:** To describe the physical activity levels and sedentary behavior of toddlers from Ventura County. **Methods:** Physical activity and sedentary behavior was measured in twenty three- (10 boys, 13 girls) toddlers ( $n = 22$  toddlers, mean age  $1.65 \pm 0.49$ ) using the Actigraph GT1M (Pensacola, Florida). GT1m's were worn for a minimum of 6 waking hours per day (approximately 60% of the waking hours for children of this age), for a minimum of 4 days. Age appropriate cut-offs were used to categorize intensities of physical activity and describe levels of sedentary behavior. **Results:** Toddlers spent a total of  $3190 \pm 1217.2$  minutes per week engaged in total physical activity. Time spent in sedentary behaviors was  $55.2 \pm 6.0\%$  for males and  $56.8 \pm 6.5\%$  for females. The gender difference was not statistically significant (ANOVA,  $p = 0.55$ ). Boys spent  $1.36 \pm 0.22\%$  and girls  $1.52 \pm 0.11\%$  of their time at light intensity physical activity, with a trend for gender difference significance, (ANOVA,  $p = 0.06$ ). The gender difference for time spent at moderate to vigorous physical activity was not statistically significant (Males  $43.5 \pm 6.0$ ; Females  $41.7 \pm 6.5$ ; ANOVA,  $p = 0.51$ ). **Conclusion:** While preschoolers spent the majority of their day sedentary, our toddlers spent a considerable amount of the day at either sedentary behavior or engaged in MVPA. Future studies should investigate the transition from toddler to preschooler and its implications on physical activity.

## 77. PHYSICAL ACTIVITY INTENSITY AND WEEKLY PATTERNS IN YOUTH WITH AND WITHOUT PRADER-WILLI SYNDROME

D.M. Castner<sup>1</sup>, A. Duran<sup>1</sup>, J.M. Tucker<sup>2</sup>, and D.A. Rubin<sup>1</sup>

<sup>1</sup>Department of Kinesiology, California State University, Fullerton, Fullerton, CA

<sup>2</sup>Healthy Weight Center, Helen DeVos Children's Hospital, Grand Rapids, MI

**Background:** Physical inactivity is a major problem in children in the United States. Prader-Willi Syndrome (PWS) is the best characterized form of congenital obesity. Individuals with PWS present hypotonia, lethargy, and poor stamina – conditions that can affect physical activity (PA) level. The purpose of this study was to compare PA levels between obese children who either have or do not have PWS. **Methods:** Thirty-one (17M, 14F) obese children without PWS (OB) (mean age: 9.6±1.2 yrs) and 18 (9M, 9F) PWS youth (mean age: 11.0±2.2 yrs) participated. Participants wore accelerometers for eight consecutive days during all waking hours, except bathing/swimming. Children with a minimum of 10 hours of wear time on 3 weekdays and 1 weekend day were included in the analyses. PA data were categorized by intensity: sedentary (SED), low (LPA), moderate (MPA), vigorous (VPA), and moderate to vigorous (MVPA). **Results:** Sex and age were not significant covariates in the MANOVA analyses. PWS spent significantly greater time than OB being SED (total: 1273±58 vs. 1220±59 min/day;  $p=0.004$ ; weekdays: 1269±62 vs. 1215±58 min/day;  $p=0.004$ ; weekend: 1281±59 vs. 1235±78 min/day;  $p=0.038$ ). PWS spent significantly less time than OB in total LPA (131±46 vs. 175±45 min/day;  $p=0.004$ ), VPA (10±6 vs. 17±9 min/day;  $p=0.005$ ), and MVPA (36±17 vs. 49±20 min/day;  $p=0.035$ ), but were similar in total MPA (27±13 vs. 32±13 min/day;  $p=0.184$ ). In addition, PWS spent significantly less time in VPA than OB specifically on weekdays (10±7 vs. 18±10;  $p=0.011$ ). All other weekly patterns were similar between groups ( $p>0.050$ ). **Discussion:** Although neither group met the minimum recommendations for total daily MVPA, on average, those with PWS appear to be at higher risk than typical obese children given their higher levels of SED and lower levels of MVPA. In particular participation in VPA should be emphasized during the weekdays in this population.

## 79. PHYSICAL ACTIVITY IS POSITIVELY ASSOCIATED WITH BONE PARAMETERS IN CHILDREN WITH CONGENITAL OBESITY DUE TO PRADER-WILLI SYNDROME

A. Duran<sup>1</sup>, D.M. Castner<sup>1</sup>, J.M. Tucker<sup>2</sup>, and D.A. Rubin<sup>1</sup>

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

Healthy Weight Center, Helen DeVos Children's Hospital, Grand Rapids, MI

**Background:** Insufficient physical activity (PA) can lead to obesity and poor bone health. Children with Prader-Willi Syndrome (PWS) present hypotonia, congenital obesity, and growth hormone deficiency, which may account for decreased spontaneous PA and poor bone health. **Purpose:** To explore associations between PA and bone parameters in PWS youth. **Methods:** Nine boys and nine girls (mean age: 11.0±2.2 y, body fat: 46.2±8.5 %) participated. Objective PA was assessed using accelerometry measured over eight days, with analyses including participants with a minimum of 3 compliant weekdays and 1 compliant weekend day. PA was classified based on intensity into sedentary (SED: 1273±58 min/day), light (LPA: 131±46 min/day), moderate (MPA: 27±13 min/day), vigorous (VPA: 10±6 min/day), and moderate plus vigorous (MVPA: 36±17 min/day). Dual-energy x-ray absorptiometry measured bone parameters (bone mineral content [BMC], bone mineral density [BMD], and BMD z-score [BMD<sub>z</sub>]) of the lumbar spine, hip, and total body minus the head (TB). **Results:** Bivariate correlations showed that SED was negatively associated with hip BMD<sub>z</sub> ( $r=-0.557$ ;  $p=0.016$ ). LPA was positively associated with hip BMD<sub>z</sub> ( $r=0.484$ ;  $p=0.042$ ). MPA was positively associated with hip BMD<sub>z</sub> ( $r=0.569$ ;  $p=0.014$ ), hip BMD<sub>z</sub> ( $r=0.589$ ;  $p=0.010$ ), and TB BMD<sub>z</sub> ( $r=0.636$ ;  $p=0.005$ ). MVPA was positively associated with hip BMD<sub>z</sub> ( $r=0.566$ ;  $p=0.014$ ), spine BMC ( $r=0.516$ ;  $p=0.034$ ), TB BMC ( $r=0.509$ ;  $p<0.05$ ), and BMD<sub>z</sub> ( $r=0.539$ ;  $p<0.050$ ). VPA was not significantly associated with any parameter. **Discussion:** Our results illustrate a positive association between MVPA and BMD in PWS youth. Interestingly, VPA had no associations with bone parameters, possibly due to lower amounts of total VPA engagement in these youth with PWS. The negative association between SED and hip BMD<sub>z</sub> supports the notion that in addition to insufficient PA, excessive sitting also negatively influences BMD. Similar to other youth, MVPA must be encouraged and SED discouraged in this population despite the inherent low stamina in PWS.

Supported by USAMRAA Award W81XWH-09-1-0682

## 78. CELL PHONE USE AND POSTURAL SWAY

Andrew Dettelbach, AJ Kirkpatrick, David McMillan, Christine Plotts, Weston Ryan, Jeff A. Nessler

Dept of Kinesiology, California State University, San Marcos

In recent years, cell phone use has expanded rapidly. Many individuals have begun to use cell phones while performing important motor tasks, which has highlighted the potential for distraction. While several investigations have focused on alterations in reaction time with concomitant cell phone use, to date no analysis of postural sway has been reported. The purpose of this study was to quantify the effect of three different cell phone conditions on postural sway during quiet standing. Nineteen college-aged students ( $m = 9$ ,  $f = 10$ ; age  $22 \pm 3$  yrs) stood with both feet on a force platform (NeuroCom Balance Master®) for a period of 18 seconds for four trials: 1) standing quietly with no distraction, 2) watching a video, 3) texting a message, and 4) speaking to a research assistant. Movement of the center of pressure was analyzed in a conventional manner (peak CoG movement in °/s) and using nonlinear analysis of Approximate Entropy (ApEn). When compared to the speaking condition (A/P,  $1.031 \pm 0.629$ °/s, M/L,  $2.215 \pm 1.566$ °/s), CoG movement was significantly reduced during quiet standing with no distraction (A/P,  $0.534 \pm 0.135$ °/s; M/L  $1.348 \pm 0.368$ °/s) and while texting (A/P,  $0.551 \pm 0.339$ °/s; M/L,  $1.175 \pm 0.473$ °/s). Approximate entropy was also significantly reduced during quiet standing with no distraction (M/L,  $0.081 \pm 0.029$ ), watching a video (A/P,  $0.079 \pm 0.045$ ), and texting (A/P,  $0.080 \pm 0.046$ ; M/L,  $0.083 \pm 0.024$ ) when compared to the speaking condition (A/P,  $0.109 \pm 0.025$ ; M/L,  $0.109 \pm 0.046$ ). Overall, conversing while using a handheld phone resulted in a significant increase in the amount and complexity of postural sway. These results may have been caused by changes in upper extremity posture while holding the phone to one's ear, or through alterations in cognitive load as suggested by significant changes in ApEn. Further investigation is needed to determine the mechanism of the observed changes in sway with cell phone use.

## 80. MECHANICAL CHARACTERISTICS OF YOUNGER AND OLDER SUBJECTS' PATELLAR TENDON VIA ACOUSTOELASTICITY ANALYSIS OF ULTRASOUND IMAGES

Kyle Evans, Steven Hawkins, FACSM, Michele LeBlanc

Exercise Science Department, California Lutheran University

Acoustoelasticity has been used to obtain non-invasive mechanical measures of in-vivo tendon from ultrasound images. **Purpose:** To use the acoustoelasticity-based software program, EchoSoft (Echometrics, Madison, WI), to compare strain developed in the patellar tendon during an isometric contraction between younger and older participants and to determine the behavior of the tendon's strain-signal change (stiffness) curve. **Methods:** Moderately active Younger subjects ( $n=14$ , age =  $22.6 \pm 3.8$  years) and Older subjects ( $n=13$ , age =  $82.2 \pm 5.6$  years) were recruited from the local community. Graded isometric knee extensions were performed on an isokinetic dynamometer while ultrasound data was collected at 25 Hz. Ultrasound DICOM files were uploaded to the EchoSoft software to obtain strain and stiffness information for a region of interest proximal to the tibial attachment site. One trial with increasing strain and stiffness for at least 800 ms was chosen for each subject's leg for analysis. **Results:** There was no difference in the maximum strain experienced in the 800 ms timeframe between the Younger and Older groups ( $8.4 \pm 6.0\%$  versus  $8.7 \pm 5.3\%$ , respectively). There was a difference between the maximum strain values between legs for the Older group ( $p = 0.007$ ), but not the Younger group. There was a significant relationship between the maximum strain and maximum torque values for the Younger group ( $r = 0.525$ ;  $p = 0.004$ ), but not the Older group ( $r = -0.030$ ). The exponential curve and general linear model fits were best and nearly identical for both groups ( $R^2 = 0.937 \pm 0.045$  for both curve types for the Younger group and  $R^2 = 0.956 \pm 0.032$  and  $0.955 \pm 0.032$  for the Older group). The individual quadratic curves fit well, but differed in their concavity direction. These observations support that the strain-stiffness curve is best described as exponential or linear. Research supported by the Swenson Research Fellowship Program

## 81. TOWARDS STANDARDIZATION OF THE NOMENCLATURE OF RESISTANCE TRAINING EXERCISES

Matthew C. Jackson, Lee E. Brown, FACSM, Jared W. Coburn, FACSM, Daniel A. Judelson, FACSM  
Center for Sport Performance, Human Performance Laboratory,  
Department of Kinesiology, California State University, Fullerton, CA

The purpose of this study was to survey different professionals regarding the nomenclature of resistance training exercises. 205 participants volunteered for the study, of which 64.9 % were male. Participants self-identified as either Certified Athletic Trainer (AT; 22.4%), Academia (ACD; 18.5%), Strength and Conditioning Coach (SC; 25.9%), Personal Trainer (PT; 15.6%), or Clinician (CLIN; 17.6%). Participants were asked to name 10 resistance training exercises as depicted by pictures. A Chi-square for exercise name by current profession analysis was used to analyze frequency differences. All exercises in the survey yielded inconsistent terminology primarily related to the responders' profession as well as naming patterns related to the three items of specification, equipment and exercise. These results reveal a need to establish consistent naming pattern guidelines for resistance training exercises. The use of a consistent naming pattern may provide direction and clarity when working with athletes and clients in a strength training environment. We suggest a "specification, equipment, exercise" (e.g. One Arm Dumbbell Row) naming pattern be used when naming resistance training exercises.

## 82. ACUTE mTOR SIGNALING RESPONSE TO WHOLE BODY VIBRATION

Michael G. Leavitt<sup>1</sup>, J. Brent Feland<sup>1</sup>, David M. Thomson<sup>2</sup>, Gary W. Mack, FACSM<sup>1</sup>, Daniel S. Nelson<sup>1</sup>, Brenda Benson<sup>1</sup>, and Allen C. Parcell, FACSM<sup>1</sup>

<sup>1</sup>Department of Exercise Sciences, Brigham Young University

<sup>2</sup>Department of Physiology & Developmental Biology, Brigham Young University

Functional adaptations in human skeletal muscle following a period of resistance exercise are the result of regular activation of cellular signaling pathways that elevate muscle protein synthesis. It has been reported that the addition of whole body vibration (WBV) to a resistance exercise program enhances performance. Such improvements in muscle function may be the result of increased activation of cellular signaling pathways associated with muscle growth. Purpose: We have investigated whether an acute bout of resistance exercise in combination with WBV results in a greater activation of the mTOR signaling pathway compared to resistance exercise alone. Methods: Eight untrained college-age males (23±2 yrs, 179±1 cm, 75±2.5 kg, and 12.6±1.8% body fat) performed unilateral leg press exercises with (Vbx) and without (RT) WBV. Muscle samples were obtained from the VastusLateralis muscle pre-exercise (baseline) and one-hour following the bout of resistance exercise. Muscle tissue samples were analyzed for phosphorylated levels of mTOR, p70S6K, and 4E-BP1 proteins. Results: One-hour following the resistance exercise bout there were no differences between phosphorylated levels of mTOR or 4E-BP1 in Vbx or RT (p>0.05). Levels of phosphorylated p70S6K were increased at the one-hour post-exercise time-point in both Vbx (2915±1438% change from baseline, p=0.07) and RT (6411±3789% change from baseline, p<0.05) however there was no difference in protein phosphorylation levels between treatments (p>0.05). Conclusion: WBV does not influence acute activation of the mTOR signaling pathway in human skeletal muscle suggesting that performance benefits resulting from combining resistance exercise and WBV may not be the result of an enhanced growth response.

## 84. PERCEIVED BARRIERS TO WORKSITE HEALTH PROMOTION PROGRAM USE AMONG CSU EMPLOYEES

Leininger, L.J., Harris, D.

Department of Kinesiology, California State University, Monterey Bay  
Department of Social Work, California State University, Fresno

Worksite health promotion programs (WHPP) have become increasingly popular among organizations in the last two decades in order to increase positive health behaviors of employees such as physical activity participation. Unfortunately, participation rates in such programs are traditionally low. Although perceived barriers to participation in physical activity have been well documented among the general population and among many worksites, barriers to participation in WHPP in the CSU system have not been thoroughly examined. PURPOSE: The purpose of this study was to evaluate the perceived barriers to program participation among California State University employees who have access to a WHPP. METHODS: A university wide electronic survey was administered to four CSU campuses with a formal WHPP. Included in the survey was a short answer option for those who did not participate in worksite sponsored events. Qualitative responses were then collected and categorized. RESULTS: Among the four CSU campuses, 494 surveys were returned. Among those, 231 respondents indicated at least one perceived barrier to WHPP participation. The six qualitative themes included time and/or work constraints (N=87); not being aware of the program or not communicated well (N=50); the employee follows their own program or exercise routine (N=40); programs are scheduled at inconvenient times (N=35); no interest in the subject, topic or mode of exercise (N=12); and the cost is too high (N=7). CONCLUSION: The results are consistent with previous research that indicates the top reasons for not participating in physical activity programs. However, if WHPP are to carry out their mission of increasing positive lifestyle behaviors among employees, the perceived barriers need to be addressed with best practices in order to encourage more employees to participate in worksite health promotion programs.

## 83. DECREMENTS IN PULMONARY DIFFUSING CAPACITY WITH DURATION OF DISEASE IN TYPE-1 DIABETES

M.J. Lee, J.C. Baldi, and J.R. Coast, FACSM

Department of Biological Sciences, Northern Arizona University,  
Flagstaff, AZ

Diabetes is known to affect peripheral tissues by damaging capillaries and basement membranes, however, its effects on the lung are less known. Lung diffusing capacity ( $D_{LCO}$ ) is influenced by alveolar-capillary membrane conductance ( $D_M$ ) and pulmonary capillary blood volume ( $V_C$ ), both of which have shown impairments in adults with type-1 diabetes (T1D). We sought to determine the effect of T1D, age, and diabetes duration on  $D_{LCO}$ ,  $D_M$ ,  $V_C$ , and cardiac output (Q). We recruited 48 subjects, 24 people with T1D (ages 10.7 – 52.8 years old) and 24 non-diabetic controls matched for age, gender, and fitness level and measured  $D_{LCO}$ ,  $D_M$ ,  $V_C$ , and Q at rest and three exercise workloads (40%  $VO_{2max}$ , 70%  $VO_{2max}$ , and 90%  $VO_{2max}$ ). When stratified into two groups based on age (young < 20.6 years old), there were no significant differences in  $D_{LCO}$ ,  $D_M$ ,  $V_C$ , or Q (all of which were normalized to body surface area [BSA]) in the young group, or in the old group. When stratified into two groups based on diabetes duration (short duration range 0.33 – 8.9 years, long duration range 9.6 – 28 years), the T1D in the long duration group had significantly lower  $D_{LCO}/BSA$  and  $D_M/BSA$  compared to the matched controls (p= 0.014 and p= 0.033, respectively) with no differences in  $V_C/BSA$  and  $Q/BSA$ . There were no differences in any of the variables in the short duration group. While we initially hypothesized that age would be a factor in the decrements in lung function, this study has shown that independent of age, duration of diabetes is a factor more associated with decrements in diffusing capacity and its components.

## **85. NONINVASIVE MEASUREMENT OF MICROVASCULAR BLOOD FLOW AND TISSUE OXYGENATION IN THE SHOULDER UNDER LOADED BACKPACK**

BP Lim, CP Mao, LL Bachman, Jr., SH Kim, and AR Hargens  
Department of Orthopaedic Surgery, UCSD

Research has shown that wearing heavy backpacks may cause back pain; many people are forced to wear heavy backpacks on a regular basis. The objective of this project is to measure altered blood flow and oxygenation in the upper trapezius with varying backpack loads. This may ultimately help explain the causes of back pain and allow for precautions to be taken to prevent back pain and other problems in those who have to wear backpacks on a daily basis. We expected muscle oxygenation and microvascular blood flow to decrease in the contact area under the straps as a function of loads. In the experiment, near-infrared spectroscopy (NIRS) measured the oxygenation in the upper trapezius. Photoplethysmography (PPG) measured the changes in microvascular blood flow underneath the backpack straps in the trapezius muscle and the skin above it. Each subject has a NIRS sensor on one side of the trapezius and a PPG sensor on the other to continuously measure its oxygenation and microvascular blood flow, respectively. The following loads were tested for each subject: 5, 10, or 15 kg. The 5 minute loading periods are separated by recovery periods during which the backpack is removed. This allows the subject's blood flow and oxygenation to return back to baseline before carrying a different load. So far, there has been a noticeable decrease in oxygenation and blood flow upon backpack wear. However, a clear correlation between oxygenation and blood flow decrease and changing backpack load cannot yet be made.

Supported by NASA grant NNX10AM18G

## **87. EFFECTS OF YOGA TRAINING ON HEART RATE AND BLOOD PRESSURE RECOVERY FROM EXERCISE**

Catherine Bradley Richmond, Tina M. Manos, Paul E. Marsh, Sheila K. Kelly, Cassandra Winzcura, and Thomas Koesterer  
Department of Kinesiology and Recreation Administration, Humboldt State University, Arcata, CA

**PURPOSE:** To determine the effects of yoga training on HR and BP recovery from a standardized exercise bout, and autonomic function, using validated HR recovery (HRR) indices. **METHODS:** Subjects (18-25 years;  $n=8$  yoga;  $n=7$  stretch and relax) were tested before and after 4 weeks of classes (two times/week, 50 min/session). A GXT on a cycle ergometer was used to determine  $VO_{2max}$ . Recoveries from two submaximal tests (40% of  $VO_{2max}$ ; 85%  $HR_{max}$ ) administered before and after the interventions were used to measure HR, SBP and DBP at 0, 2, 4, and 6 minutes, as well as T30 and Delta 60 (measures of HRR). To determine if there were differences in HR, SBP, DBP, and rate-pressure product (RPP) between pre- and post-intervention, depending on group and time-period of recovery, four 2X2X4 mixed-factorial ANOVAs were computed (time X group X time-period of recovery). Two 2X2 (time X group) mixed-factorial ANOVAs were computed to determine if there were differences in HRR. **RESULTS:** No significant interactions ( $p>.05$ ) between time, group, and time-period of recovery and no main effects for group were found for HR, SBP, DBP, or RPP. There was a significant main effect for time-period of recovery (i.e., 0, 2, 4 and 6 minutes) for HR ( $p = .000$ ), SBP ( $p = .000$ ), and RPP ( $p = .000$ ), but not for DBP ( $p = .142$ ). A significant effect for time (pre- vs. post-intervention) was found for SBP ( $p = .028$ ), but not for HR ( $p = .622$ ), DBP ( $p = .076$ ) and RPP ( $p = .094$ ). No significant ( $p>.05$ ) interactions or main effects between time and group were found with respect to either HRR variable. **CONCLUSION:** The interventions resulted in significantly lower mean SBP, with trends towards lower DBP and RPP post-intervention when compared to pre-intervention, regardless of training type.

## **86. FACTORS CONTRIBUTING TO VARIABILITY IN THE MEASUREMENT OF PULMONARY DIFFUSING CAPACITY**

K.C. O'Connor, M.J. Lee and J.R. Coast, FACSM  
Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ

The rebreathing method for determining the pulmonary diffusing capacity ( $D_L$ ), and its components: membrane diffusing capacity ( $D_M$ ), and pulmonary capillary blood volume ( $V_C$ ), as well as cardiac output ( $Q$ ) requires a gas mixture consisting of helium, acetylene, carbon monoxide, and nitric oxide rebreathed from a 5L anesthesia bag and analyzed by mass spectrometry. The method consists of filling the bag to approximately the subject's tidal volume, and rebreathing from the bag following a normal exhalation. Using this method, errors may be encountered with the bag filling volume or the timing when the subject starts the rebreathing maneuver. This study evaluated the effects of these possible errors on  $D_L$ ,  $D_M$ , and  $V_C$ , with 6 healthy subjects (3 men, 3 women), measured during rest and exercise (50/75 Watts) on the cycle ergometer with random assignment to four variations: under-filling the bag volume (-200 mL), overfilling the bag volume (+200/300 mL), switching to the rebreathing bag while the subject was in the middle of exhaling, and switching to rebreathing bag during inhalation. Data was averaged from four trials at each condition for each subject and analyzed using a one-way repeated measures ANOVA. We found that exhaling into the bag during the first breath significantly affected the measurement of  $D_M$ ,  $D_L$ , and  $Q$  ( $P < 0.001$ ), as did switching into the bag during inhalation ( $P < 0.001$ ), whereas under-filling or overfilling the bag appeared to have no significance ( $P > 0.05$ ). There was no significance affecting the measurement of  $V_C$ . In conclusion, the time at which (end of exhalation) the subject begins the rebreathing maneuver will significantly affect the measured parameters and must be controlled carefully. By contrast, the volume with which the rebreathing bag is filled within 200 mL, is relatively unimportant in the measurement.

## **88. THE EFFECTS OF 8 WEEKS OF EXERCISE TRAINING, CROSSFIT VERSUS ACTIVE CONTROL ON EXECUTIVE FUNCTION AND WORKING MEMORY IN YOUNG ADULTS**

Amy Ritzke, Michelle Deneen, Emily Aven, Brianna Romeo, Mike Anderson, and Priscilla MacRae, FACSM  
Natural Science Division, Sports Medicine, Seaver College, Pepperdine University

Previous research suggest that endurance training can improve cognition, but the effects of high intensity, constantly varied, functional movements (CrossFit®) on cognition have not been studied. This study examined the effects of 8-weeks of CrossFit®(CF), i.e. high intensity, constantly varied, functional training vs. Active Control (C) on executive function and working memory in young adults. The CF group was composed of students in a CrossFit® course ( $n=11$ ,  $20.0 \pm 1.6$  yrs) which met for two, 50 minute exercise classes per week. The CF group also completed a third CrossFit® workout on their own each week while continuing their "usual exercise". The C group ( $n=16$ ,  $18.4 \pm 1.0$  yrs) were students who continue their "usual exercise" i.e. primarily jogging. Measures of executive function, Reitan Trail Making, Stroop Color-Word, and choice reaction time, and working memory, Digit Symbol Substitution, were measured before and after the 8 weeks of exercise. Two-way ANOVA (Time, pre/post, and Group, CF vs. C) for repeated measures was performed on each dependent measure. For the Stroop task there was a significant main effect for Time ( $F_{1, 21} = 14.28$ ,  $P \leq 0.001$ ) with both groups improving over the 8 weeks. There were no other significant main effects or interactions. We conclude that 8 weeks of CrossFit® training did not differentially affect executive function or working memory in healthy, active college students. A larger number of participants or a sample of adults who are physically inactive, cognitively impaired, or older should be examined in the future.

## 89. RELATIONSHIP BETWEEN SLEEP AND NEXT DAY PHYSICAL ACTIVITY

Wyatt W. Sessions, Bruce W. Bailey, James LeCheminant FACSM, Timothy W. Hope  
Exercise Sciences, Brigham Young University

**Objective:** The purpose of this study was to examine the effect that sleep duration and quality has on next day physical activity among a population of young adult women. **Subjects:** Three-hundred and seventy-five women (18-24 yrs) were recruited to participate in the study. **Measurements:** Each participant wore an accelerometer for 7 consecutive days and nights to measure sleep and physical activity. Sleep logs were used to verify the bedtime and wake time for each night. Actigraph data was then evaluated to determine sleep latency, efficiency, and number of awakenings. Physical activity data was also evaluated for intensity (sedentary, light, moderate and vigorous) and duration. **Results:** Two thousand six hundred and forty one observations were collected and 2144 observations were used. There was an inverse relationship between total sleep time and next day activity ( $F = 102.76, p < 0.0001$ ). However, controlling for wake time reduced the magnitude of the relationship by 92%. Wake time was the best predictor of next day physical activity ( $F = 202.02, p < 0.0001$ ). There was a significant drop in physical activity for every hour after 7:30 in the morning that the participants got out of bed ( $F = 32.24, p < 0.0001$ ). While sleep efficiency did not correlate with overall activity, it did show an inverse relationship with light activity ( $F = 48.94, p < 0.0001$ ) and a positive relationship with sedentary activity ( $F = 39.73, p < 0.0001$ ). **Conclusions:** Sleep duration and more specifically, time getting out of bed are related to next day physical activity. Arising earlier in the morning may significantly increase physical activity, which may be due to simply having more time to be active during the day.

## 90. DEVELOPMENT OF CUT-POINTS TO MEASURED HABITUAL PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR IN A REPRESENTATIVE SAMPLE OF TODDLERS

Spencer Wendt<sup>1</sup> Blake Carney<sup>1</sup>, Jonathan Decker<sup>2</sup>, Louise A. Kelly<sup>1</sup>  
<sup>1</sup>Department of Exercise Science, California Lutheran University,  
<sup>2</sup>Department of Kinesiology, California State University, Monterey Bay.

**Background:** Accelerometers are now the method of choice to objectively assess activity in young children. While numerous cut-points exist for preschoolers, cut points for children aged 1-3 years are limited. **Purpose:** To determine Actigraph GT1M cut-points for sedentary (SED), light (LPA) and moderate-vigorous physical activity (MVPA) in toddlers. **Methods:** Twenty three- (10 boys, 13 girls) toddlers ( $n = 22$  toddlers, mean age  $1.65 \pm 0.49$ ) were asked to attend an adult-led structured play class. All participants wore the GT1M (Pensacola, Florida) secured using an elastic strap on their right hip. Accelerometer data collection was synchronized with direct observation of activity using the Children's Physical Activity Form (CPAF). The CPAF categorizes activity on a scale of 1-4: 1, stationary, no movement; 2, stationary with limb movement but no trunk movement (e.g. drawing); 3, slow trunk movement (e.g. walking); 4, rapid trunk movement (e.g. running). Receiver operating characteristic (ROC) curve analysis was performed to determine accelerometer cut-points. **Results:** For the GT1M, the SED cut-point was 0-181 cpm, LPA was 182-201cpm, MVPA  $>202$ . Sensitivity (Se), and specificity (Sp) for SED were 90.0% and 83%. For LPA, Se and Sp were 70% and 64.4% and for MVPA, Se and Sp were 40% and 37.5%. **Conclusion:** The cut-points established for the GT1m can be used to quantify time toddler spend in sedentary behavior and at different physical activity intensities.



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