

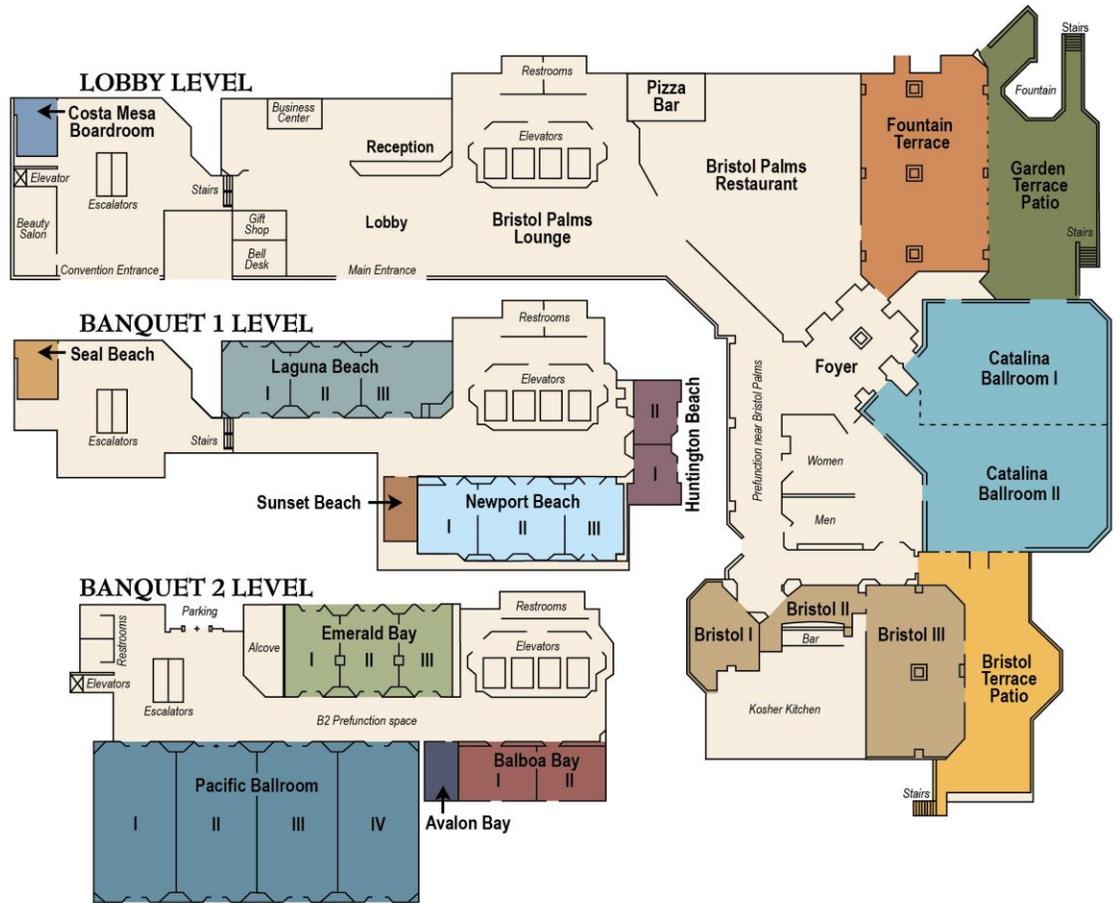
**SOUTHWEST CHAPTER**  
**AMERICAN COLLEGE OF SPORTS MEDICINE**  
**2014 ANNUAL MEETING**



October 17-18, 2014

Orange County/Costa Mesa Hilton  
Costa Mesa, California

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



*Welcome to the*

34<sup>th</sup> Annual Meeting

of the

Southwest Regional Chapter

of the

AMERICAN COLLEGE  
of SPORTS MEDICINE SM

**October 17-18, 2014**

**Orange County/Costa Mesa Hilton  
Costa Mesa, California**

**Jointly sponsored by the American College of Sports  
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The Southwest ACSM annual meeting has been approved for 14 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, 17 OCTOBER 2014**

**Registration**

**Level 2 Alcove**

**7:30 am – 4:00 pm**

**General Session**

**9:00 am – 10:30 am**

**Pacific 1 & 2**

Moderator: Lorraine Turcotte, Ph.D., FACSM, President, SWACSM  
University of Southern California

**SWACSM Recognition Award**

Dr. Michael Hogan, University of California, San Diego

**Preview of Meeting:** Matt Lee, Ph.D., FACSM

San Francisco State University

**D.B. Dill Lecture**

*Is Exercise Physiology a Profession?*

Carol Ewing Garber, Ph.D., FACSM, President ACSM  
Columbia University, New York, NY

**Concurrent Colloquia**

**10:30 am – Noon**

**Diaphragm & Psoas: The Direct Relationship between  
the Hip, Spine, and Shoulder: “in that order”**

**Emerald Bay 1**

Brian Bradley, Vice-President, Egoscue Method, San Diego, CA

**SAFeR Communities: Successful Aging and Falls Risk  
Reduction**

**Emerald Bay 2**

Robert Wood, Ph.D., New Mexico State University  
Christian Thompson, Ph.D., University of San Francisco  
Mary Alice Scott, Ph.D., New Mexico State University  
Jennifer Fabe, Ph.D., New Mexico State University  
Lin Zhang, Ph.D., New Mexico State University

**Cardiometabolic Function and Exercise Training in Health  
and Disease**

**Emerald Bay 3**

Donna Cataldo, Ph.D., Arizona State University  
Siddhartha Angadi, Ph.D., Arizona State University

**LUNCH**

**Noon - 1:00 PM**

**FRIDAY, 17 OCTOBER 2014, continued**

**Student Research Award**

**1:00 pm – 2:30 pm Emerald Bay 1**

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

- 1:00 **A Comprehensive Kinematic Analysis of a 15km Training Run**  
Bailey, Joshua P., John A. Mercer, FACSM, Janet S. Dufek, FACSM  
University of Nevada, Las Vegas; Department of Kinesiology and Nutrition Sciences
- 1:15 **Cytokine Responses to Acute Intermittent Aerobic Exercise in Children with Prader-Willi Syndrome and Non-Syndromic Obesity**  
Duran, Andrea T.<sup>1</sup>, Gertz, Erik R.<sup>2</sup>, Judelson, Daniel A.<sup>1</sup>, Tsang, Kavin W.<sup>1</sup>, Kersey, Robert<sup>1</sup>, Haqq, Andrea M.<sup>3</sup>, and Rubin, Daniela A.<sup>1</sup>  
<sup>1</sup>Department of Kinesiology, California State University, Fullerton, Fullerton, CA,  
<sup>2</sup>Obesity & Metabolism Research Unit, Western Human Nutrition Research Center, Davis, CA, <sup>3</sup>Department of Pediatrics, University of Alberta, Edmonton, AB, Canada
- 1:30 **Genetic Variability and the Inflammatory Response in the U.S. Marine Corps' School of Infantry**  
Jensen, Andrew<sup>1,2</sup>; Martinez, Ricardo<sup>3</sup>; Mayfield, Jarrot<sup>3</sup>; Devaney, Joseph<sup>4</sup>; Turcotte, Lorraine, FACSM<sup>1</sup>; Kelly, Karen<sup>1,2,3</sup>  
<sup>1</sup>Department of Biological Sciences, University of Southern California, Los Angeles, CA;  
<sup>2</sup>Department of Warfighter Performance, Naval Health Research Center, San Diego, CA;  
<sup>3</sup>Department of Exercise and Nutritional Sciences, San Diego State University, San Diego, CA; <sup>4</sup>Center for Genetic Medicine Research, Children's National Medical Center, Washington, DC
- 1:45 **Moderate Postmeal Walking Attenuates Postprandial Hyperglycemia in a Population at Risk for Type 2 Diabetes**  
Knurick, Jessica R.; Johnston, Carol S.; Gaesser, Glenn A., FACSM  
School of Nutrition and Health Promotion, Arizona State University, Phoenix, AZ
- 2:00 **The Effect of Aging on Markers of Autophagy and Heat Shock Responses in Human Peripheral Blood Mononuclear Cells**  
McCormick, J.<sup>1,2</sup>, VanDusseldorp, T.<sup>1,2</sup>, Mermier, C.<sup>1</sup>, Lanphere, R.<sup>1,3</sup>, Dokladny, K.<sup>2</sup>, Moseley, P.<sup>2</sup> FACSM  
<sup>1</sup>Health, Exercise and Sports Sciences Department; <sup>2</sup>Department of Internal Medicine, University of New Mexico, Albuquerque, NM <sup>3</sup>Department of Kinesiology & Health Promotion, University of Kentucky, Lexington, KY
- 2:15 **100 Citizens Diabetes Prevention Program**  
Zambrano, Sergio<sup>1</sup>, Jasso, Jazmyn<sup>2</sup>, Ramos, Davey<sup>2</sup>, Phillips, Jamie<sup>2</sup>, Wong, Michael<sup>2</sup>, Henige, Kim<sup>2</sup>, Xie, Jimmy<sup>2</sup>, Burke, Sloane<sup>2</sup>, Loy, Steven<sup>2</sup>  
<sup>1</sup>Los Angeles Trade Tech College, Los Angeles, CA, <sup>2</sup>California State University, Northridge, Department of Kinesiology, Northridge, CA

**FRIDAY, 17 OCTOBER 2014, continued**

**Concurrent Colloquia**

**1:00 pm – 2:30 pm**

**Assessing and Correcting Posture and Function**

**Emerald Bay 2**

*Functional Assessment and Training – Past, Present, and Future*

Pat Vehrs, Ph.D., Brigham Young University

*Assessment and Correction of Posture and Function: Case Studies*

Ronald L. Hager, Ph.D., Brigham Young University

*Corrective Exercises: A Key Component of Exercise Training*

James D. George, Ph.D., Brigham Young University

**The Impact of Aging, Obesity, and Disease on the Adaptive Response of Skeletal Muscle and Tendon**

**Emerald Bay 3**

Jared M. Dickinson, Ph.D., Arizona State University

Christos S. Katsanos, Ph.D., Arizona State University

Chad C. Carroll, Ph.D., Midwestern University

**Concurrent Colloquia**

**2:45 pm – 4:15 pm**

**Concussion/Brain Trauma in Sport: Epidemiology, Physiology, Management, and Recovery**

**Emerald Bay 1**

Meeryo Choe, M.D., UCLA Mattel Children's Hospital

**Acute Applications of Whole Body Vibration Based Post-Activation Potentiation Protocols for Performance Enhancement**

**Emerald Bay 2**

Hugh Lamont, Ph.D., California Lutheran University

**Molecular Regulators of Insulin Resistance**

**Emerald Bay 3**

Marcia Abbott, Ph.D., Chapman University

Nina Brandt, Ph.D., University of California, Los Angeles

**Gatorade Sports Science Lecture**

**4:00 PM – 5:00 PM**

**Emerald Bay 1**



**Exercise is Medicine; How Do We Get Patients to Take It?**

Robert Sallis, M.D., Kaiser Permanente

**FRIDAY, 17 OCTOBER 2014, continued**

**Concurrent Colloquia**

**4:00 pm – 5:00 pm**

**Mechanisms of the Repeated Bout Effect in Human Skeletal Muscle**

**Emerald Bay 2**

Allen C. Parcell, Ph.D., Brigham Young University  
Robert D. Hyldahl, Ph.D., Brigham Young University

**Stress Fractures in Runners**

**Emerald Bay 3**

Jake Veigel, M.D., Intermountain Healthcare, Salt Lake City, UT

**SOCIAL EVENT**

**Pacific 3 & 4**

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



**Poster Presentations**

**No Host Wine/Cheese Reception**

**SPECIAL EVENT**

**Balboa**

**6:30 -7:30 PM**

***Student Jeopardy Bowl***

**SATURDAY, 18 OCTOBER 2014**

**Registration**

**Ballroom Foyer**

**7:30 am - 10:00 am**

**Student Colloquium**

**8:00 am – 9:00 am**

**Pacific 3**

**Meet the Experts  
Career Options in the Field of Exercise Science  
Continental Breakfast; Give-a-Ways**

**Panelists:**

Carol Ewing Garber, Ph.D., FACSM, National ACSM President  
Professor, Columbia University, New York, NY

Corina Martinez, M.S., PAPHS  
Physical Activity Health Educator, Los Angeles County, Department of Public Health

Don MacNeil, M.S.  
Foothill Community College, Los Altos Hills, CA

Micah Drummond, Ph.D.  
Department of Physical Therapy, University of Utah

Kyle Burnett, M.S., ATC  
Assistant Athletic Director, California State University, Fullerton

**Concurrent Symposia**

**9:00 AM – 11:00 AM**

**Exercise-Associated Hyponatremia, Thermoregulation,  
and Body Fluid Balance**

**Emerald Bay 1**

***Exercise-Associated Hyponatremia – A Hazard of Irresponsible Drinking***

Martin Hoffman, M.D., University of California, Davis

***Sweat Gland Adaptation During Heat Acclimation***

Michael Buono, Ph.D., San Diego State University

***Exercise-Associated Muscle Cramps***

Kevin Miller, Ph.D., Central Michigan University

***Body Fluid Balance During Exercise in the Heat***

Gary Mack, Ph.D., Brigham Young University

**SATURDAY, 18 OCTOBER 2014, continued**

**Concurrent Symposia**

**9:00 am – 10:30 am**

**The Task and the Toil: Exercise Intolerance in Health and COPD**

**Emerald Bay 2**

*Magnetic Resonance Spectroscopy of Skeletal Muscle Bioenergetics*

Daniel T. Cannon, Ph.D., LA BioMed at Harbor-UCLA Medical Center

*Ventilatory Demands in COPD and the Role of Rehabilitation*

Janos Porszasz, M.D., Ph.D., LA BioMed at Harbor-UCLA Medical Center

**Colloquium**

**Emerald Bay 3**

*Pregnancy: Teachable Moment for Mothers and Fathers?*

**9:00 am – 10:00 am**

Todd Hagobian, Ph.D. California Polytechnic University, San Luis Obispo

*Caffeine Use in Sports: Considerations for the Athlete*

**10:00 am – 11:00 am**

Bulent Sokmen, Ph.D., Sonoma State University

**General Session**

**11:00 am – 12:30 pm**

**Pacific 1 & 2**

Moderator: Lorraine Turcotte, Ph.D., FACSM, President, SWACSM  
University of Southern California

**Student Awards** – Marcella Raney, Ph.D., Occidental College

**Recognition of Host School:**  
**University of LaVerne**

**Business Meeting**

**Founders Lecture**

**Intraoperative and Laboratory Measurements of Muscle Properties in Children with Cerebral Palsy**

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

## **SOUTHWEST ACSM RECOGNITION AWARD**

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1985	Fred Kasch
1986	John Boyer
1987	Herbert de Vries
1988	Charles Tipton
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
2006	Jack Wilmore
2007	Larry Verity
2008	Steven Loy
2009	Lorraine Turcotte
2010	William Beam
2011	Priscilla MacRae
2012	Barbara Ainsworth
2013	J. Richard Coast
2014	Michael Hogan

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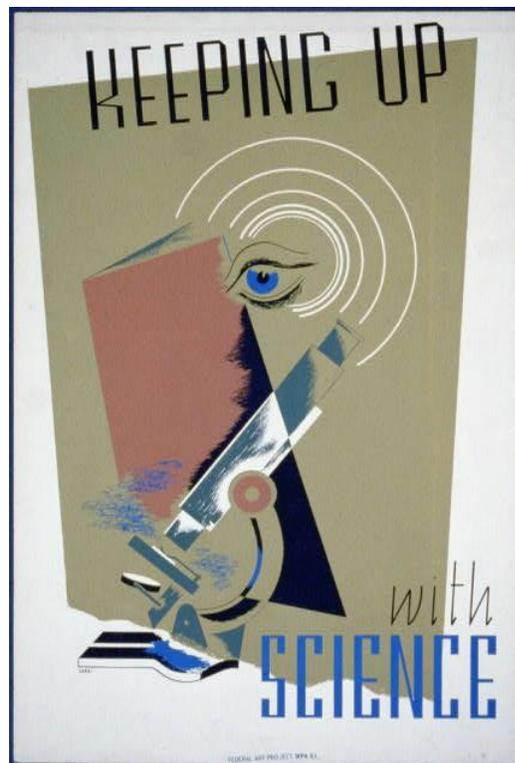
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**2014 SWACSM**

**Annual Meeting**

**ABSTRACTS**

**Student Research Award  
Poster Presentations**



# STUDENT RESEARCH AWARD

## 1. A COMPREHENSIVE KINEMATIC ANALYSIS OF A 15km TRAINING RUN

Bailey, Joshua P., John A. Mercer, FACSM, Janet S. Dufek, FACSM  
University of Nevada, Las Vegas; Department of Kinesiology and Nutrition Sciences

A current gap in the endurance running literature exists regarding the knowledge of how (if at all) kinematic patterns are altered during a training run. **Purpose:** To measure and evaluate kinematics at 0.5 km intervals during a 15 km submaximal effort training run. **Methods:** 15 recreational runners (8 male, 7 female; 30.5±8.4 years; 71.8±11 kg; 1.73±0.07 m) training for an endurance race completed a 15 km training run in less than 2 hours. Six high contrast markers were placed on the right side of the body and sagittal plane video was captured each 0.5 km. The dependent variables including, gait parameters (lap times, step length, step frequency and stance period), angles at foot contact (torso, hip, knee, ankle), lower extremity joint peak flexion during stance (hip, knee, ankle), and greater trochanter vertical excursion, were identified using Maxtraq (120 Hz) digitizing software. Half km laps were grouped to form five (6 lap) circuits for analysis across time. One-way ANOVAs ( $\alpha=0.05$ ) were used to examine differences across circuits. **Results:** Throughout the 15 km training run both lap times ( $p < 0.001$ ) and stance phase period ( $p < 0.001$ ) showed a significant increase across the duration of the run. Runners decreased step length ( $p = 0.020$ ), with no decrease in step frequency ( $p = 0.087$ ) across time. Knee flexion at foot contact decreased across time ( $p = 0.041$ ), with no changes in hip ( $p = 0.916$ ) or ankle ( $p = 0.591$ ) joint position at foot contact. Torso inclination showed a significant within subject difference among laps ( $p = 0.001$ ). Decreased peak knee flexion ( $p = 0.041$ ) during the stance phase was the only lower extremity joint angle altered during the run. **Conclusion:** Recreational runners alter kinematics (gait parameters and knee flexion) during an endurance training run outdoors.

## 3. GENETIC VARIABILITY AND THE INFLAMMATORY RESPONSE IN THE U.S. MARINE CORPS' SCHOOL OF INFANTRY

Jensen, Andrew<sup>1,2</sup>; Martinez, Ricardo<sup>3</sup>; Mayfield, Jarrot<sup>3</sup>; Devaney, Joseph<sup>4</sup>; Turcotte, Lorraine, FACSM<sup>1</sup>; Kelly, Karen<sup>1,2,3</sup>  
<sup>1</sup>Department of Biological Sciences, University of Southern California, Los Angeles, CA; <sup>2</sup>Department of Warfighter Performance, Naval Health Research Center, San Diego, CA; <sup>3</sup>Department of Exercise and Nutritional Sciences, San Diego State University, San Diego, CA; <sup>4</sup>Center for Genetic Medicine Research, Children's National Medical Center, Washington, DC

**BACKGROUND:** U.S. Marines undergo training with body armor and load; however there are no data regarding the inflammatory response, and/or influence of genetic variability, following this type of training. **Purpose:** The purpose of this study was to determine whether 40-days of U.S. Marine Corps' infantry training would affect the inflammatory response and whether this response would be affected by specific DNA sequence variations. **Methods:** Active-duty male U.S. Marines ( $n = 36$ , age = 19.8 ± 0.3 yr, weight = 79.9 ± 1.4 kg, height = 178.8 ± 1.1 cm) from the Marine Corps' School of Infantry were recruited to participate. Plasma inflammatory marker concentrations for interleukin(IL)-6, IL-15, tumor necrosis factor(TNF)- $\alpha$  and C-reactive protein(CRP) were analyzed via ELISA on days 12 and 40, pre- and post-5k and 20k marches. In addition, two single nucleotide polymorphisms (SNPs) in the promoter regions of the IL-6 and TNF- $\alpha$  genes, rs1800795 and rs1800629 respectively, were examined for any effect on the inflammatory response. **Results:** Post-march concentrations of plasma IL-6 were found to be significantly higher than that of pre-march measures (13.2 ± 6.6 vs. 19.5 ± 6.9;  $P = 0.001$ ; respectively); whereas no differences were observed between 5- and 20-kilometer marches. A significant interaction ( $P = 0.002$ ) was observed for IL-6 between rs1800795 variants, pre- to post-march and march distance with the homozygotes of the C allele displaying lower plasma levels of IL-6 pre- and post-5k in comparison to all other time points and to homo- and hetero-zygotes with the G allele. Plasma IL-15, TNF- $\alpha$  and CRP concentrations were not found to be different at any time point and were not influenced by genetic variation. **Discussion:** Our data supports that U.S. Marine Corps' training may increase resiliency via attenuation of the production of inflammatory cytokines; regardless of allele variation of rs1800795 and rs1800629.

## 2. CYTOKINE RESPONSES TO ACUTE INTERMITTENT AEROBIC EXERCISE IN CHILDREN WITH PRADER-WILLI SYNDROME AND NON-SYNDROMIC OBESITY

Duran, Andrea T.<sup>1</sup>, Gertz, Erik R.<sup>2</sup>, Judelson, Daniel A.<sup>1</sup>, Tsang, Kavin W.<sup>1</sup>, Kersey, Robert<sup>1</sup>, Haqq, Andrea M.<sup>3</sup>, and Rubin, Daniela A.<sup>1</sup>  
<sup>1</sup>Department of Kinesiology, California State University, Fullerton, Fullerton, CA, <sup>2</sup>Obesity & Metabolism Research Unit, Western Human Nutrition Research Center, Davis, CA, <sup>3</sup>Department of Pediatrics, University of Alberta, Edmonton, AB, Canada

Exercise induced stress releases cytokines into circulation during acute aerobic exercise and during recovery. Obesity affects cytokine responses to exercise in adults, but the responses in children are inconclusive. Prader-Willi Syndrome (PWS) is the best characterized form of syndromic childhood obesity. **Purpose:** This study determined if obesity and/or PWS affected cytokine responses to acute intermittent aerobic exercise in children. **Methods:** Eleven children with PWS (10.9±1.6 y, 45.4±9.5 % body fat), 12 obese (OB) children (9.2±1.2 y, 39.9±6.8 % body fat), and 12 lean (LN) children (9.4±1.2 y, 17.5±4.6 % body fat) participated. Children completed ten two-minute cycle ergometer exercise bouts of moderate intensity, separated by one-minute rest. Blood samples were collected pre-exercise (PRE), immediately post-exercise (IP), and 15, 30, and 60 minutes into recovery. Samples were analyzed for Interleukin-6 (IL-6) and Interleukin-8 (IL-8). **Results:** In all groups IL-6 and IL-8 concentrations were greater during recovery compared to PRE. PWS and OB presented higher IL-6 area under the curve (AUC) than LN (median [interquartile range], PWS= 67.17[37.50, 78.23], OB= 68.25[43.69, 93.44], LN= 29.25[27.10, 35.44] pg-min/mL;  $p < 0.01$  for both). PWS presented higher IL-8 AUC than LN (median [interquartile range], 315.75[249.00, 369.75] vs. 247.13[192.19, 269.06] pg-min /mL;  $p < 0.04$ ). **Discussion:** Acute bouts of intermittent aerobic exercise of at least 30 minutes elicited elevations of systemic IL-6 and IL-8 concentrations during recovery from exercise in children with or without OB and PWS; suggesting that physiological adaptations associated with

## 4. MODERATE POSTMEAL WALKING ATTENUATES POSTPRANDIAL HYPERGLYCEMIA IN A POPULATION AT RISK FOR TYPE 2 DIABETES

Knurick, Jessica R.; Johnston, Carol S.; Gaesser, Glenn A., FACSM  
School of Nutrition and Health Promotion, Arizona State University, Phoenix, AZ

Postprandial hyperglycemia (PPHG) directly contributes to type 2 diabetes (T2D) and cardiovascular disease risk. Exercise reduces PPHG, yet many interventions are too intense or time-consuming to adopt long-term. A short postmeal walk may lower PPHG and reduce T2D risk. **Purpose:** To evaluate the effect of a 15-min postmeal walk on the 2-hr glucose response in hyperinsulinemic individuals. **Methods:** Nonsmoking, sedentary individuals ( $n=9$ ) were recruited from the community (BMI >25 kg/m<sup>2</sup>, fasting insulin >10 $\mu$ U/mL). Participants completed three randomly ordered protocols one week apart. Subjects consumed 2 bagels (540 kcals, 104g CHO), limited activity on the day preceding testing, and arrived at the laboratory following an overnight fast. Each protocol required intake of a high glycemic meal (670kcals, 70% CHO, 23% fat, 7% protein). The 3 sessions included either 1) meal with no walking or fiber (CON); 2) meal with 10g fiber and no walking (FIB); 3) meal with no fiber followed by 15-min treadmill walk at 3.0mph (WALK). Two-hour postprandial insulin and glucose concentrations were measured. Variables were analyzed using Friedman tests and the Wilcoxon signed rank-test determined differences between each condition. **Results:** Fasting glucose (range: 94.0 – 97.6 mg dL<sup>-1</sup>;  $p=0.819$ ) and insulin (range: 17.9 – 21.7  $\mu$ U mL<sup>-1</sup>;  $p=0.641$ ) were similar between trials. The iAUC for glucose was lower in FIB (-80.99 mmol·L<sup>-1</sup>·min;  $p = 0.021$ ) and WALK (-59.48 mmol·L<sup>-1</sup>·min;  $p = 0.008$ ) compared with CON. The iAUC for insulin was lower in FIB (-64.61  $\mu$ U mL<sup>-1</sup>;  $p=0.011$ ) and WALK (-63.02  $\mu$ U mL<sup>-1</sup>;  $p=0.015$ ) compared with CON. There were no differences in iAUC for glucose or insulin between FIB and WALK. **Conclusion:** A 15-min postmeal walk can reduce the blood glucose and insulin responses to a high glycemic meal in hyperinsulinemic individuals. These data suggest that postmeal walking could be an important prevention strategy for decreasing the risk of developing T2D.

## 5. THE EFFECT OF AGING ON MARKERS OF AUTOPHAGY AND HEAT SHOCK RESPONSES IN HUMAN PERIPHERAL BLOOD MONONUCLEAR CELLS

McCormick, J<sup>1,2</sup>, VanDusseldorp, T<sup>1,2</sup>, Mermier, C<sup>1</sup>, Lanphere, R<sup>1,3</sup>, Dokladny, K<sup>2</sup>, Moseley, P<sup>2</sup> FACSM

<sup>1</sup>Health, Exercise and Sports Sciences Department; <sup>2</sup>Department of Internal Medicine, Univ of New Mexico, Alb, NM <sup>3</sup>Department of Kinesiology & Health Promotion, Univ of Kentucky, Lexington, KY

In the United States, persons 65 years or older numbered 39.6 million in 2009 and represented 12.9% of the U.S. population. By 2030, there will be about 72.1 million older persons, more than twice their number in 2000. Aging is associated with an accretion of damaged aberrant macromolecules. Autophagy contributes to the maintenance of cell homeostasis through degradation of damaged proteins and organelles, and aids in cellular energy production. Impaired autophagy is viewed as one of the principal elements of cellular aging. **Purpose:** The purpose of this study was to investigate the autophagic response of Heat Shock Protein 70 and autophagy marker Light Chain 3-II/B (HSP70 and LC3-II/B) in aged individuals through starvation-induced autophagy via rapamycin (RAPA). **Methods:** Peripheral blood mononuclear cells (PBMCs) were isolated from whole blood in younger (21.80±1.87yr) and older (64.0±3.68yr) adults. Expression of LC3II and HSP70 proteins were analyzed using Western blot analysis. Gene expression for LC3B and HSP70 was analyzed via qRT-PCR. **Results:** Significant differences were found between no treatment (NT) LC3-II (1.78±0.74) and RAPA LC3-II (1.97±0.88) in younger adults ( $p \leq 0.05$ ) as well as between younger (2.58±2.13) versus older (1.09±0.23) adults for RAPA LC3B mRNA ( $p \leq 0.05$ ). Significant differences were also found between NT LC3B mRNA (1.13±0.29) and RAPA LC3B mRNA (2.58±2.13) for younger adults ( $p \leq 0.05$ ). Lastly, significant differences were found between RAPA HSP70 mRNA response of younger (1.96±1.36) and older (0.91±0.19) adults and between NT HSP70 mRNA (1.03±0.38) and RAPA HSP70 mRNA (1.96±1.36) in younger adults ( $p \leq 0.05$ ). All values are reported as relative change compared to  $\beta$ -actin. **Conclusion:** We found that autophagy is blunted in older individuals compared to young. A lack of normal autophagic responses presents serious health implications for older adults.

## 6. 100 CITIZENS DIABETES PREVENTION PROGRAM

Zambrano, Sergio<sup>1</sup>, Jasso, Jazmyn<sup>2</sup>, Ramos, Davey<sup>2</sup>, Phillips, Jamie<sup>2</sup>, Wong, Michael<sup>2</sup>, Henige, Kim<sup>2</sup>, Xie, Jimmy<sup>2</sup>, Burke, Sloane<sup>2</sup>, Loy, Steven<sup>2</sup>

<sup>1</sup>Los Angeles Trade Tech College, Los Angeles, CA, <sup>2</sup>California State University, Northridge, Department of Kinesiology, Northridge, CA

With an estimated 86 million Americans classified as pre-diabetic and a projection of 1 in 3 Americans to have diabetes by the year 2050, there is great urgency to identify affordable and sustainable solutions to ameliorate this public health crisis. Obesity and physical inactivity are major risk factors for development of Type 2 diabetes (T2D). The study's purpose was to evaluate the effectiveness of an undergraduate kinesiology student delivered free 12-week modified diabetes prevention program of exercise, lifestyle modification, and education for pre-diabetic adults. Effectiveness was defined as a weight loss of 5-7% of initial body weight which research has indicated reduces the risk for T2D by 58%. 35 individuals mean age 54 ±15 years and all with either BMI  $\geq 27$  kg/m<sup>2</sup> (mean 33.3 ± 6.4) or a score  $\geq 5$  (mean 5.5 ±1.0) on the National Diabetes Education Program Diabetes Risk Test were included in 3 days per week of exercise consisting of 60 minutes of physical activity split into approximately half cardiovascular and half muscular strength and endurance training. Following exercise was 20 minutes of student led education classes in Spanish and English. Twenty one participants (20 Latino, 1 Caucasian) completed the program. There was a significant decrease in weight (3.5 kgs,  $p < 0.005$ ) and Body Mass Index (BMI) (32.1 to 30.6,  $p < 0.005$ ) and 47.6% (n=10) achieved the weight loss goal of  $\geq 5\%$ . The results are comparable to other diabetes prevention programs but accomplished with zero cost to the participant. The importance of developing a public health model capable of delivering a diabetes prevention program with exercise that is effective, accessible, sustainable, affordable, replicable, and culturally appropriate cannot be understated. The 100 Citizens free Diabetes Prevention Program is that model delivered in public parks with sustainability through the kinesiology student internship model.

# POSTER PRESENTATIONS

## 1. ACUTE RESPONSE OF TESTOSTERONE TO LOW-MODERATE INTENSITY RESISTANCE EXERCISE IN OBESE VS LEAN CHILDREN

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**Background:** Following resistance exercise of sufficient intensity, adult males display an acute increase in testosterone (T); such increase appears diminished in obesity. While the predominant source of T production in men is the testes, adrenocortical production of T makes up a greater relative proportion of boys' T. Adrenocortical production of both T and cortisol respond to stress such as exercise. Although obesity is associated with diminished testicular T production, obesity may increase activity of the hypothalamic-pituitary-adrenal axis (HPA) axis. **Methods:** Subjects consisted of eight obese boys (age 9±1yr, height 142±7cm, mass 48±9kg, lean mass 27±4kg, body fat 40.5±5.0%) and six lean boys (age 9±1yr, height 143±8cm, mass 32±5kg, lean mass 26±4kg, body fat 15.0±3.1%). Participants first warmed up for five minutes on a cycle ergometer, and then performed six sets of ten repetitions per leg of step-ups while wearing a weighted vest; subjects rested 1 minute between sets. Step height was adjusted to 20% of each subject's height, and the vest was weighted with 50% of each subject's lean body mass as measured by DEXA. Blood samples for serum concentrations of T and cortisol were obtained from an indwelling catheter pre-exercise (PRE) and immediately post-exercise (IP). **Results:** T concentrations increased from PRE to IP in obese boys (+14%;  $p=0.018$ ) however T concentrations did not change over time in lean boys (-8%;  $p=0.173$ ). Obese boys displayed a greater percent change in T compared to lean boys ( $p=0.014$ ). The percent change in concentration of T was correlated to the percent change in concentration of cortisol for all boys ( $r_s=0.604$ ,  $p=0.022$ ). **Conclusion:** T concentrations were increased following exercise in obese boys and changes in T correlated to changes in cortisol in all boys. Possibly, increases in T following exercise in obese boys are related to greater activity in the HPA axis.

## 3. EFFECTS OF A TWELVE-WEEK PHYSICAL TRAINING PROGRAM IN CHILDREN WITH PRADER-WILLI SYNDROME

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**Background:** Prader-Willi Syndrome (PWS) is a genetic disease associated with obesity and cognitive problems. Physical activity has an important role promoting and maintaining health in this population. This study aimed to assess the effects of a Physical Training Program (PTP) upon components of physical fitness and health in two children with PWS. **Methods:** The study presents two descriptive case reports composed of an initial assessment, a 12-week PTP (interventions occurred three times a week using increased progressive loading and extended time and a 12 week reassessment. Measures included body mass index (BMI), intellectual quotient (IQ) obtained using the Wechsler Intelligence for Children 3<sup>rd</sup> edition, body composition (DEXA), explosive strength, agility test, and physical activity level (pedometer and questionnaire). Fasting blood work was obtained. **Results:** After the PTP, CA (Female; 11 years; BMI: 46.1 kg/m<sup>2</sup>; IQ: 68) presented a decrease in body fat % (pre= 52.0, post= 50.4%), an increase in total body mass content (BMC) (pre= 985.9, post= 1,011.1 g) and spine BMC (pre= 24.79, post= 25.30 g). She also increased upper/lower muscle power (pre= 177, post= 200 cm) / (pre= 10, post= 24.2 cm) respectively and agility (pre= 15:25, post= 13:39 s). Her total cholesterol also improved (pre= 166; post= 159 mg/dL). CB (Male; 14 years; BMI: 37.6 kg/m<sup>2</sup>; IQ: 74) presented an increase in total body BMC (pre=1,505.8, post=1,595.5 g), upper muscle power (pre= 275, post= 310 cm) and daily physical activity level (pre= 24,529, post=31,345 steps/day). He presented decreased total cholesterol (pre= 235, post= 182 mg/dL) and triglycerides (pre= 143, post= 95 mg/dL). **Conclusion:** Twelve weeks of PTP have the potential for improving physical fitness and health in children with PWS. Studies of longer duration are necessary to understand the benefits of sustained physical activity in PWS.

## 2. DIFFERENCES IN BODY COMPOSITION ANALYSIS BETWEEN UNDERWATER WEIGHING, DUAL-ENERGY X-RAY ABSORPTIOMETRY, AND TWO BIOELECTRICAL IMPEDANCE DEVICES IN OVERWEIGHT YOUNG ADULTS

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**Introduction:** As the prevalence of obesity rises, as does the need for reliable body composition (BC) methods. Many methods of BC analysis exist, however accuracy is questioned with respect to which criterion method is referenced by the device. There is much debate within the scientific literature about which criterion method and BIA field measurement is applicable for the overweight population. Little research has been found comparing two debated criterion methods with popular field methods in overweight or obese individuals. The purpose of this study is to compare criterion methods, hydrostatic weighing (HW) and dual energy x-ray absorptiometry (DXA) with two methods of bioelectrical impedance analysis (BIA) in overweight or obese young adults. **Methods:** N=25 overweight and obese adults (BMI 29.04 ± 3.568kg/m<sup>2</sup>, 13 males, 12 females, ages 24.37 ± 4.924y) followed standardized pre-testing guidelines for BC assessment. Percent body fat (%BF) was estimated by Omron BIA, Impedimed BIA and compared to GE Lunar Prodigy DXA, and HW. %BF was estimated using generalized population specific equations. **Results:** Repeated measures ANOVA with a Greenhouse-Geisser correction determined there was a significant mean difference between BC methods. Pairwise comparisons indicated significant differences ( $p < 0.05$ ) between Omron BIA and Impedimed, Omron BIA and DXA, and between HW and DXA. Furthermore, %BF was significantly correlated between Omron BIA and HW ( $p < 0.05$ ,  $r = 0.902$ ) as well as between Impedimed BIA and DXA ( $p < 0.05$ ,  $r = 0.709$ ). **Conclusion:** The results of this study show criterion methods, HW and DXA were found to be statistically different from one another. Depending upon which criterion method is referenced, the appropriate field measurement, Omron BIA or Impedimed BIA, should be selected for use in this population.

## 4. THE USE OF RESISTANCE BANDS AND A VERBAL CUE ON THE FRONTAL PLANE KNEE KINEMATICS AND KINETICS DURING A DROP VERTICAL JUMP TASK

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**Introduction:** Many individuals participate in recreational activities that involve multi-directional movements, such as jumping, running, and cutting. Often during these activities some individuals may experience uncontrolled frontal plane knee movements, which have been associated with non-contact anterior cruciate ligament (ACL) injuries. The use of resistance bands during training had been hypothesized to alter neuromuscular responses and force individuals to control medial knee collapse. **Purpose:** To examine the use of resistance bands and a verbal cue on frontal plane knee kinematics and kinetics during the landing phase of a drop vertical jump exercise. **Methods:** Twenty-seven recreationally active college aged (18-26) females performed three trials of a drop vertical jump exercise from a 31 cm box for three different conditions: control (C), mini band (MB), and mini band with verbal cue (MBC). Participants were outfit with a full lower body marker set to track the limb kinematics while also landing with each foot on a separate force platform to collect kinetic data. **Results:** Mean peak valgus knee angles were significantly difference between the MBC (5.979±5.225°) and C (7.750±5.446°) ( $p=.001$ ) and MBC and MB (8.022±5.522°) ( $p=.000$ ). Mean peak external knee abduction moments showed significant difference between MBC (.345±.139 Nm/kg) and C (.396±.161 Nm/kg) ( $p=.019$ ) and MBC and MB (.399±.163 Nm/kg) ( $p=.001$ ). No difference was reported between C and MB for either dependent variable. **Conclusion:** The use of a mini band with a verbal cue showed an acute effect to significantly decrease the peak valgus angle as well as the external moments placed on the knee during drop jump landing task. The use of the mini band and verbal cue during training may be a valuable tool in reducing knee valgus collapse and potentially greatly decreasing injury risk.

## 5. THE EFFECTS OF AEROBIC AND RESISTANCE TRAINING ON MUSCULAR STRENGTH, FLEXIBILITY, AND HANDGRIP IN CANCER SURVIVORS FROM THE IMPAACT STUDY

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The Improving Physical Activity After Cancer Treatment (IMPACT) Program is a Department of Health and Human Sciences collaborative study examining the effects of physical activity changes on cancer survivors. The purpose of this portion of the larger study was to examine the ability to positively influence low muscle strength and flexibility, which are factors associated with higher rates of injury and poor function following cancer treatment. The functional capacity of females (n=9; 57.2 ± 11.1 years; 1.66 ± 0.07 m; 75.4 ± 12.2 kg; 9.1 ± 8.9 years since last treatment) was evaluated using the effects of combined aerobic and resistance training (CART). Strength and flexibility were assessed at baseline and after 13 weeks of CART. Grip strength was assessed with a handgrip dynamometer (A5401, Takei), flexibility with the standardized sit and reach, and maximal voluntary torque and power of knee extensors were tested at 0, 60, 240, and 450 deg/s (n=8) on an isokinetic dynamometer measured in Nm/kg of body weight (HUMAC NORM). Significantly greater peak torque results were seen isometrically (+6.9%, 1.89 ± 0.37 vs. 2.06 ± 0.45), at 60 (+21.1%, 1.24 ± 0.23 vs. 1.40 ± 0.27), and at 240 deg/s (+28.6%, 0.65 ± 0.12 vs. 0.76 ± 0.12). Significant differences were seen for peak power at 60 (+21.3%, 1.29 ± 0.24 vs. 1.46 ± 0.28) and 240 deg/s (+30.4%, 2.6 ± 0.49 vs. 3.0 ± 0.49), along with flexibility scores (30.78 ± 7.59 vs. 35.33 ± 7.95 cm). No significant increases in grip strength were found. Preliminary findings show CART can increase muscular strength and flexibility in participants and likely improve their functional performance. Future IMPACT studies have been expanded to include a larger subject pool of participants for a longer duration to assess the effect of training on the musculoskeletal health of cancer survivors.

## 7. EFFECT OF CHRONIC ACTIVITY-BASED THERAPY ON BODY COMPOSITION AND MYOKINES IN PERSONS WITH SPINAL CORD INJURY

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**Background:** Accretion of fat mass and reductions in fat-free mass are characteristic of spinal cord injury (SCI). **Aim:** To examine the effect of intense activity-based therapy on body composition and myokines in persons with SCI. Twenty four men and women with SCI (age, mass, and duration of injury = 37.2 ± 12.5 yr, 74.6 ± 12.8 kg, and 4.1 ± 7.5 yr) underwent 6 mo of activity-based therapy consisting of locomotor training, resistance exercise, assisted/unassisted walking, and electrical stimulation which was individualized for each client. Pre- and post-training, dual-energy x-ray absorptiometry was performed to obtain whole-body and regional estimates of body composition. In addition, fasting blood samples were obtained to assess plasma concentrations of myostatin and adiponectin. Paired t-test and one-way ANOVA with repeated measures, with duration of injury and completeness used as between-subjects factors, were used to examine effects of training. **Results:** In 19 individuals who completed training 8.4 ± 4.8 h/wk, overall %BF (p = 0.01) trunk %BF (p = 0.01), and arm %BF (p = 0.05) were higher and FFM (p = 0.04) lower at 6 mo of training, with similar trends seen when subjects were separated by duration of injury. When participants were separated by injury completeness, FFM declined by 5.1 % in 8 persons with complete injury yet was preserved in those with incomplete injury (n = 11, p = 0.02 for interaction). Similar results were evident for leg FFM (p = 0.05 for interaction) in that it declined by 5.5 % in complete, yet slightly increased in persons with incomplete SCI. There was no change in myokines (p > 0.05) during the study. **Conclusion:** Intense activity-based therapy seems to minimize deleterious changes in body composition in persons with incomplete SCI, yet it is ineffective to combat these effects in persons with complete SCI.

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## 6. COMPARISON OF CLASSIC FATIGABILITY AND PEAK TORQUE TESTS USED TO ESTIMATE FAST-TWITCH MUSCLE FIBER COMPOSITION

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Estimation of skeletal muscle fiber type has long been performed through the classic Thorstensson fatigue test. This non-invasive method has strong practical relevance due to its ease of administration and quickness of estimating fast-twitch fiber type percentage (%FT). The classic Thorstensson fatigue test estimation is based on the first three repetitions and the last three repetitions of a leg extension exercise. However, peak torque may not occur within the first three repetitions, reducing the equation's accuracy. Including the peak torque repetition may improve accuracy of estimation of %FT. **PURPOSE:** The purpose of this study was to compare the classic Thorstensson fatigability test (CT) with a new peak torque test (PT). **METHODS:** Twenty-four resistance trained men (age=24.9±1.7 yrs; height=179.6±4.6cm; mass=85.7±11.1kg) volunteered. All volunteers were seated on a Biodex isokinetic dynamometer and performed 50 maximal knee extensions at 180 degrees per second, measuring dynamic peak torque. **RESULTS:** The new PT estimation of %FT (72.5±6.9) and power slope (-2.8±0.6) were significantly greater compared to the CT estimation of %FT (71.4±7.2) and power slope (-2.7±0.6). **DISCUSSION:** The rate of fatigue of the power slope is used to determine %FT. Our results show that the power slope was greater in the new PT test, thus estimating a greater %FT compared to the CT. **CONCLUSIONS:** These results show individuals may not reach peak torque in the first three repetitions. When administering fatigability tests, careful consideration should be given to the method used to evaluate the results. Estimation of %FT can help coaches develop proper training programs. Currently the validity of the new PT test is unknown. Future research should verify this test with muscle biopsy results.

## 8. UPPER BODY MUSCLE ACTIVATION BETWEEN STABLE AND UNSTABLE LOAD DURING CONCENTRIC BENCH PRESS

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Unstable loads are often used to provide variation to the traditional bench press. Instead of changing the exercise to facilitate muscle activation, the form of resistance might be altered. It is unknown if unstable loads (UL) result in different levels of muscle activation. **PURPOSE:** To investigate muscle activation during the concentric phase of a bench press while using a stable load (SL) and an UL. **METHODS:** Twelve males (age= 24.3 ± 2 yrs.; height= 177.0 ± 6.8 cm; mass= 87.6 ± 11.4 kg) completed two experimental conditions (SL and UL) at two different intensities [60% 1RM and 80% 1RM]. UL was achieved by hanging 16kg kettlebells by elastic bands from the end of the bar. All trial lifts were set to a two second cadence with a hold at the bottom of the lift. Subjects had electrodes attached to five muscles, pectoralis major, anterior deltoid, medial deltoid, triceps brachii and latissimus dorsi. They also performed three isometric bench press trials to normalize electromyography data. After 48 hours, subjects completed the opposite condition. **RESULTS:** ANOVA revealed that muscle activation was significantly (p<0.05) greater for the UL condition (1.13 ± .06 relative to MVIC) compared to the SL condition (1.07 ± .06 relative to MVIC), collapsed across muscle and intensity. **DISCUSSION:** These results show a significant increase in upper body concentric muscle activation, as a whole, with UL compared to SL. **CONCLUSIONS:** Strength and conditioning professionals may use UL on the bench press to increase upper body muscle activation for athletes.

## 9. RELATIONSHIP BETWEEN RESISTANCE BAND TENSION AND MUSCLE ACTIVITY DURING USE OF A HIP EXERCISE DEVICE

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Numerous exercise equipment companies have introduced products for training that incorporate resistance bands often with little known about the relationships among the bands and muscle activation (EMG) during exercise. One device using bands for resistance is a thigh trainer, intended to target hip ab/adduction strength. The purpose of this study was to determine the relationship between changes in band tension and corresponding muscle activity when using a thigh trainer. First, the stress-strain characteristics of each of three sets of bands (low, moderate, high resistance) were determined using an analog force dynamometer (Chatillon, AMTEK, Inc.) at four levels of strain (7, 14, 17, 21 cm). Ten healthy male subjects (81.3±13.2 kg; 1.73±0.07 m; 24.7±1.1 yrs) granted consent and were instrumented with EMG electrodes on the adductor longus (AL) and gluteus medius (GM) following Noraxon guidelines. Participants used the thigh trainer for 30 s at each resistance (low, moderate, high) with movement rate controlled via a metronome (0.333 Hz). EMG data (1500 Hz) were filtered using a zero-lag fourth order recursive Butterworth filter. Average EMG for all subject-condition-muscles was identified across 30 s. Mean and standard deviation values were calculated among measured bands and muscle-band combinations. Resistance bands showed 11% change between low ( $\bar{x}$ =33.81±10.4 N) and moderate ( $\bar{x}$ =37.5±13.4 N) and 5.4% change between moderate and high ( $\bar{x}$ =39.6±14.0 N) resistance, with strong correlations ( $r$ =0.996 or greater) at each strain. GM EMG activity exhibited 3.7% change between low ( $\bar{x}$ =41.2±30.2 mV) and moderate ( $\bar{x}$ =42.79±32.1 mV) and 5.7% change between moderate and high ( $\bar{x}$ =45.25±33.5 mV) resistance. AL EMG activity showed a 13.1% change between low ( $\bar{x}$ =21.3±12.2 mV) and moderate ( $\bar{x}$ =24.1±15.5 mV) and 24.3% change between moderate and high ( $\bar{x}$ =29.3±22.2 mV) resistance. These findings suggest that EMG activity, particularly AL activity, may exceed the proportionate increase in band tension.

## 11. ACUTE EFFECTS OF ASSISTED JUMPING ON RELATIVE PEAK POWER AND PEAK VELOCITY OF A VERTICAL JUMP

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**INTRODUCTION:** Maximizing vertical jump (VJ) performance is critical in many sports. Assisted jump training has led to acute increases in VJ performance, and an acute analysis may help enhance training. **PURPOSE:** To investigate the acute effects of assisted jumping on relative peak power and peak velocity during a body weight VJ. **METHODS:** Nine NCAA collegiate women volleyball players (age 19.11 ± 1.05yrs.; HT 175.99 ± 7.52cm; Mass 75.47 ± 10.88kg) completed 2 experimental conditions [bodyweight (BW) and assisted (AS) jumps] and a control (C) condition with no prior jumps. During AS, they wore a climbing harness with elastic cords attached to their hips that were stretched to the ceiling by a rope. In both conditions, participants performed 5 plyometric countermovement VJ with either 0% bodyweight reduction (BW) or 40% bodyweight reduction (AS). Following each condition, participants rested for 1 minute then performed 3 individual bodyweight countermovement VJ separated by 15 seconds rest. Relative peak power and peak velocity were measured using an AMTI force plate sampling at 1000 Hz. **RESULTS:** ANOVA revealed no significant ( $p$ >0.05) difference by condition for relative peak power ( $C$ =52.40±2.64W/kg,  $BW$ =52.54±2.50W/kg,  $AS$ =51.54±2.40W/kg), or peak velocity ( $C$ =2.69±0.064m/s,  $BW$ =2.71±0.069m/s,  $AS$ =2.58±0.13m/s). **DISCUSSION/CONCLUSIONS:** These results do not help explain the acute enhanced VJ performance in previous training studies since no change was observed. The volume of the assisted jump stimulus may not have been large enough to elicit differences between conditions since the subjects were already performing a high volume of jumps daily. Future studies should investigate other VJ stimulus volume conditions.

## 10. ASYMMETRY OF BACK SQUAT KINETICS AND KNEE EXTENSOR STRENGTH

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Functional asymmetries have been linked to an increased injury risk in a variety of movements. The back squat has been used to investigate functional asymmetries during fatigue and in asymmetrical sports participants and is an exercise frequently used in training programs. **Purpose:** To determine if athletes involved in symmetrical sports exhibit strength differences and functional strength imbalances. **Methods:** Ten athletes who participate in symmetrical sports performed three sets of back squats with 50%, 70% and 90% 1RM while standing on two Kistler 9281CA force plates collecting at 1200 Hz. The peak vertical force made by each leg during the concentric phase of the middle repetition of each set was analyzed. Subjects warmed up with five concentric knee extension and flexion contractions at 180°/s, followed by five repetitions at 60°/s for each leg. Leg order was randomized. The Dominant (D) side was defined as the leg with the largest peak force in the 90% 1RM test while the Stronger side was defined as the leg that produced the largest peak torque at 60°/s. Statistical tests comparing strength and force values between the sides (D vs. ND) and strength values between legs (Stronger vs. Weaker) were performed ( $p$  < 0.05). **Results:** More force was created by the D leg for all squat conditions ( $p$  < 0.02). Subjects created 8.7 ± 11.8%, 7.5 ± 10.1%, and 12.1 ± 6.7% less force with their ND leg in the 50%, 70%, and 90% 1 RM conditions, respectively. The peak torque values for D were not different than the ND values. However, the peak torque for the Stronger leg was greater than the weaker leg ( $p$  < 0.001). **Conclusions:** Strength asymmetry does not always produce a movement asymmetry. Further study should be done to determine if these imbalances exist in other common movements performed by this population.

## 12. INFLUENCE OF SEX ON REACTIVE STRENGTH INDEX-MODIFIED

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Reactive strength index-modified (RSImod) is a variable designed to evaluate stretch-shortening cycle performance in the countermovement jump, calculated by dividing jump height by time to take-off. Previous research has indicated that RSImod is a valuable measure of explosive performance, and that there are differences in RSImod between stronger and weaker subjects and between sexes. Given that males are typically stronger than females it is possible that maximal strength may explain the difference in RSImod between sexes. **Purpose:** Thus, it is the purpose of this study to determine if there is a difference in RSImod between sexes while controlling for maximum strength. **Methods:** To fulfill this purpose, 40 female and 58 male Division-I athletes performed unloaded countermovement jumps on a force plate. Subjects then performed the isometric mid-thigh pull test (IMTP), according to previous methods. Peak force allometrically scaled (IPFa) was determined as the peak value obtained from the force-time trace of the IMTP, divided by body mass<sup>(2/3)</sup>. An ANCOVA was used to evaluate differences between sexes while controlling for IPFa, after evaluating for assumptions of the ANCOVA (e.g. normal distribution of residuals, homogeneity of variance). **Results:** No ANCOVA assumptions were violated. After controlling for IPFa, there was a statistically significant difference in RSImod between sexes,  $F(2,95)=12.310$ ,  $p=0.001$ , partial  $\eta^2=0.115$ . The covariate was statistically significantly related to RSImod,  $F(1,95)=10.024$ ,  $p=0.003$ , partial  $\eta^2=0.095$ . **Discussion/Conclusions:** The finding that sex differences exist after controlling for isometric maximum strength indicate that there are other important factors besides maximal strength to contribute to differences in RSImod between sexes. Based on previous literature, possibilities to explain sex differences in RSImod may include passive and active lower body stiffness, different levels of eccentric strength, eccentric rate of force development, or in jumping strategies.

### 13. EFFECTS OF LANDING DIRECTION AND GENDER ON LOWER EXTREMITY KINEMATICS IN DROP LANDINGS

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Previous research has identified factors that may contribute to ACL injury, including gender, improper landing mechanics, and landing direction. **Purpose:** The purpose of this study was to compare the effect of landing directions and gender on lower body kinematics. **Methods:** Twenty-nine physically active subjects (15 M, 14 F) age 18-25 years participated in this study. Drop landings were performed from a 60 cm box with kinematics captured with a Vicon 6-camera motion capture system collecting at 120 Hz. Trials were performed from six equal distance directions (Right, Diagonal Right, Forward with Left foot, Forward with Right foot, Diagonal Left, Left) with direction order randomized. Sagittal and frontal plane angles at the hip, knee and ankle for the lead leg were calculated at touchdown (TD), at maximum knee flexion (LP), and the corresponding ROM with five clean trials per direction averaged for analysis. Analysis was performed with a two-factor ANOVA ( $p < 0.05$ ) with post hoc tests using Bonferroni. **Results:** There were no gender differences or interactions for the hip or ankle angles in either plane. Ankle angles did not differ based on direction in either plane. Gender differences existed for the knee in the frontal plane at TD ( $-3.7^{\circ} \pm 10.4^{\circ}$  for F,  $6.1^{\circ} \pm 8.8^{\circ}$  for M;  $p < 0.001$ ), at LP ( $-7.1^{\circ} \pm 19.0$  for F,  $15.0^{\circ} \pm 13.3^{\circ}$  for M;  $p < 0.001$ ), and the ROM ( $-3.4^{\circ} \pm 11.1^{\circ}$  for F,  $8.8^{\circ} \pm 6.3^{\circ}$  for M;  $p < 0.001$ ) with females generally exhibiting valgus angles. Hip adduction and knee flexion angles differed based on direction ( $p < 0.004$ ). In general, subjects had smaller hip adduction and greater knee flexion angles when landing in directions that had their right foot as lead. **Conclusions:** Various landing directions maintained the knee frontal plane angle differences associated with gender. Subjects altered landing mechanics based on lead foot which may affect injury potential.

### 15. EFFECTS OF THE TRAP BAR DEAD LIFT AND LEG PRESS ON EARLY ADOLESCENT MALES LEG STRENGTH, VERTICAL JUMP AND SPRINT PERFORMANCE

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Improving lower body leg strength, power, and speed is fundamental for athletes of all sports and those looking to improve their fitness. The optimal exercise dose and modality for improving the aforementioned attributes for adolescent males is an ongoing topic of interest. **Purpose:** This study compared two lower body leg lifts, the trap bar deadlift (TBDL) and the leg press (LP), relative to their contributions to strength (6RM leg strength), power (vertical jump-VJ height), and speed (40 yard dash-40YD) in adolescent males. **Methods:** 51 adolescent males (13-15 years) were separated into two groups (TBDLG and LPG) via a matched pair design based on initial VJ height. Periodized resistance training was performed for 8-weeks (2x/wk) and focused on the primary exercises of the TBDL or the LP with supplemental lower body resistance training exercises (lunges, hamstring curls, calf raises, etc.) held equal between the study groups. (Weeks 1-2: 3 sets of 12@60%-1RM, Weeks 3-4: 3 sets of 8@80%-1RM, Weeks 5-6: 4 sets of 6@85%-1RM, and Weeks 7-8: 5 sets of 4@90%-1RM). Pre- and post-tests were conducted for 6RM leg strength in TBDL or LP, VJ height, and 40YD. **Results:** Both groups improved their lower body leg strength. The TBDLG improved the TBDL 6RM by 20% ( $p < 0.01$ ) and the LPG improved the LP 6RM by 19.4% ( $p < 0.01$ ). Despite improved strength, neither group demonstrated meaningful improvements in VJ height or 40YD times. **Discussion/Conclusions:** The results of this study are consistent with previous literature in that lower body strength will improve when following a periodized strength training protocol in a population of adolescent males. While strength is a corner stone of power and speed, exercise protocols should include plyometrics and Olympic lift variations in order to facilitate the transfer of newly acquired strength to the attributes of power and speed.

### 14. CAFFEINE INGESTION INCREASES MEAN POWER BUT NOT CRITICAL POWER IN FEMALE COLLEGE STUDENTS

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To test whether caffeine affects critical power, nine female kinesiology students ( $60.8 \pm 9.0$  kg) underwent a 3-min, all-out cycling effort 1 hour after ingesting either anhydrous caffeine (3 mg/kg) or placebo. Resistance on the cycle ergometer was 3% of the subject's body weight. Treatments were randomly assigned and administered two weeks apart in a double-blind manner. Critical power and the curvature constant were determined from the intercept and slope, respectively, of the linear regression of power vs. time<sup>-1</sup>. Additionally, we determined if maximum, average or minimum power differed between treatments. Neither critical power ( $p = 0.771$ ) nor the curvature constant ( $p = 0.288$ ) differed between treatments. Average power increased with caffeine compared to placebo (Caf,  $154.1 \pm 31.3$  W; Pla,  $148.9 \pm 28.3$  W;  $p = 0.039$ ). Neither maximum ( $p = 0.398$ ) nor minimum power ( $p = 0.767$ ) differed between groups. These data suggest that caffeine increases average power without affecting maximum or minimum power in a 3-min all-out cycling effort. To our knowledge, this is the first study on the effect of caffeine on critical power. In addition, we tested whether critical power differed between the subjects' first and second trials. Critical power increased on their second trial compared to their first (Trial 1,  $98.0 \pm 32.2$  W; Trial 2,  $106.3 \pm 34.4$  W;  $p = 0.024$ ) regardless of whether they consumed caffeine or placebo. Maximum, average and minimum power did not differ between trials 1 and 2. These data suggest that subjects may have paced themselves during the second trial due to extreme discomfort experienced during the first trial.

### 16. 30 MINUTES OF ACUTE MODERATE EXERCISE PRIOR TO A HIGH FAT MEAL DOES NOT ATTENUATE POSTPRANDIAL TRIGLYCERIDES IN POSTMENOPAUSAL WOMEN

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**Purpose.** To determine if 30 minutes of moderate exercise, prior to a high fat meal, attenuates postprandial triglycerides (PPT) in post-menopausal women. **Methods.** Five post-menopausal women (59.8 years) completed 2 trials. The exercise trial performed 30 minutes of moderate exercise of 60% heart rate reserve (HHR). Prior to exercise, heart rate, blood pressure, and blood lipids were collected. Following exercise they were given a high fat meal that consisted of 62 grams of CHO, and 57 grams of fat and instructed to rest. Lipid levels were collected at 1, 2, 3, and 4 hours post feeding. The control trial did no exercise and was given the high fat meal followed by rest. **Results.** There was no difference in PPT between the control and exercise trials. TG increased from pre-exercise in both trials ( $p < 0.05$ ) (pre-feeding  $88.4 \pm 26.7$  con.  $93.6 \pm 36.8$  ex., 1hr  $141 \pm 51.7$  con.  $139 \pm 65.4$  ex., 2hrs  $195 \pm 32.7$  con.  $166 \pm 82.4$  ex., 3hrs  $203 \pm 52.2$  con.  $185 \pm 78.1$  ex., 4hrs  $179 \pm 22.4$  con.  $193 \pm 50.5$  ex). Glucose values were similar between trials. Glucose peaked post-feeding followed by a gradual return to baseline in both trials ( $p < 0.05$ ) (pre-feeding  $86 \pm 5.5$  con.  $84.6 \pm 5.8$  ex., 1hr  $117 \pm 11.3$  con.  $125 \pm 23.5$  ex., 2hrs  $104 \pm 4.1$  con.,  $113 \pm 16.7$  ex., 3hrs  $97.4 \pm 6.3$  con.,  $88.6 \pm 11.6$  ex., 4hrs  $87.6 \pm 6.7$  con.,  $81.2 \pm 9$  ex). **Conclusion.** A greater volume of exercise (an increase in either intensity or duration) may be required to attenuate PPT. This increase in exercise volume is not commonly practiced among this population and the pursuance of acute benefits may not be practical.

## 17. INTERVERTEBRAL DISC FLUID FLOW CHANGES USING TRACTION: A CADAVERIC PILOT STUDY

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**Background:** Intervertebral disc (IVD) health is strongly associated with nutrient flow within the disc. Magnetic resonance imaging (MRI) has a well-established clinical history in assessing IVD health and allows evaluation of water diffusion and anisotropic fluid flow within the IVD. Using diffusion tensor imaging (DTI), an application of MRI, fluid flow within the IVD can be determined by calculating various metrics, one widely used measurement being the apparent diffusion coefficient (ADC). **Purpose:** Using a cadaveric model, this pilot study tests the assertion that lumbar traction has an impact on fluid flow in the IVD, which is essential for disc health.

**Methods:** One female cadaveric subject (age 50 at death of end stage lung disease, weight 105 lbs) received two baseline scans – a sagittal T2 scan for reference anatomy and gross measurements, followed by an axial DTI scan. Traction was then applied using 17 lbs of water weight at each end of the specimen and scanning was repeated. The experimental procedure was repeated with the specimen dissected to include only T11 with ribs, full L –spine and pelvis, and upper thighs. The section was submerged in water to improve imagery. Testing was again repeated following 24 hours of compression, this time using 22 lbs of traction at each end. **Results:** With traction, the IVDs exhibited slight decreased height changes from baseline (as measured from the center of the disc) from 1.128 cm to 1.002 cm (L4-L5), and from 0.994 cm to 0.960 cm (L5-S1). The discs also showed changes in mean ADC from  $1109.456 \times 10^{-6} \text{ mm}^2/\text{s}$  to 1102.141 (L4-L5), and from 998.232 to 1042.865 (L5/S1). **Conclusion:** This pilot experiment demonstrated an increase in ADC of the L5-S1 intervertebral disc without a concomitant change in disc height, indicating a potential benefit to using lumbar traction in support of IVD health.

## 19. DIFFERENCES IN MUSCLE RECOVERY IN RESPONSE TO DEEP TISSUE SCULPTING MASSAGE

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**Purpose:** The aim of this study was to determine if post-exercise massage therapy alters recovery of muscle function, muscle activation, and delayed onset muscle soreness (DOMS) 48 hours after exercise. **Methods:** This study included 8 active subjects (six men and two women, mean age, mass, and height =  $23.0 \pm 2.5 \text{ yr}$ ,  $67.7 \pm 8.2 \text{ kg}$ , and  $1.7 \pm 0.1 \text{ m}$ ) with no history of lower extremity injury. The experiment was a randomized crossover design. Baseline measurements of peak torque, total work, and electromyography (EMG) amplitude of vastus lateralis (VL) and rectus femoris (RF) were recorded during a single maximum voluntary contraction (MVC) and a single set of 5 unilateral isokinetic knee extensions (KE) at 30 deg/s. Participants performed 5 maximal sets of 10 bilateral KE interspersed with 30-60s of rest. Over the next two sessions separated by two days, subjects were randomly assigned to passive recovery (PR) or a 10-15 minute deep tissue sculpting massage (M) 10-15 post-exercise. Forty eight hours later, muscle force and EMG were re-assessed, and leg soreness was recorded. A one-way repeated measure analysis of variance (ANOVA) and Tukey's post hoc analysis were used to analyze the data. **Results:** Peak KE torque was higher ( $p < 0.05$ ) in response to M ( $158.5 \pm 52.4 \text{ ft-lbs}$ ) versus baseline ( $148.5 \pm 49.9 \text{ ft-lbs}$ ) and PR ( $134.5 \pm 61.3 \text{ ft-lbs}$ ), respectively. There was significantly greater total work ( $p < 0.05$ ) in M ( $754.9 \pm 268.0 \text{ ft-lbs}$ ) versus baseline ( $707.6 \pm 251.5 \text{ ft-lbs}$ ) and PR ( $631.0 \pm 331.3 \text{ ft-lbs}$ ), respectively. There was no significant effect of treatment on EMG amplitude during MVC or KE for either vastus lateralis (VL) ( $p > 0.05$ ) or rectus femoris (RF) ( $p > 0.05$ ). There was no significant difference ( $p > 0.05$ ) observed in muscle soreness between conditions. **Discussion:** This study supports the use of post-exercise massage therapy to improve recovery of muscle function after intense exercise. Further study is merited to identify mechanisms explaining this response.

## 18. HEART RATE RESPONSES OF HIGH SCHOOL STUDENTS PARTICIPATING IN SURFING PHYSICAL EDUCATION

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**Background:** Despite the nation's rising epidemic of childhood obesity and diabetes, schools struggle to promote physical activities that help reduce risks for cardiovascular disease. Emerging data suggest that adopting novel activities into Physical Education (PE) curriculum may serve as an effective strategy for increasing physical activity in children. **Purpose:** The purpose of this study was to test the hypothesis that high school students participating in a novel PE curriculum (surf PE) would meet the American College of Sports Medicine's duration and heart rate (HR) recommendations for cardiovascular fitness and health. **Methods:** Twenty-four male ( $n = 20$ ) and female ( $n = 4$ ) high school students (mean age =  $16.7 \pm 1.0 \text{ yrs}$ ) that were enrolled in surf PE courses at two San Diego County High Schools participated in this investigation. Daily measurements of surfing durations, average HR, and maximum HR were made on the students with HR monitors (Polar FT1). In addition, HR and activity in the water was evaluated once over the course of the class in a subset of students ( $n = 11$ ) using a HR monitor (Polar RCX5) and a video camera (Canon HD). Activity and HR were synchronized and evaluated in 5-second intervals during data analysis. **Results:** The average duration that PE students participated in surfing during class was  $61.7 \pm 1.6 \text{ min}$ . Paddling, wave riding, sitting or lying, and miscellaneous activities comprised  $36.7 \pm 2.4$ ,  $2.9 \pm 0.4$ ,  $42.7 \pm 2.9$ , and  $17.8 \pm 3.5\%$  of the time, respectively. The average and maximum HRs during these activities were  $131.1 \pm 0.9$  and  $177.2 \pm 1.0 \text{ bpm}$ , respectively. **Conclusion:** The data suggests that high school students participating in surf PE obtained heart rates and durations that are consistent with recommendations with cardiovascular fitness and health. In the future, physical education programs should consider incorporating other action sports into their curriculum to enhance cardiovascular health.

## 20. HEALTHY LIFESTYLE BEHAVIORS, CHRONIC DISEASE MORTALITY, AND LIFE EXPECTANCY IN MEN AND WOMEN

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Although physical inactivity, cigarette smoking, and an unhealthy diet are significant underlying risk factors for chronic disease, the favorable effects of not having these risk factors on chronic disease mortality in the US populations remains less explored. **PURPOSE:** We investigated the combined effects of a healthy lifestyle behavior (never smoking, physically active, and healthy diet) on chronic disease mortality in US men and women. **METHODS:** We followed up 15,060 men and women, aged 20 to 80 years, who participated in the Third National Health and Nutrition Examination Survey. All participants completed baseline lifestyle behavior questionnaires. A healthy lifestyle profile was defined as never smoking, physically active, and a healthy diet defined by the American Heart Association. There were a total of 1868 chronic disease deaths during an average of 14.1 years of follow-up (211,667 person years). **RESULTS:** After adjustment for age, sex, race, and multiple risk factors, there was an inverse association between a greater number of healthy-lifestyle behaviors and chronic disease mortality (P-value for trend  $< 0.001$ ). Persons who were physically active, never smoked, and had a healthy diet had a 60% lower risk of chronic disease mortality (95% CI: 48% to 67%) compared with persons with none of these healthy lifestyle behaviors. Persons with all 3 healthy lifestyle behaviors had a 9.8 year (95% CI: 7.5 to 11.9) longer life expectancy from chronic disease mortality compared with persons with zero healthy lifestyle behaviors. Approximately 41% (95% CI: 26% to 53%) of chronic disease deaths might have been avoided if they had maintained all 3 healthy lifestyle behaviors. **CONCLUSION:** Eating a healthy diet, being physically active, and never smoking is associated with lower risk of dying from chronic diseases in US men and women. Public health agencies should emphasize the importance of developing these healthy lifestyle behaviors across the lifespan.

## 21. EXAMINATION OF THE IMPACT OF HIP EXTERNAL AND INTERNAL ROTATOR STRENGTH ON KNEE MOVEMENT DURING AN OVERHEAD SQUAT

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Knee valgus has been shown to put an athlete at increased risk for ACL injuries, especially among female athletes. **Purpose:** The purpose of this study was to examine the strength of hip external and internal rotators and their effect on knee instability during the overhead squat (OHS). It was hypothesized that people with muscular deficiencies or imbalances are more likely to have knee valgus movement during the OHS. **Methods:** Thirty-five female Division I college athletes participated in the study (age:  $19.49 \pm 1.32$ ; height:  $1.69\text{m} \pm 0.09$ ; mass:  $63.13\text{kg} \pm 8.78$ ). The participants were video recorded performing an OHS from the frontal and sagittal plane. Participants performed three consecutive OHS and were instructed to sit as low as they can during those squats. Participants were then tested for hip rotator muscle strength, using a hand held dynamometer. Participants were placed in a prone position, knee flexed at a  $90^\circ$  angle and then instructed to perform three maximal contractions against a hand held dynamometer. **Results:** The mean difference of hip rotator muscle strength was compared for participants with knee valgus movement and those without knee valgus movement during an OHS. Twelve participants showed knee valgus movement and 23 had no knee valgus movement during the OHS. An independent t-test showed a significant difference between hip external rotator strength, of the left leg, ( $M= 93.97$ ,  $SD= 25.77$ ) for the knee valgus group, compared to hip external rotator strength, of the left leg, ( $M= 114.38$ ,  $SD= 26.03$ ) for the non-knee valgus group;  $t(23) = 2.216$ ,  $p = 0.037$ . There was no significant difference for hip internal rotation strength. **Conclusion:** The results suggest that female college athletes with decreased strength in their hip external rotators have increased frequency of knee valgus, which puts them at an increased risk for ACL injury.

## 23. THE EFFECTS OF AN ACUTE BOUT OF STATIC STRETCHING ON 800 METER RUN TIME

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**Purpose:** To examine the effects of an acute bout of static stretching on 800 meter run time.

**Design:** Seven young, healthy male runners were recruited (age:  $22 \pm 1.6$ ;  $VO_{2\text{max}}$ :  $56.4 \pm 6.3$ ) with a history of competing in mid-distance and distance track events ( $5.1 \pm 2.6$  seasons) were recruited. An introduction session consisting of body composition, baseline flexibility, and aerobic capacity was completed followed by two counterbalanced testing sessions (static stretching (SS) or no stretching (NS)). Testing sessions consisted of a warm-up (5 minutes at 50% HR max), static stretching, consisting of 5 different stretches each held for 30 seconds and performed for 2 repetitions, or no stretching, and an 800m timed run. Each testing session was held 7-10 days apart with sit and reach scores measured both pre- and post- conditions. **Results:** Mean running time for the SS group was  $157.7 \pm 11.6$  seconds and for the NS group  $154.8 \pm 7.2$  seconds ( $p = 0.203$ ). Sit and reach values increased to the same degree for both conditions (SS: pre  $20.7 \pm 11.2$ , post  $23.3 \pm 12.8\text{cm}$ ; NS: pre  $20.7 \pm 11.2$ , post  $22.8 \pm 8.2$ ) ( $p = 0.87$ ). **Conclusion:** This study found that although flexibility did not increase between groups, performance decreased following an acute bout of SS. Following NS a decrease in run time occurred, for an average improvement of 2.9 seconds. These data suggests that further development in flexibility could possibly result in performance decrements. This represents a practical significance for mid-distance runners in the world of track and field. Future study should focus on specifying the most beneficial warm-up exercises for optimal effects on performance.

## 22. INFLUENCE OF RESISTANCE EXERCISE ON HUMAN ACHILLES TENDON RELEASE OF MATRIX METALLOPROTEINASES AND GROWTH FACTORS

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Tendon responds to exercise by increasing extracellular matrix (ECM) remodeling. ECM remodeling relies on a balance between the production of matrix degrading metalloproteinases (MMP) and tissue inhibitors of MMPs (TIMP). IL-6 and IGF-1 are implicated as growth factors, which stimulate tendon collagen synthesis. The purpose of this study was to evaluate the effect of resistance exercise on Achilles tendon production of MMP-9, MMP-2, TIMP-1, IGF-1, and IL-6. Male subjects ( $n=8$ ,  $27 \pm 1\text{y}$ ) performed a single bout of calf-press exercise (8 sets of 15 repetitions at 70% of 15-rep maximum). After the exercise bout, a microdialysis fiber was inserted into the space adjacent to the Achilles tendon. A control experiment was completed without exercise ~2-weeks prior to the exercise testing session. MMP-9, MMP-2, and TIMP-1 were evaluated at 2 and 5 hours post-exercise while IGF-1 and IL-6 were evaluated 3 and 4 hours post-exercise. IGF-1 was 45% greater ( $p<0.05$ ) than the control experiment at 3-hours post-exercise but had returned to baseline by 4-hours. IL-6 was increased 8-fold at 3-hours post-exercise ( $p<0.05$ ) but was not significantly elevated above baseline at 4-hours post-exercise. MMP-9 was ~250% greater ( $p<0.05$ ) at both 2 and 5 hours post-exercise when compared with the control experiment. MMP-2 was also elevated (~100-120%) post-exercise at both 2 and 5 hours ( $p<0.05$ ). TIMP-1 also increased with exercise (340%) but only at the 5-hour ( $p<0.05$ ) time point. Our findings indicated that resistance exercise is a potent stimulus for the production of enzymes and growth factors that are important for tendon ECM remodeling. Resistance exercise results in a large but transient increase in tendon production of IL-6 and IGF-1. The increase in MMPs and TIMP-1 appears to be more prolonged. The increased production of these compounds may contribute to changes in tendon mechanical and structural properties that have been previously observed with chronic training.

## 24. A COMPARISON OF THE INTENSITY OF EXERCISE AT DIFFERENT DEFINITIONS OF THE "LACTATE THRESHOLD"

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Endurance athletes use information about their "lactate threshold" to design an effective training program, to monitor training progress, and to estimate a race pace. Various definitions of the "lactate threshold" are available in the literature. **PURPOSE:** The purpose of this study was to compare the intensities of exercise at which the "lactate threshold" occurs using common definitions. **METHODS:** Six well-trained men, 18-39 years of age with  $VO_{2\text{max}}$  values ranging between 56 and 65 mL/kg/min volunteered to participate in this study. Each participant completed an exercise test to determine  $VO_{2\text{max}}$  and lactate threshold. Intravenous blood samples were taken during the last 30 s of each 3 min stage. Blood lactate levels were measured using the YSI analyzer and corrected for changes in hemoglobin and hematocrit. The "lactate threshold" was identified in each subject using each of the following methods: (1) visual detection of the inflection point of the lactate response curve, (2) a blood lactate level of 1 mmol/L greater than the previous value, (3) a blood lactate level of 1 mmol/L above a baseline value, (4) a fixed blood lactate of 4 mmol/L, and (5) the ventilatory threshold. **RESULTS:** An ANOVA indicated that the  $VO_2$  (mL/kg/min), HR (bpm), running speed, RER, and plasma blood lactate levels were not significantly different between four definitions of the "lactate threshold": visual detection of the inflection point of the lactate response curve, ventilatory threshold, and 1 mmol/L above the previous lactate value and above the baseline value. The fixed blood lactate value of 4 mmol/L resulted in  $VO_2$  and HR values that were not significantly different from maximal values, and an RER value significantly greater than RER values at all other definitions. **CONCLUSIONS:** Although there were no significant differences in  $VO_2$ , HR, RER, running speed, and blood lactate between four of the definitions of "lactate threshold", there were practical differences that could influence training and performance.

## 25. THE EFFECTS OF VELOCITY ON FOOT-STRIKE ANGLE IN RECREATIONAL RUNNERS

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Foot-strike patterns employed by runners have major implications on running economy and biomechanics. Although ample research has been conducted on the walk-to-run transition, little has been conducted on shifts in foot-strike due to acute changes in running velocity. **PURPOSE:** To investigate how changes in running velocity affect foot-strike angle. **METHODS:** 14 recreational runners ( $23.1 \pm 2.46$  yr,  $1.75 \pm 0.08$  m,  $64.99 \pm 9.80$  kg) completed two testing sessions. The first session consisted of a timed one-mile run in order to attain maximum sustainable running velocity. On a separate day, subjects ran on an indoor treadmill at 100% - 60% of their maximum speed for two minutes at each 10% increment. A motion capture system (Qualisys, Gothenburg, Sweden), sampling at 240 Hz, was used to identify participant's foot-strike angle; and a within subjects ANOVA was conducted to determine if a difference was present in foot-strike angle between running velocities. **RESULTS:** The ANOVA results suggest that there was a significant difference among foot-strike angles ( $F_{(4,13)}=5.72$ ,  $p<.01$ ). Further, the effect of velocity accounted for 31% ( $\eta_p^2 = 0.31$ ) of the change seen in foot-strike angle. A Bonferroni post hoc test revealed a significant difference in foot-strike between the 100% trials and 70% trials ( $p=.04$ ), as well as between the 90% and 70% trials ( $p<.01$ ). **CONCLUSIONS:** The differences between 70% and higher velocity trials (90% and 100%) is attributed to participants shifting from a rear-foot to a mid-foot striking pattern as their velocity increased. However, no difference was seen between the 60% and higher velocity trials. This was attributed to the fact these velocities were slower than participant's preferred running speed, resulting in an unorthodox gait pattern. A better understanding of foot-strike pattern changes in regards to gait velocity is important for training and injury prevention.

## 27. EFFECT OF INTENSE ACTIVITY-BASED THERAPY ON BONE MINERAL DENSITY AND FEMORAL STRENGTH INDEX IN INDIVIDUALS WITH SPINAL CORD INJURY

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**Purpose:** A severe complication of spinal cord injury (SCI) is osteoporosis of extremities below the level of injury. Several exercise modalities are used to slow bone loss, however; the efficacy of these regimes are equivocal. This study examined the effects of chronic activity-based therapy (ABT) on femoral strength index (FSI) and bone mineral density (BMD) in individuals with SCI. **Methods:** Twenty-four men and four women with SCI (age and injury duration =  $37.21 \pm 2.37$  and  $4.13 \pm 1.42$  years) underwent 6 months of ABT at a local rehabilitation facility. Exercise modalities included body weight supported treadmill training, assisted/unassisted walking, vibration exercise, resistance training, and functional electrical stimulation and were performed a minimum of 4 h/wk. At baseline, 3 and 6 months of training, subjects underwent dual-energy x-ray absorptiometry (DXA) scans to obtain whole body and regional estimates of bone mineral density (BMD) and FSI. **Results:** Results showed no significant changes ( $p > 0.05$ ) in whole body BMD, and bilateral femoral neck BMD was attenuated (report data here,  $p < 0.05$ ) from 0 to 6 months of training. Right FSI did not change in response to ABT ( $p > 0.05$ ); whereas, left FSI showed a significant increase (data from 0 to 6 mo,  $p < 0.05$ ).

**Conclusions:** Activity-based therapy did not reverse bone loss that is anticipated after a spinal cord injury, yet the magnitude of loss in BMD was less than expected after injury. It seems that different regimes characterized by greater skeletal loading are needed to reverse bone loss in this population.

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## 26. TRIATHLON RESEARCH: THE EFFECTS OF WEARING A WETSUIT ON RUNNING ECONOMY DURING TRANSITION IN MALES AND FEMALES

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**PURPOSE:** To investigate if wearing a triathlon wetsuit influences rate of oxygen consumption ( $VO_2$ ), heart rate (HR), rating of perceived exertion (RPE), preferred running speed (PRS), and/or stride frequency (SF). **METHODS:** Twenty subjects (male  $n=10$ ,  $33.8 \pm 8.18$  years,  $1.78 \pm 0.05$  m,  $79.4 \pm 3.75$  kg; female  $n=10$ ,  $27.9 \pm 8.53$  years,  $1.65 \pm 0.06$  m,  $63.6 \pm 5.98$  kg) completed 5 minutes of running on the treadmill during four conditions: no wetsuit (NWS), carrying wetsuit (CWS), wetsuit worn fully on ( $WS_{full}$ ), wetsuit worn halfway down ( $WS_{half}$ ). Prior to testing,  $PRS_{test}$  was determined for NWS and used for all test conditions. Before testing each condition,  $PRS_{cond}$  was determined for that condition – but all testing was done using the  $PRS_{test}$  during NWS. During each running condition, RPE and SF was collected at the beginning, middle, and end of the 5-min time interval while  $VO_2$  and HR data collected throughout the 5-mins at 15s intervals.  $VO_2$  and HR data were averaged over the last 3-minutes while RPE and SF were averaged across each condition. Each dependent variable was analyzed using a repeated measures ANOVA with simple effects post hoc testing comparing NWS to each of the other conditions ( $\alpha=0.05$ ). **RESULTS:** SF, HR, RPE, or  $PRS_{cond}$  were not different between conditions ( $p>0.05$ ).  $VO_2$  was different between conditions ( $p<0.05$ ) with  $VO_2$  lower during NWS vs. any other condition ( $p>0.05$ ). **CONCLUSION:** HR,  $PRS_{cond}$ , SF, and RPE were not affected by the way the wet suit was carried or worn. However, running while carrying or wearing the wetsuit did tend to increase  $VO_2$  by about 6-8%. Based upon this study, it seems that triathletes can estimate the energetic cost of T1 by about 6-8% more than running with no wet suit.

## 28. THE EFFECT OF MYOSTATIN ON ADIPONECTIN IN ADIPOSE TISSUE OF TRANSGENIC AND KNOCK-OUT MICE

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**PURPOSE:** We have shown that genetic modification of myostatin (Mst) expression alters primarily the skeletal muscle (SM) glucose metabolism and it is accompanied by a reduction in fatty acid oxidation (FAO) in adipose tissue (AT) in transgenic mice overexpressing Mst (TG) and fed high fat-diet for 4 weeks. To further investigate the effects of Mst on AT and to provide mechanistic insights for the metabolic changes induced by the overexpressing (TG mice) or lack of Mst (knock-out mice), we measured the protein expression of several genes involved in fatty acid (FA) uptake and oxidation, in regulation of oxidative capacity (PGC-1 $\alpha$ ), systemic inflammation (tumor necrosis factor alpha; TNF $\alpha$ ) and investigated the presence of Mst receptor in AT. **METHODS:** Adult male mice (6 mice/group) were kept on either control diet (CD) or high fat-diet (HFD) for 4 weeks; glucose tolerance was measured before and after the diet; blood and AT were collected. The metabolic profile of AT was generated using METABOLON. **RESULTS:** Our data suggest that blood adiponectin levels were significant ( $P<0.05$ ) lower in TG and KO compared to the control; both blood adiponectin and protein levels in AT were unaffected ( $P>0.05$ ) by the diet. Furthermore, adiponectin expression in AT was higher in both TG and KO compared to wild-type (WT); in TG group adiponectin level was not increased ( $P>0.05$ ), suggesting that Mst rescues the effect of high-fat diet. We also identified the presence of Mst receptor (activin A receptor, type IIB) in AT of TG and KO, and although we did not measure significant ( $P>0.05$ ) differences between groups, KO mice contains a higher amount. **CONCLUSION:** The results suggest that the level of Mst expression plays an important role in the regulation of the expression of adiponectin and several proteins from AT, and other important intermediates involved in the regulation of metabolism.

## 29. DOES EXTRINSIC GOAL SETTING INCREASE STEP COUNTS AMONG UNIVERSITY EMPLOYEES PARTICIPATING IN A WORKSITE WALKING COMPETITION

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Worksite wellness programs have become increasingly popular as positive benefits continue to be reported, including increased physical activity. Goal setting is considered an important part of facilitating increased physical activity among individuals. The purpose of this study was to evaluate if extrinsic goals set by worksite program organizers increased weekly step counts among university employees participating in a worksite walking competition. During the spring semester at a small California State University, the six-week Workplace Walkoff Challenge (WWC) was held to help increase physical activity among employees. This study was a matched sample design that coincided with the WWC. Every week, the organizers set a goal to achieve a certain amount of steps individually; each week the steps were increased. The first week's goal was 30,000 steps, and increased by 10,000 per week until 70,000 steps was reached during the last two weeks of the WWC. The participants logged their weekly steps using a website designed for the program. The dependent variables were steps per week. Multiple matched pair t-tests were performed to evaluate significant increases each week. Further, a matched pair t-test was performed to evaluate differences from week one to week six. Results indicated no significant increase in step counts from week to week. However, when comparing week one to week six, there was a significant increase in step counts ( $p < .001$ ). Due to the significant increase in step counts over the duration of the six-week program, walking competitions may be considered a valuable intervention tool for universities who seek to increase the physical activity levels of their employees.

## 31. EFFECTS OF RESISTANCE EXERCISE MODE ON RATING OF PERCEIVED EXERTION DURING SHORT-TERM TRAINING

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Short-term resistance training has been shown to increase muscle strength and isokinetic performance after a few days of training. However, no studies have investigated the effects of different types of muscle actions during short-term resistance training on rating of perceived exertion. **Purpose:** To examine and compare the effects dynamic constant external resistance (DCER) and isokinetic resistance training on set and session rating of perceived exertion (RPE). **Methods:** Thirty-one apparently-healthy untrained men were randomly assigned to a DCER or isokinetic training group. Subjects visited the laboratory four times. The first visit was a familiarization session and the subsequent three visits were for training sessions. The groups performed DCER or isokinetic leg extension exercise on the dominant leg for four sets of ten repetitions in each of the three days of training. A category-ratio scale (CR-10) was used to compare efforts between the DCER and isokinetic training modes. **Results:** There were no three-way interaction for time  $\times$  group  $\times$  set, or two-way interactions for time  $\times$  set or time  $\times$  group for set RPE ( $p > 0.05$ ). However, there was a significant set  $\times$  group interaction for training ( $p < 0.05$ ). Post-hoc pairwise comparisons for the marginal means (collapsed across time) indicated a significant main effect for set RPE ( $p < 0.05$ ). RPE increased significantly ( $p < 0.05$ ) from the first until the last set within all sessions for both training groups. There were no two-way interactions for time  $\times$  group or main effect for time or main effect for group for session RPE, ( $p > 0.05$ ). **Conclusions:** There were no differences in RPE as acknowledged by the subjects between the DCER or isokinetic training groups. The findings of the current study may indicate the feasibility and cost-effectiveness of traditional DCER training during short-term resistance training compared to more expensive isokinetic devices.

## 30. MUSCLE CONTRACTION DOES NOT AFFECT THE EXPRESSION OF POTASSIUM CHANNEL PROTEINS IN PERFUSED RAT MUSCLE

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Regulation of potassium homeostasis is critical for optimal exercise performance. However, we know very little about the changes in the muscle content of the various potassium channel proteins that regulate potassium fluxes during muscle contraction (MC). The purpose of this study was to determine whether moderate-intensity muscle contraction would affect the expression of the ATP-sensitive inward rectifying potassium channel (Kir6.2), the calcium-activated potassium channel (KCNMA1), and the inward rectifier potassium channel (Kir2.1) in contracting muscle. Rat hindlimbs were perfused at rest ( $n=4$ ) or during moderate intensity muscle contraction ( $n=4$ ). Muscle contraction resulted in an increase in oxygen uptake compared with the resting group ( $P < 0.05$ ). During the first 10 minutes of electrical stimulation, muscle tension development decreased rapidly to 65% of the initial tension and this was followed by a more gradual decrease in tension development for the remaining 10 minutes. Muscle contraction increased ( $P < 0.05$ ) the activity of CaMKK $\beta$  by 145% and that of AMPK $\alpha$ 2 by more than 7-fold. Muscle contraction did not affect ( $P > 0.05$ ) the protein expression of Kir6.2 ( $84.5 \pm 4.5$  vs.  $73.0 \pm 7.5$  arbitrary units for rest vs. MC), KCNMA1 ( $120.5 \pm 2.0$  vs.  $108.5 \pm 24.9$  arbitrary units), or Kir2.1 ( $79.3 \pm 22.6$  vs.  $82.7 \pm 33.3$  arbitrary units). These results show that the expression of the potassium channel proteins Kir6.2, KCNMA1, and Kir2.1 is not affected by muscle contractions and is not the primary mechanism by which potassium fluxes are altered during muscle contractions.

## 32. IMPACT FORCES DURING RUNNING IN NEW AND WORN SHOES

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**Purpose:** The purpose of this project was to determine if shoes influenced kinetic left-right asymmetry during running. **Methods:** Subjects ( $n=3$ ;  $24.7 \pm 2.9$  years;  $86.6 \pm 4.1$  kg;  $1.77 \pm 0.03$ m) ran in two pairs of shoes. The first pair was a standard trainer shoe (NewBalance M680BB2). The second pair was categorized as an 'extreme' cushioning shoe (Hoka OneOne Stinson Tarmac). The unique aspect of the extreme cushioning shoe was that one shoe was repetitively loaded with 500 miles prior to testing such that the left-right shoes were different. Subjects completed 10 trials per pair of shoes with velocity controlled at  $3.5\text{m/s} \pm 5\%$ . For each trial, subjects contacted two force platforms positioned such that consecutive right-left steps were recorded (1000Hz). Trials where the subject did not strike both force platforms or were out of the velocity range were repeated. Subjects were unaware of the one shoe that was loaded to 500 miles. A 2 (shoes: trainer, extreme cushioning)  $\times$  2 (side: left-right) repeated measures ANOVA was used to compare impact and maximal vertical force and stance time ( $\alpha = 0.05$ ). **Results:** Only 64.2% of trials showed an impact force. Neither impact force nor maximal force was influenced by the interaction of shoe and side ( $p > 0.05$ ). Impact force was influenced by both shoe ( $p < 0.05$ ) and side ( $p < 0.05$ ). Maximal force was not influenced by shoe ( $p > 0.05$ ) but was different between sides ( $p < 0.05$ ). Stance time was influenced by shoe ( $p < 0.05$ ) but not by side ( $p > 0.05$ ). **Conclusion:** Difference in impact force between sides regardless of shoe suggests that there are inherent kinetic asymmetries and that footwear did not alter. Furthermore, the use of one shoe loaded to 500 miles seemed to have no influence on the kinetic right-left symmetry.

### 33. ACUTE EFFECTS OF ALKALINE WATER ON HIGH INTENSITY ANAEROBIC PERFORMANCE

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**Purpose:** To test the effects of alkaline water on anaerobic performance measures during a Wingate anaerobic cycling test. **Methods:** Fifteen recreationally trained subjects participated in the study. Participants were males (mean  $\pm$  SD age =  $24 \pm 2.4$  years, height =  $177.6 \pm 6.7$  cm, mass =  $89.4 \pm 20.0$  kg) who were involved in anaerobic or resistance training at least one time per week for the prior two months. Participants supplemented with either regular water or alkaline water for seven days then completed an anaerobic Wingate cycle test. For the next seven days, participants ingested the water not given during the first seven days, then completed another Wingate cycle test. **Results:** Results indicated no differences between alkaline water and regular water conditioning in peak anaerobic power ( $947.8 \pm 158.0$  vs.  $933.8 \pm 144.4$  W), mean anaerobic power ( $676.6 \pm 116.6$  vs.  $672.4 \pm 113.6$  W), or the fatigue index ( $57.7 \pm 4.5$  vs.  $58.7 \pm 5.9$  %). **Conclusion:** Seven days of alkaline water ingestion was shown to be ineffective as ergogenic aid to improve anaerobic cycling performance.

### 35. THE RELATIONSHIP BETWEEN STATIC AND DYNAMIC BALANCE PERFORMANCE IN FEMALE COLLEGIATE ATHLETES

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Proper balance is essential for athletes during competition and training as sport places different balance requirements on the human body. **Purpose:** The purpose of this study was to identify relationships between static and dynamic balance performance in collegiate female athletes. **Methods:** Twenty-eight female collegiate athletes completed testing Soccer ( $n = 13$ ), Volleyball ( $n = 8$ ), and Dance ( $n = 7$ ). Static balance was assessed using UST (unilateral stance test) and dynamic balance was assessed using motor control test (MCT) on the NeuroCom Equitest. Medial/Lateral (ML) and anterior/posterior (AP) sway velocities (SV), and reaction time latencies were used to quantify balance. Data was assessed via Pearson product-moment correlation matrix with two-tailed tests of significance at  $\alpha$  level of  $p \leq 0.05$ . **Results:** In the soccer athletes, significant ( $p < 0.05$ ) moderate correlations were found for ML SV for right leg with eye open and MCT forward and backward medium translations. Significant ( $p < 0.05$ ) moderate correlations were found for AP SV for right leg with eyes open and MCT forward and backward medium translations in soccer athletes. In the volleyball athletes, a significant ( $p < 0.05$ ) high correlation was found for ML SV in left leg with eyes closed and MCT forward medium translation. In the dance athletes, a significant ( $p < 0.05$ ) high correlation was found for ML SV in right leg with eyes open and MCT forward small translation. A significant ( $p < 0.05$ ) high correlation was found for AP SV in right leg with eyes open and MCT forward medium translation in dance athletes. **Conclusion:** These results indicate that there is a moderate to strong relationship between dynamic and static balance in female athletes. It is critical for testing not only static but dynamic balance performance as well when assessing the stability of athletes.

### 34. THE PREVALENCE OF OVERWEIGHT AND OBESITY AMONG PRESCHOOL AGED CHILDREN IN SAN LUIS OBISPO COUNTY BY INCOME, ETHNICITY, AND LANGUAGE SPOKEN AT HOME

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Almost 32% of children in the United States are overweight or obese (OW/OB). Recent studies indicate that this trend may be stabilizing; however evidence suggests that considerable disparities in weight status exist when considering income, ethnicity, and language spoken at home. **Purpose:** The purpose of the study in 2014 was to determine the rate of OW/OB among children aged 3-5 years in San Luis Obispo County and to identify if differences in weight status existed based on income, ethnicity, and primary language spoken at home. **Methods:** Preschool children aged 3-5 years ( $n=442$ ) were measured for height and weight using standardized stadiometer and digital scale protocols. Parents provided information through a questionnaire about child's date of birth, ethnicity, family income, and language spoken at home. CDC Body Mass Index-for-age growth charts for children aged 2-20 years were used to determine BMI classification. **Results:** Over 33% of children were OW/OB. Hispanics were more likely to be OW/OB than other ethnicities ( $p < 0.0001$ ). Children were more likely to be OW/OB if Spanish was the primary language spoken at home ( $p=0.0030$ ). Those from homes with low incomes were 2.132 times more likely to be OW/OB than children from homes with higher incomes (CI: 1.090, 4.316). **Discussion:** Hispanic children, those from homes with low income, and where Spanish is the primary language spoken at home are disproportionately affected by OW/OB. **Conclusion:** Interventions should be designed to be culturally and educationally appropriate for Hispanic, low-income, and Spanish speaking populations. Preschool based interventions should include efforts to facilitate an environment for children and their families that support behaviors such as healthy dietary intake and regular physical activity.

### 36. RELATIONSHIPS BETWEEN DISORDERED EATING STATUS AND NUTRIENT INTAKE AMONG MALE AND FEMALE INTERCOLLEGIATE ENDURANCE RUNNERS

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Few studies have concurrently evaluated disordered eating behaviors and nutritional status, particularly among male athletes. **Purpose:** Examine the prevalence of disordered eating and the relationships between disordered eating and nutrient status among male and female intercollegiate cross-country runners ( $n=49$ ). **Methods:** At the beginning of the Fall 2014 cross-country season, runners completed a baseline questionnaire, which assessed sports participation history and training volume, injury history, menstrual history, eating behaviors, and general health history. Runners also completed three, unannounced, phone-based 24-hour dietary recalls, which were used to analyze nutrition status, and an evaluation of their exercise training, which was used to determine mean daily exercise energy expenditure. **Results:** Among the sample, 36.7% of female runners and 40.0% of male runners were classified with disordered eating (DE), with 50.0% of female runners with DE meeting criteria for dietary restraint and 41.7% of male runners with DE reporting excessive exercise. Female runners with DE had significantly lower intakes of energy ( $2,318.7 \pm 284.2$  vs.  $2,875.3 \pm 604.5$ ,  $p=0.05$ ), protein in g/day and g/kg ( $96.9 \pm 18.3$  vs.  $125.7 \pm 23.5$ ,  $p=0.02$ ;  $2.3 \pm 0.5$  vs.  $1.6 \pm 0.4$ ,  $p=0.01$ ), and carbohydrates in g/day ( $5.2 \pm 1.3$  vs.  $7.2 \pm 0.8$ ,  $p=0.04$ ) compared to female runners without DE. Energy balance was significantly lower in female runners with DE compared to without DE ( $-559.0 \pm 256.8$  vs.  $119.4 \pm 543.8$ ,  $p=0.01$ ). Male runners with DE had significantly higher calcium intake than male runners without DE ( $2,111.2 \pm 682.6$  vs.  $1,480.3 \pm 562.9$ ,  $p = 0.01$ ). However, there were no differences in total energy or macronutrient intake according to DE status among males. **Discussion/Conclusion:** These findings support the notion that male and female runners exhibit disordered eating behaviors, however, the relationships between DE and dietary and nutritional intake may vary based on gender.

### 37. DETERMINATION OF HEEL DEFORMATION USING A TWO-CAMERA SYSTEM

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The development of diabetic ulcers can be attributed to multiple factors, one of which is the increased stiffness in the plantar tissues, which can increase the probability of trauma to the foot, leading to ulceration. A method was developed to measure heel deformation, using a combination of two cameras, during simulated walking. The purpose of the study was to assess the accuracy of this method in calculating heel compression area, which can be used in calculating plantar tissue stiffness. Thirteen healthy, non-diabetic volunteers who granted institutionally approved consent (4 females, 9 males, 23.0 ± 2.2 yrs, 173.7 ± 9.3 cm, and 73.0 ± 11.6 kg.) were given stockings to don. The heel areas were painted over the stockings. Subjects were asked to simulate walking by extending their leg in a heel strike position, pressing and holding their heel to a piece of paper attached to the floor, creating a print of their heel. While in this position, each camera captured an image of the deformed heel. Utilizing a code created in MatLab which incorporated the Computer Vision System Toolbox and a custom edge-detection algorithm, the images were analyzed and the area of heel deformation was calculated. The area of the heel print on the paper was measured and calculated. The computer-calculated area and measured heel print areas were compared (correlated t-test,  $\alpha=0.05$ ) to the measured area of deformation marked by the heel print. There was no significant difference ( $p \geq 0.1$ ) between the code-calculated ( $14.8 - 30.0 \pm 5.1 \text{ cm}^2$ ) and the measured heel print areas ( $14.0 - 28.6 \pm 4.7 \text{ cm}^2$ ). Average error between the techniques was  $5.0 \pm 2.6\%$ . The accuracy of the code was confirmed. Future steps will include an increased number of participants performing dynamic walking, as well as simultaneous measurement of ground reaction forces.

### 39. THE RELATIVE IMPORTANCE OF FOUR MUSCLE GROUPS FOR INDOOR ROCK CLIMBING PERFORMANCE

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Little research is available to guide training programs for rock climbers. To help meet this need we sought to determine the relative importance of four muscle groups for rock climbing performance. Eleven skilled male climbers were familiarized with an indoor climbing route before five separate days of testing. On testing days, subjects were randomly assigned to climb with no pre-fatiguing exercise (control climb), or following a pre-fatiguing exercise designed to specifically target the digit flexors (DF), shoulder adductors (SA), elbow flexors (EF), or lumbar flexors (LF). Immediately after the pre-fatiguing exercise the subject climbed the route as far as possible without rest until failure. The number of climbing moves was recorded for each climb. Surface electromyography of the target muscle was recorded during the pre-fatiguing exercises. Time was recorded from the start of pre-fatigue to the end of the climbing bout. Significantly fewer climbing moves compared to the control climb were completed after pre-fatigue of the DF ( $50\% \pm 18\%$  of control) and EF ( $78\% \pm 22\%$  of control) ( $p < 0.05$ ). The number of moves completed following pre-fatigue of the LF and SA were not statistically significant compared to the control climb ( $p > 0.05$ ). The shot time lapse between the end of pre-fatiguing exercise and the start of climbing (transit time) that may have allowed for some recovery was not different among trials ( $p > 0.05$ ). EMG median frequency for each muscle was reduced from beginning to end of each pre-fatiguing exercise. These results suggest that among the muscle groups studied in men, muscular endurance of DF followed by EF muscle groups are especially important for rock climbing on  $40^\circ$  overhanging terrain.

### 38. INTRA-RATER RELIABILITY IN MEASURING THE THICKNESS OF TWO LOWER LEG MUSCLES

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Ultrasound (US) imaging can assess the thickness of muscles in a cost-effective way, and can be used in clinical settings to monitor muscle changes. **Purpose:** The purpose of this study was to determine intra-rater reliability in measuring consecutive US images for the thickness of the tibialis anterior (TA) and the tibialis posterior (TP). **Methods:** A trained individual, using a 10 MHz linear probe (GE LogiqP6), recorded two 7s US videos of the TA and TP muscles of the right leg. Both muscles were captured on each video. The videos were taken at a point 30% distal from the knee joint line to the inferior tip of the lateral malleolus. The probe was held perpendicular to the shaft of the leg. Each person was instructed to invert their foot against active resistance and then to relax, in order to more easily view the borders of the muscles of interest. After the first video was recorded, the probe was removed from the leg and repositioned, following the same protocol to obtain the second video. Using the ultrasound machine's internal software, still-shots of the muscles at rest were used to make calculations of the thickness. Each individual image was measured twice and the rater was blinded to each measurement value. The measurements were made one right after the other. **Results:** The ICC for the measurement reliability of thickness of the TA was .988 and for the TP, .998. **Conclusion:** Excellent intra-rater reliability of the measurements of the TA and TP muscle thicknesses were found. The rater was also accurate at finding similar images within the video, from which the measurements were made. Measurements made by the same measurer can be trusted as reliable, especially when videos are used as references for more clearly distinguishing fascial borders in deep muscles of the lower leg.

### 40. EFFECTS OF PROTEIN SUPPLEMENTATION DURING 10 DAYS OF INTENSIFIED CYCLING TRAINING ON WHOLE MUSCLE SIZE AND FUNCTION

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**Purpose:** Protein supplementation (with carbohydrates; CP) can restore muscle function following heavy endurance exercise. The value of CP supplementation during an extended period of endurance training is less understood. This study was designed to determine the effects of CP supplementation during 10-days of intensified training (IT) on whole muscle function and size in well-trained cyclists. **Methods:** Eight cyclists ( $25 \pm 7$  yr;  $72 \pm 12$  kg;  $63.8 \pm 8$  ml/kg/min) completed two identical 10 day IT phases, characterized by a 100% increase in average daily training volume (baseline =  $63.2 \pm 6.8$  min/day; IT =  $136.1 \pm 16.0$  min/day). In one phase, carbohydrate treatments (CHO) were provided during (45 g/hr) and immediately following (1.2 g CHO/kgBW) all exercise sessions, whereas CP treatments were provided throughout the other IT phase (during-exercise: 45 g CHO/hr + 15g PRO/hr; post-exercise: 1.2 g CHO/kgBW + 0.3 g PRO/kgBW). Muscle function was assessed before and following IT using an isokinetic dynamometer. Whole muscle size was measured before and on day 9 of IT using ultrasonography of the vastus lateralis. Data were analyzed using ANOVA, and interpreted using magnitude-based inferences. **Results:** CP 'likely' improved peak torque of the knee flexors ( $\Delta\text{CP} = 2.8 \pm 4.1$  ft/lbs;  $\Delta\text{CHO} = -0.8 \pm 5.6$  ft/lbs) and extensors ( $\Delta\text{CP} = 2.3 \pm 10.9$  ft/lbs;  $\Delta\text{CHO} = -11.4 \pm 14.7$  ft/lbs) at 120 deg/sec. At 240 deg/sec, CP 'likely' improved peak torque of the knee flexors ( $\Delta\text{CP} = 5.6 \pm 5.7$  ft/lbs;  $\Delta\text{CHO} = 2.8 \pm 6.4$  ft/lbs). CP 'possibly' better maintained whole muscle size ( $\Delta\text{CP} = 0.05 \pm 0.24$  cm;  $\Delta\text{CHO} = -0.05 \pm 0.38$  cm), compared CHO. **Conclusion:** Protein supplementation may help maintain whole muscle function, while better preserving whole muscle size throughout IT, compared to carbohydrate.

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#### 41. FOOT-STRIKE PATTERNS OF RUNNERS DURING A 100 MILE ULTRAMARATHON

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Foot-strike patterns can have major implications on long distance running performance and injuries. While foot-strike patterns have been examined during traditional long distance events, such as half and full marathons, little research has been conducted on events longer than 26.2 miles.

**PURPOSE:** To classify foot-strike patterns and their effect on race performance during a 100 mile ultramarathon. **METHODS:** Foot-strike patterns were recorded at four intervals for 40 runners at the Beyond Limits Ultramarathon, a 100 mile race consisting of a 2 mile loop, in Mountain Center, CA. One Casio EX – FH1000 high speed camera (Tokyo, Japan) sampling at 240 HZ was used to film runners from the waist down at miles 11.5, 31.5, 61.5, and 91.5. Video analysis was conducted to identify foot-strike patterns for each runner. **RESULTS:** Rearfoot (RF) foot-strike pattern was observed most frequently among runners (mile 11.5: 69.6%; mile 31.5: 54.3%; mile 61.5: 30.4%; mile 91.5: 26.1%). As the race progressed, the decrease in RF frequency was associated with an increase in Walking (mile 11.5: 4.3%; mile 31.5: 32.6%; mile 61.5: 34.8%; mile 91.5: 30.4%). Remaining runners were identified as either midfoot or undefined (shuffling). No runners were observed as striking exclusively forefoot (FF) at any of the collection points. In addition, there were no significant differences ( $p > .05$ ) in pace as a result of foot-strike type at any of the collection points. **DISCUSSION:** The predominance of rearfoot-strikers throughout the event is consistent with similar research conducted on shorter running events. The lack of significance between foot-strike pattern and race order could be attributed to the overall length of the event. Research on shorter events has found that increases in speed encourage midfoot or forefoot strikes, however the current findings did not. This may be due to extraneous factors affecting runners over the course of 100 miles.

#### 43. COMPARING ENERGY EXPENDITURE ESTIMATES FROM ECOLOGICAL MOMENTARY ASSESSMENT AND SENSOR-INFORMED DAILY RECALL

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Accelerometers provide an objective assessment of overall physical activity in free-living situations and provide a low burden experience for participants. However, accelerometers are not typically able to distinguish among distinct activity types. Ecological momentary assessment (EMA), a real-time sampling strategy, can prompt participants at context-sensitive moments (e.g. change in physical activity) or random time intervals. This study examines the validity of self-reported contextual information about sports and exercise using EMA and the added value of this approach above and beyond accelerometry alone. Fifty-one high school students (ages 14-19, 55% female) were instructed to wear an Actigraph accelerometer and carry a smartphone with an EMA application for 14 days. The application prompted participants with surveys up to 7 times per day at specific time intervals and when the smartphone detected specific bouts of activity. Items asked participants to report what they had been doing (e.g., sports or exercise, using technology) for the past hour. Follow-up questions queried the type (e.g., running, basketball) and form (e.g., flexibility, strengthening) of sports or exercise. Multi-level models were used to compare moderate-to-vigorous physical activity (MVPA) measured by the Actigraph across the 60 minutes prior to an EMA prompt to activities self-reported during that prompt. After adjusting for age and gender, prompts reporting sports or exercise had significantly more MVPA in 60 minutes preceding that prompt than prompts reporting all other types of activities. ( $p < 0.001$ ). There were no differences in prior MVPA among any of the types or forms of sports or exercise reported. The findings provide evidence for the construct validity in EMA-reported sports or exercise compared to objectively measured MVPA. The lack of differences in MVPA among specific types and forms of sports and exercise highlights a unique advantage of EMA to capture contextual information about physical activity beyond the capabilities of an accelerometer.

#### 42. UPPER BODY MUSCLE ACTIVATION BETWEEN STABLE AND UNSTABLE LOAD DURING ECCENTRIC BENCH PRESS

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**INTRODUCTION:** The bench press is one of the most commonly used upper body exercises in training. There is conflicting research on use of an unstable surface, but little to no research on the use of an unstable load (UL). **PURPOSE:** To investigate muscle activation during the eccentric phase of a bench press while using a stable load (SL) and UL. **METHODS:** Twelve males (age =  $24.3 \pm 2$  yrs.; height =  $177.0 \pm 6.8$  cm; mass =  $87.6 \pm 11.4$  kg) completed 2 experimental conditions (SL and UL) at two different intensities [60% 1RM and 80% 1RM]. UL was achieved by hanging 16kg kettlebells by elastic bands from the end of the bar. All trial lifts were set to a two second cadence with a hold at the bottom of the lift. Subjects had electrodes attached to 5 muscles [pectoralis major (PM), anterior deltoid (AD), medial deltoid (MD), triceps brachii (TB) and latissimus dorsi (LD)] and performed three isometric bench press trials to normalize electromyography data. After 48 hours, subjects completed the opposite condition. **RESULTS:** There was no effect of intensity but there was an interaction of condition and muscle. The AD had significantly greater muscle activation using UL ( $0.69 \pm 0.21$  relative to MVIC) compared to SL ( $0.63 \pm 0.22$  relative to MVIC). All other muscles showed no significant differences. **CONCLUSIONS:** These results suggest that the use of an UL may increase AD activation during the eccentric phase. The use of an UL could be incorporated into training to increase muscle activation.

#### 44. TEN SESSIONS OF AEROBIC INTERVAL TRAINING IMPROVE MAXIMAL OXYGEN UPTAKE WITHOUT A CHANGE IN CARDIAC OUTPUT

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Repeated bouts of low volume, high intensity interval training (HIT) have been shown to enhance maximal oxygen uptake ( $VO_{2max}$ ) as well as cause peripheral adaptations within the heart and muscle, respectively. However, the exact mechanism explaining the change in  $VO_{2max}$  is not readily known. **Purpose:** The purpose of this study was to assess the effects of 10 sessions of HIT on hemodynamics and  $VO_{2max}$  in active men and women. **Methods:** Recreationally active participants (5 men and 5 women, mean age and mass =  $24.50 \pm 2.10$  yr and  $71.04 \pm 2.98$  kg) completed 10 sessions of HIT consisting of 6 – 10 bouts of cycling for 1 min at workloads ranging from 90 – 110 % $W_{max}$ . Progressive cycle ergometry was completed until volitional fatigue at baseline and after training. During exercise, gas exchange data were obtained to determine  $VO_{2max}$  which was verified with a subsequent supramaximal test. Hemodynamics were continuously measured during exercise using thoracic impedance. **Results:** There was a significant improvement in  $VO_{2max}$  ( $p = 0.006$ ) from baseline ( $41.98 \pm 4.27$  ml/kg/min) to post HIT ( $44.57 \pm 4.50$  ml/kg/min). Yet, there was no change in cardiac output ( $20.03 \pm 1.74$  L/min to  $20.61 \pm 1.57$  L/min,  $p = 0.30$ ) or arteriovenous oxygen difference ( $15.54 \pm 1.93$  ml/dL to  $15.88 \pm 1.42$  ml/dL,  $p = 0.33$ ) in response to HIT. **Discussion:** Improvement in  $VO_{2max}$  may have occurred due to peripheral adaptations, while the volume of training may have been inadequate to promote central adaptations. **Conclusion:** Ten sessions of HIT significantly improved  $VO_{2max}$  without a change in hemodynamics. Additional study is merited to identify mechanisms explaining the improved  $VO_{2max}$  exhibited in response to interval training.

#### 45. EFFECT OF CARBOHYDRATE INGESTION ON BASKETBALL PERFORMANCE

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Research has shown that carbohydrate (CHO) intake improves performance in activities >45 minutes. Basketball requires intermittent high-intensity exercise bouts over the course of 20 minute halves or 12-minute quarters, suggesting that players may benefit from CHO intake during games. **Purpose:** The purpose of this investigation was to measure the affect of CHO ingestion on basketball performance. **Methods:** Five competitive basketball players (23.6±1.8yrs, 193±3.1cm, 87.2±3.8kg) completed two randomized game simulations. Each simulation consisted of game-like drills separated into quarters. The first and second quarter drills were repeated during the third and fourth quarters, respectively. Participants were allowed a five-minute break after the first and third quarters, with a 10-minute break after the second quarter for halftime. During the course of each game simulation, participants consumed 1000 ml of either a 6% CHO beverage or placebo (PLA). Participants consumed 250 ml after the first and third quarter breaks and 500 ml at halftime. A paired T-test was used to compare data between trials. Significance was set at  $p < 0.05$ . **Results:** There were no differences between CHO and PLA trials in the first and second quarter drills. During the third quarter there was a trend (30.2±4.5 to 31.0±4.6s;  $p=0.08$ ) for a faster full court combination drill in CHO. During the fourth quarter the key combination drill was completed faster in CHO (40.7±4.4 to 42.8±4.1s  $p=0.002$ ). Additionally, there was a trend for faster completion of the lane slide drill in the CHO trial (36.5±2.2s to 38.1±2.1s;  $p=0.07$ ). **Conclusion:** Although there were no differences in drill performance during the first two quarters, there is evidence that CHO intake led to faster completion of various third and fourth quarter drills. These data suggest that CHO intake during a basketball game may lead to performance improvements in the latter moments of a game.

#### 47. RELATIONSHIP BETWEEN PEAK POWER REACHED DURING CYCLING TESTS AND HIGH SCHOOL MOUNTAIN BIKE ATHLETE RACE PERFORMANCE

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Mountain biking (MTB) is a complex sport requiring a variety of physical attributes (e.g., power, speed, and endurance) combined with technical bike skills and race strategy. High School mountain biking race teams are growing in popularity but limited research has been conducted on high school mountain bike athletes. Currently, there is no data exploring the relationship between a high school mountain bike athlete's ability to reach high levels of PP (W) and their subsequent racing/finish times. **Purpose:** The purpose of this research was to determine the correlation (if any) between PP (W) in MTB athletes and their race time (i.e., performance). **Methods:** 28 MTB athletes (age: 16.5 ± 1.5 years; weight: 66 ± 8.1 kg ; height: 167.64 ± 8.12 cm) from the Salinas High School Mountain Biking Team (SHSMTB) completed one round of Wingate (WIN) testing prior to their first racing event of the season. During this session, anthropometric measurements were obtained, after which a resistance equal to 7.5% of each athlete's body weight was added to the flywheel of the Monark 894e Anaerobic Test Ergometer. After a brief warm-up, each athlete completed one 30 second WIN test. Subsequent individual race times were collected from <http://www.nationalmtb.org> and correlation values were determined using a log-log transformation of the data and the Pearson product-moment correlation coefficient. **Results:** There is no significant correlation between peak power and the average race lap time ( $t=0.8047$ ,  $df=26$ ,  $p\text{-value}=0.4283$ ). **Discussion/Conclusion:** These results suggest that a single 30 second WIN test is not an accurate method for predicting race performance or potential for success in MTB riders aged 14-18, though results from previous studies have shown that the ability to maintain high levels of PP over multiple WIN tests is a significant factor in adult MTB racing.

#### 46. THE EFFECT OF CARBOHYDRATE INTAKE ON CROSSFIT PERFORMANCE AND ASSOCIATED METABOLIC/PHYSIOLOGICAL DEMANDS AND RESPONSES

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CrossFit (CF) is a physically and metabolically demanding strength and conditioning method. Given the metabolic profile of CF training, a carbohydrate (CHO)-rich diet may enhance its performance. **Purpose:** This study investigated the effect of three consecutive days of high CHO intake on CF performance and corresponding metabolically/physiologically-related variables in strength trained individuals with a chronic CHO intake of <6 g/kg/d. **Methods:** Eighteen subjects were randomly assigned into a CHO (n = 9) or control (C) group (n =9) and underwent a 9-day training protocol. In days 1, 5, and 9, CF performance was measured in repetitions completed during a 12 minute CF workout. Oxygen consumption ( $VO_2$ ), respiratory exchange ratio (RER), and blood lactate (BL) were measured as well. From days 6-8, the CHO group increased CHO intake from <6 g/kg/day to 6-8 g/kg/day whereas the C group maintained their current intake of <6 g/kg/day. On days 6 and 7 both groups performed prescribed CF workouts followed by a day of rest prior day 9. **Results:** A repeated measures ANOVA revealed a time main effect ( $p < 0.002$ ) for repetitions completed in day 9 (vs. mean score of day 1 + day 5). There was no group effect or (time x group) interaction. Despite the latter, it should be noted that the CHO group displayed a 15.22 repetition increase (+10.9%) in day 9, whereas the C group did so by only 5.67 (+4.2%). Hence, the practical implications of our results warrant consideration in a competition-type setting. Scores for  $VO_2$ , RER, and BL were not influenced by the experimental intervention. **Discussion:** Despite the commonly practiced moderately-low CHO intake within the CF community (40% CHO), our results suggest that CF performance may be enhanced by practicing a CHO-rich diet during periods of training due to the expected pronounced reliance on glycolytic energy production.

#### 48. INTRA TESTER RELIABILITY STUDY OF INTRINSIC FOOT MUSCLE STRENGTH

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**Introduction/Purpose:** Measuring strength of the intrinsic foot muscles can help researchers evaluate the relationship of muscle weakness and injury incidence and develop exercise regimens targeting the intrinsic foot muscles. Measuring the forces produced during doming and toe-pull exercises is one method of assessing strength. The purpose of this project was to determine the intra reliability of these measurements. **Methods:** Twelve feet were analyzed while performing doming and toe-pull exercises on the same day. During each test, the subject was placed in a seated position with the knee at 90 degrees. To assess doming strength, a dynamometer was placed on the dorsum of the foot directly above the navicular tuberosity. The subject performed the doming movement to a maximal plateau for 3 seconds. Toe flexor strength was assessed from the big toe individually, and the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> toes together. During these tests, the dynamometer was attached to the big toe via an S-beaner or the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> toes using a t-bar. Each subject pulled to a maximal plateau for 3 seconds and then relaxed. All tests were completed on each foot three times. **Results:** The within day Intraclass Correlation Coefficient (ICC) for the tests were: doming trials ICC=0.73, the big toe test ICC=0.98, for the lateral toes ICC=0.86. **Conclusions:** From these results, we determined that there was moderate-good reliability between doming trials, good reliability for big toe trials, and good reliability for lateral toe trials. The consistency of these trials suggests that this measurement of intrinsic foot muscle strength is reliable and can be used for further testing in the future.

#### 49. THE RELATIONSHIP BETWEEN PHYSICAL FITNESS AND EXPERIENCE ON JOB-RELATED DECISION MAKING IN LAW ENFORCEMENT OFFICERS

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According to the American with Disabilities Act, law enforcement agencies are not to use a candidate's fitness to deem an office qualified for duty. However, high fitness levels are often assumed to be pertinent in job performance of an officer. The purpose of this study was to determine if either physical fitness or experience play a prominent role in officers' ability to make accurate decisions in the field. **Methods:** Police officers ( $39.2 \pm 7.5$  years) with 2 to 35 years of experience were recruited for this study. Each officer performed a battery of tests required during a monthly training course by their respective agency including shooting accuracies, simulation training, and situational training with low intensity exercise. Additionally, officers completed a questionnaire, qualitative interviews, and observation of training and informal conversations that took place during the fieldwork. **Results:** Findings suggested that there is no significant correlation between physical fitness and any decision making task performed by the police officers. However, there is a significant negative correlation between experience and 50yd Run and Shoot test ( $r^2=-0.18$ ,  $p<.05$ ). **Discussion:** According to the data, being physically fit may not influence an officer's ability to make accurate decisions during stress inoculation training. This research article is one of the first articles to combine how physical fitness and experience relate to a police officer's accurate decision making. Physical fitness does not appear to be the most critical attribute of being a police officer. The number of repetitions involving technical and tactical skills increase with the officers experience level, which may have a greater impact on his or her performance and accuracy in the field.

#### 51. PHYSICAL ACTIVITY LEVELS AMONG OVARIAN CANCER SURVIVORS: AN NRG ONCOLOGY/GYNECOLOGIC GROUP STUDY

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**Introduction:** Regular physical activity (PA) has been associated with improved health outcomes in cancer survivors. Evidence suggests that PA is associated with improvements in fatigue, peripheral neuropathy, sleep, and psychosocial functioning in ovarian cancer survivors. Despite the health promoting effects of regular PA, data to date describing PA behaviors after treatment for ovarian cancer survivors are limited. Purpose: This analysis characterizes recreational moderate-intensity PA and vigorous-intensity PA after treatment among ovarian cancer survivors enrolled in a lifestyle intervention trial. **Methods:** Ovarian cancer survivors ( $n=312$ ; age:  $60.1 \pm 9.7$  years; BMI:  $27.8 \pm 5.8$  kg/m<sup>2</sup>) enrolled in the Lifestyle Intervention for Ovarian Cancer Enhanced Survival study completed the validated Arizona Activity Frequency Questionnaire (AAFQ) within 6 months post-treatment. The recreational activity section of the questionnaire included 22 popular activities, such as walking, aerobics, jogging, and swimming. For each activity performed, participants were asked how many times in the past 4 weeks they participated in the activity and the duration of each activity. To incorporate frequency, duration, and intensity, metabolic equivalent (MET) values were assigned to each moderate-intensity PA ( $\geq 3$  METs and  $\leq 6$  METs) and vigorous-intensity PA ( $>6$  METs). **Results:** Ovarian cancer survivors participated in  $11.9 \pm 13.2$  MET-hr/wk and  $4.01 \pm 6.9$  MET-hr/wk of moderate and vigorous recreational PA, respectively. Normal weight survivors participated in significantly more moderate-intensity PA ( $13.2 \pm 12.7$  MET-hr/wk) compared to overweight and obese survivors ( $11.6 \pm 12.9$  and  $10.3 \pm 14.2$  MET-hrs/wk, respectively) ( $p<0.05$ ). Overall, 48% participated in ACSM recommended levels of PA defined as  $\geq 7.5$  MET-hrs/wk of moderate-vigorous intensity recreational PA. Fewer obese (35%) ovarian cancer survivors met the recommendation than overweight (53%) or normal weight (58%) survivors ( $p<0.05$ ). **Conclusion:** A majority of ovarian cancer survivors were not achieving PA recommendations. Efforts to identify barriers and facilitate PA among these women are warranted.

#### 50. EFFECT OF 10 SESSIONS OF AEROBIC INTERVAL TRAINING ON FAT OXIDATION KINETICS

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**Background:** There is a dearth of literature showing increases in whole body fat oxidation through endurance training; however, the time constraints of this exercise mode make it impractical for many individuals. In contrast, high intensity interval training has been documented to be an efficient means to improve cardiorespiratory fitness and metabolic health. **Aim:** To examine the effects of 10 sessions of aerobic interval training on fat oxidation kinetics. **Methods:** 10 active, healthy men and women (age =  $24.5 \pm 6.6$  yrs.,  $VO_{2max} = 41.9 \pm 4.3$  mL/kg/min) completed 10 sessions of 8-10 bouts of cycling at 90-110% of individual  $W_{max}$ . Each bout lasted 60 seconds with a 75 second recovery between bouts. Pre and post-training, subjects cycled at 40W for 4 minutes followed by 20W increments every 3 minute until RER surpassed 1.0, after which work rate was increased 20W per minute until fatigue. During exercise, gas exchange data were obtained to determine  $VO_2$  and  $VCO_2$ , which were used to calculate RER, maximum fat oxidation (MFO), FATzone, and minimum fat oxidation (FATmin). **Results:** Interval training did not alter FAT ( $P=0.14$ ) or CHO ( $P=0.33$ ) oxidation. MFO ( $p = 0.23$ ) and Fatzone ( $p = 0.18$ ) were increased via HIT, yet these changes were insignificant. **Conclusion:** Ten sessions of interval training at near-maximal work rates may be inadequate to significantly improve fat oxidation kinetics in a heterogeneous sample of young men and women. Data oppose recent findings showing improved whole-body fat oxidation in untrained women, and may be due to our small sample size or higher existing fitness level of subjects. A more prolonged and intense training stimulus may be needed to elicit significant improvements in whole-body fat oxidation in young, habitually active individuals.

#### 52. THE ENDOGENOUS ROLE OF HIPPOCAMPUS GHRELIN RECEPTOR SIGNALING IN FEEDING BEHAVIOR

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Ghrelin is a stomach derived "hunger" hormone that is known as the only circulating hormone that increases feeding behavior. Ghrelin injected in the ventral hippocampus (vHPF) increases food intake and drives higher-order processes related to food reward. The endogenous relevance of ghrelin signaling in the hippocampus is unknown. Here, we will use a rat model to examine whether the genetic knock down of ghrelin receptor in the ventral hippocampus influences feeding behavior. We developed an Adeno-Associated viral vector (AAV) to "knock down" the gene expression for the ghrelin receptor. First, infected neurons were confirmed by observing fluorescently labeled vHPF neurons. After confirming AAV infection in the vHPF, ghrelin receptor gene expression knockdown was determined via qPCR analysis. Now that we've confirmed that the AAV is effective for knock down of the ghrelin receptor, we will examine the endogenous role of ventral hippocampus ghrelin receptor signaling on different aspects of feeding behavior. We hypothesize that long-term knock down of ghrelin receptor in this brain region will reduce diet-induced obesity.

### 53. ABILITY TO PREDICT $VO_{2PEAK}$ OF URBAN FIREFIGHTERS BASED ON HEIGHT, AGE, AND SEX

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**Purpose:** To investigate the ability of the Jones (1985) cycling protocol to estimate the peak aerobic capacity of urban firefighters (6 women; 106 men) from northern New Mexico. **Methods:** As part of the departmental fitness initiative, firefighters reported for maximal aerobic testing. They consented to allow their de-identified data to be subsequently analyzed. Baseline gas exchange data were recorded prior to a brief warm-up. The cycling protocol (100 kgm/min) was incrementally adjusted each minute until volitional exhaustion and followed by an active cool-down. Metabolic gases were averaged over 30-sec intervals. The highest value was recorded as the actual  $VO_{2peak}$ . A paired t-test was performed to evaluate possible differences between predicted and actual  $VO_{2peak}$ . A Pearson's correlation was used to assess the strength of the correlation. The Bland and Altman technique was applied to investigate individual variation in the predictive ability of the Jones equation. **Results:** 112 firefighters (35.1±8.5 yr, 1.76±0.04 m, 84.8±12.8 kg) completed the maximal cycling protocol. Given the small number of females, all data were pooled and reported as mean ± SD. On average, the peak power output and HR were 263.7±48.8 W, 172.8±12.1 bpm, respectively. There was no significant difference between  $VO_{2max}$  estimated by the Jones (1985) prediction formula ( $VO_{2max} = 0.046 (Ht, cm) - 0.021 (Age, yr) - 0.62 (Sex; 0=male, 1=female) - 4.31 L/min$ ) and the measured  $VO_{2peak}$  (36.7±5.4 and 37.2±7.2 ml/kg/min, respectively); the relationship between the two aerobic capacity values was moderately strong ( $r = .59$ ). Bland and Altman results revealed 94% of the firefighters'  $VO_{2peak}$  were correctly estimated within ± 3.4 METS (2 SDs; 11.9 ml/kg/min).

**Conclusion:** Given the moderate correlation and the large individual differences between aerobic capacity values, our results suggest the Jones (1985) prediction equation does not accurately estimate the aerobic capacity of these urban firefighters.

### 54. HIGH SCHOOL SPORT COACHES AND PHYSICAL EDUCATORS STRENGTH AND CONDITIONING PRACTICES

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The purpose of this study was to survey the level of strength and conditioning (S&C) knowledge in high school sport coaches (SC) and physical education teachers (PET) who coach students and athletes in the weight room. The demographic for this study included PET and SC that taught S&C who were currently employed by a California (CA) or Washington (WA) high school. A modified version of the "Physical Educator/ Sport Coach" exam (PE/SC) developed by McGladrey, Hannon, Faigenbaum, et al. (2014) was used to assess current S&C expertise among those surveyed. The modified PE/SC consisted of 14 demographic questions, 46 knowledge questions (KQ), and 2 additional questions regarding extracurricular education. A passing grade for the KQ required a success rate ≥ 75% (i.e., 35 correct questions). During the 3-month survey period, 208 surveys were opened of which 78 were fully completed. Frequency distributions were generated for all questions, as well as passing rate of the KQ (including grade distribution), and passing rate according to continuing education and certification. Fifty responders (64.1%) did not pass the KQ. Those who scored below 69% represented the highest frequency (n=37) and percentage (47.4%) of participants; only 4 responders (5.1%) achieved a grade ≥ 90%. Of the 48 (61.5%) responders who participated in continuing education, 22 (45.8%) passed the KQ; those who didn't participate (n=6) had a passing rate of only 20%. Of the 16 responders (20.5%) that held a strength training or personal training certification, 10 (62.5%) passed the KQ. In contrast, out of the 62 responders that didn't hold a certification, only 18 (29%) passed. Our results imply substantial inadequacy in strength and conditioning knowledge among the sampled population. Prior formal education such as attendance to S&C seminars or clinics outside the school seems to be beneficial when it comes to S&C knowledge.

### 56. IMPACT OF INCREASED FUNDING FOR UNIVERSITY EMPLOYEE WELLNESS PROGRAM ON HEALTH CARE CLAIMS COSTS

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**Introduction:** Rarely has the cost-effectiveness of an investment in university employee wellness been investigated. In 2008, Utah State University increased its wellness program funding by approximately 2,000%. The purpose of this study was to compare health care claims costs for the University for 4 years before and 4 years after this increase in funding. **Methods:** Data for the 2005-2012 fiscal years were obtained for the costs of both medical and prescription health care claims and the total number of employees enrolled in the University's health care plan. A Shapiro-Wilk test was used to assess normality. A general linear model was used to assess the trend in health care claims, adjusted for yearly increases in health care costs, per person for each year and to compare the claims before and after the increase in funding. **Results:** There was not a significant change ( $F(1,6) = 1.51, p = .27$ ) in the average health care claims per person before ( $\$2,206.00 \pm \$184.10$ ) and after ( $\$2352.90 \pm \$153.00$ ) the large increase in wellness program funding. **Conclusion:** There was no change in health care claims costs after the increase in employee wellness funding, although it is possible savings could be realized in the future.

### 55. MOVEMENT AND WORK QUANTIFICATION IN ELASTIC VARIABLE RESISTANCE EXERCISE

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Accurate volume quantification is an essential component of resistance exercise programming. Elastic bands in conjunction with free-weight loading create a variable loading pattern; however estimating work from band contributions has not been fully quantified in previous research.

**Purpose:** To utilize human subject measurement data to determine mean band lengths at the top (extended) and bottom (flexed) positions, along with mean displacements, during the squat (SQ) and bench press (BP) exercises. These measurements will aid in the derivation of equations used to calculate load and volume for elastic band plus free-weight exercises. **Methods:** A total of 133 participants (58 males and 74 females, 19±1.4 yrs, 170±9.3 cm, 69±12.2 kg) were measured for band lengths incurred at: BP extended position, BP flexed position, SQ extended position, SQ flexed position, and change in band length. The band length change or displacement was calculated for each exercise by subtracting the flexed position from the extended position measurements, and was subsequently calculated as an expression of height. **Results:** Mean band length change expressed per height for BP was 55.6±3.6% and 58.2±4.2% for males and females and 51.4±2.9% and 52.0±2.4% for SQ respectively. Significant sex differences were found for BP flexed, SQ flexed, and displacement measures ( $p < 0.05$ ). **Discussion:** Significant sex differences established the need for separate work equations regarding males and females, otherwise female work would be overestimated due to decreased range of motion during BP. The measurements of this study can be generalized to the general public because the data collected for participant heights were nearly identical with national reference data (McDowell, et al. 2008). In conclusion, the mean band lengths and displacement measurements collected in this study will be used to create equations to calculate work for elastic band plus free-weight exercises.

## 57. ASSESING INTRA- AND INTER- TESTER RELIABILITY OF VARIFORM ACCUPIN SCANNER FOR ARCH HEIGHT MEASUREMENT

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**Purpose:** The Variform AccuPin scanner uses a pin casting matrix to help practitioners create a 3D image of the foot for precise orthotics molding. Variform has established its place in the orthotics industry as an efficient tool for creating orthotics and providing patient information, but this scanner has not been formally evaluated for clinical research. The purpose of our study has been to test the reliability of the Variform AccuPin scanner for arch height measurement. We assessed both inter- and intra- tester reliability. **Method:** Three testers measured a total of sixteen feet in both a neutral/non-weight bearing position as well as a standing/weight bearing trial. For the neutral trial, the subject was seated at 90 degrees of knee flexion with their foot resting on the Variform pin matrix. The tester then applied pressure to the top of the knee and the dorsum of the foot to push the foot into the pin board without affecting the arch. The standing arch height was measured after the subject stood on the pin board and performed three squats to a pre-determined height. **Results:** Our inter-tester results showed an ICC of .875 to .957 while our intra-tester analysis resulted in an ICC of .759 to .996.

**Discussion/Conclusion:** From these results we can conclude that the inter- and intra- tester study of the Variform device showed good to excellent reliability. This shows consistency in measurement of arch height by the Variform system. Future studies involving arch height measurement can rely on the Variform device for consistent and reliable data.

## 59. SIDE BY SIDE TREADMILL WALKING REDUCES GAIT ASYMMETRY INDUCED BY UNILATERAL ANKLE WEIGHT

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Asymmetric gait is a hallmark of many neurological and musculoskeletal conditions. Synchronization to an external signal appears to be a promising therapy for improving asymmetry, yet no one to date has investigated the effects of unintentional synchronization that often occurs when two people walk side by side. The purpose of this study was to investigate the effects of side by side walking on bilateral coordination of gait in young, healthy subjects. A total of 50 subjects completed four trials while walking on a motorized treadmill, both by themselves (SOLO), and with a partner on an adjacent treadmill (PAIRED). For one SOLO and one PAIRED trial, subjects walked normally. For a second SOLO and a second PAIRED trial, the subject of interest walked with additional weight applied unilaterally to their right ankle. As expected, the addition of unilateral weight increased asymmetry according to several spatiotemporal measures of gait, but 1) the presence of a partner on an adjacent treadmill significantly reduced this effect ( $p < 0.001$ ), 2) the amount of unintentional synchronization among pairings was relatively unaffected by the addition of ankle weight, and 3) all pairings realized a beneficial effect on asymmetrical gait but this effect was greater for pairings that consistently synchronized unintentionally. These results suggest that side by side walking might be an effective approach for influencing bilateral coordination of gait, and may hold insight for understanding gait asymmetry and variability in certain patient populations.

## 58. THE RELIABILITY OF A COMMERCIAL DEVICE DESIGNED TO MEASURE PUNCHING IMPACT

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Combat sports such as mixed martial arts, karate, and boxing are internationally popular. Punching power is an integral component to success in these sports. Yet, a precise and reliable method of measuring such is not currently available. **PURPOSE:** The purpose of this study was to assess the reliability of a commercially available device specifically designed to measure punching impact. **METHODS:** Reliability of the device was established by using a pulley system to drop three different implements of known mass (8, 17.9, and 24kg) from a fixed height (1.5m), ten times each (CON). Next, thirteen elite male professional boxers and mixed martial artists (age =  $29.23 \pm 5.64$ ; height =  $180.33 \pm 9.04$ cm; mass =  $87.06 \pm 17.89$ kg, number of professional fights =  $17.9 \pm 12.7$ , winning % =  $73.8 \pm 13.8$ %, of victories via knockout/technical knockout =  $35.6 \pm 21.9$ %) wore a standardized 14oz boxing glove and performed 10 repetitions (2 sets of 5) of a maximal punch into the device. Each repetition was separated by 30 seconds of rest, and each set by 5 minutes. All participants performed a 15-minute self-selected warm-up (including 10-20 practice punches) before the protocol and were instructed to use the same punching technique on every repetition. **RESULTS:** The precision (CV = 6.01%, 4.52%, 5.68%, during 8, 17.9, and 24kg conditions, respectively) and reliability (ICC = 0.99) of the device were high during the CON and athlete trials (CV = 10.54%, ICC = 0.82). **CONCLUSION:** These results suggest this commercially available device is a precise and reliable method of measuring punching impact in professionally trained punchers. This information may be useful for researchers, coaches, and other parties interested in measuring punching impact.

## 60. RESPIRATORY EXCHANGE RATIO AS AN INDEX FOR ENDURANCE TRAINING INTENSITIES

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Lactate threshold (LT), maximal lactate steady state (MLSS) and the velocity at  $\dot{V}O_{2max}$  ( $v\dot{V}O_{2max}$ ) have been identified as endurance performance indicators and may provide more individualized exercise prescription when used by coaches and athletes. Due to the intense and invasive nature of the maximum treadmill tests and MLSS trials requiring exercise to the point of fatigue and blood collection, the use of the respiratory exchange ratio may provide a more convenient estimation of these training intensities. **Purpose:** To explore the use of the respiratory exchange ratio (RER;  $\dot{V}CO_2/\dot{V}O_2$ ) as an index to prescribe training intensities for LT, MLSS and  $v\dot{V}O_{2max}$  in moderately-trained runners. **Methods:** Oxygen cost of running ( $\dot{V}O_2$ ) and blood plasma lactate concentrations [La]p were measured in six adult males (mean age =  $29.2 \pm 4.9$  years, 5 km best time =  $17.0 \pm 0.6$  min) during an incremental maximum treadmill protocol and subsequent 30 minute MLSS trials. LT was identified as the speed before a lactate increase of 1.0 mmol above baseline values. MLSS was defined as the highest exercise intensity that resulted in an increase in lactate of less than 1.0 mmol between 10 and 30 min.  $v\dot{V}O_{2max}$  was identified as the highest intensity reached during the maximum treadmill test. **Results:** The RER data for LT ( $0.87 \pm .02$ ), MLSS ( $0.90 \pm .03$ ) and  $v\dot{V}O_{2max}$  ( $1.02 \pm .02$ ) suggest that RER can be used for the estimation of blood lactate training parameters and  $v\dot{V}O_{2max}$ . **Conclusion:** RER may serve as a valuable tool for making individualized training recommendations without requiring invasive blood sampling protocols. Future investigations may explore the accuracy of this metabolic index compared to current training recommendations based on the generalized percentages of maximum  $\dot{V}O_2$  and/or HR.

## 61. LONGITUDINAL ASSOCIATIONS BETWEEN ANTHROPOMETRIC AND FUNCTIONAL MEASURES OF SARCOPENIA AND OSTEOPENIA

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The purpose of this study was to determine the longitudinal associations between anthropometric and functional measures of sarcopenia and osteopenia. Fifty-three subjects (19 males and 34 females) aged 68-91 yrs were recruited from the previous study completed in 2011. Bone mineral density was measured by a dual energy x-ray absorptiometry. A leg strength test, performed on a leg press machine, and pinch strength and handgrip strength tests, performed with a dynamometer, were used to measure muscle strength. Get up and go was performed as a measure of functionality. Data were compared across time by paired samples t-tests ( $p < 0.05$ ). For males, there was a significant decline in leg press ( $471 \pm 158$  vs.  $379 \pm 125$  lbs,  $p < 0.05$ ) and grip ( $40 \pm 8$  vs.  $37 \pm 7$  kg,  $p < 0.05$ ) strength. GUG time ( $6.8 \pm 1.3$  vs.  $7.8 \pm 2.9$  s) and hip BMD ( $0.930 \pm 0.14$  vs.  $0.902 \pm 0.15$  g/cm<sup>2</sup>) approached significance. For females, GUG time ( $6.7 \pm 1.1$  vs.  $7.1 \pm 1.3$  s,  $p < 0.05$ ), grip strength ( $27 \pm 5$  vs.  $25 \pm 6$  kg,  $p < 0.05$ ), and hip BMD ( $0.761 \pm 0.10$  vs.  $0.741 \pm 0.11$  g/cm<sup>2</sup>,  $p < 0.05$ ) changed significantly. For both males and females, change in GUG time and change in grip strength were the strongest predictors of change in hip and spine BMD. It appears that strength and functional measures may be useful to predict osteoporosis in older men and women.

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## 63. EFFECTS OF DUAL-TASKING ON SPATIO-TEMPORAL GAIT PARAMETERS IN CHILDREN WITH CEREBRAL PALSY

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**Background:** The ability to dual-task is more challenging for children with cerebral palsy (CP) than for typically developing children. Yet, little is known about the effects of dual-tasking on functional ambulation in this population. **Purpose:** To examine the effects of dual-tasking on spatio-temporal characteristics of gait in children with CP. **Methods:** Five assenting children with CP (four boys, one girl;  $7.0 \pm 0.9$  yrs,  $125.7 \pm 6.5$  cm,  $26.0 \pm 4.5$  kg) participated in the experiment and walked twice across the GAITRite® instrumented walkway system (CIR Systems Inc./GAITRite, Sparta, NJ; 120 Hz) at their self-selected speed. Next, participants completed the same walking protocol while simultaneously carrying a tray, similar to what they might do in a school lunchroom. Foot pressure data were extracted and analyzed by footfall to compare stride length, stride rate, base of support width, double support time, and stride velocity for each condition. Data were evaluated using a single-subject procedure (Model Statistic,  $\alpha = 0.05$ ). **Results:** Three children decreased their stride length significantly when dual tasking ( $87.2 \pm 9.1$  vs.  $79.4 \pm 19.5$  cm;  $p < 0.05$ ) while one showed an unexpected increase ( $86.9 \pm 0.0$  vs.  $96.2 \pm 0.0$ ;  $p < 0.05$ ). Two of five children significantly reduced their stride velocity ( $84.8 \pm 16.6$  vs.  $68.4 \pm 17.0$  cm/s;  $p < 0.05$ ), and unilateral base of support reduced in two children as well ( $11.8 \pm 1.3$  vs.  $8.3 \pm 0.5$  cm;  $p < 0.05$ ). Only one of five children demonstrated a reduction in stride time ( $1.13 \pm 0.07$  vs.  $1.05 \pm 0.05$  s;  $p < 0.05$ ). **Conclusion:** This everyday dual-tasking condition significantly altered certain gait parameters in children with CP, although the change was inconsistent for stride length. Clinicians would be wise to keep aware of the spatio-temporal challenges to gait presented by dual-tasking.

## 62. THE IMPACT OF THREE PROGRESSIVELY HIGHER STEP RECOMMENDATIONS ON FOOD ATTENTION ALLOCATION IN FRESHMAN COLLEGE WOMEN

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**Purpose:** The purpose of this study was to examine the effects of long-term (24 weeks) physical activity on attention allocated toward food in freshmen college women. **Methods:** Seventy-nine freshmen college women wore a multi-function pedometer for 24 weeks after being randomly assigned to a daily step level: 10,000; 12,500; or 15,000. After at least 16 weeks of intervention, participants were given a cognitive viewing task (pictures of food and flowers) with the neural response measured using electroencephalogram (EEG) and event-related potentials (ERPs). P300s and LPPs are components of the ERP indicating increased attention to stimuli. **Results:** There was a significant difference in daily step counts between groups ( $P < 0.01$ ). No interaction between step group and picture condition (food vs. flowers) was found for any of the three ERP variables (P300 amplitude, P300 latency, LPP amplitude). The 12,500 group showed a significantly elevated response in comparison to the other groups for both food and flowers ( $F=8.84$ ;  $P<0.01$ ). **Conclusion:** 12,500 and 15,000 steps per day did not preferentially alter neural orientation toward food cues compared to flowers. However, there is a non-linear response to hedonic cues (both food and flowers), with 12,500 steps per day resulting in higher neural response to food and flower cues compared to 10,000 and 15,000 steps per day.

## 64. AGE AND GENDER DIFFERENCES IN LOWER EXTREMITY KINEMATICS DURING A SINGLE LEG SQUAT BETWEEN INJURED AND HEALTHY YOUNG ATHLETES

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The single leg squat (SLS) is commonly used to evaluate lower extremity (LE) movement patterns and neuromuscular deficiencies. Those with LE injuries and/or pain would be expected to demonstrate poor hip control consisting of excessive hip internal rotation and adduction, which can lead to excessive knee valgus during dynamic activities. While much research has been done on the SLS, there is a lack of kinematic data reported on the SLS for younger athletes. **Purpose:** To characterize LE kinematics during a SLS in young athletes and assess influence of age, gender, and presence/absence of pain. **Methods:** 41 subjects aged 8-19yo (67 limbs with no LE pain, 16 limbs with LE pain; 18 male, 23 female; age  $3.5 \pm 3.1$ yo; weight  $49.59 \pm 14.04$ kg; height  $1.57 \pm 0.14$ m) performed a SLS. 3-dimensional LE kinematic data was collected and evaluated using ANOVA or Mann-Whitney U tests. **Results:** While significant differences were seen in peak knee valgus between the 8-10yo group ( $1.7 \pm 3.8^\circ$ ) and the 15-19yo group ( $-3.2 \pm 3.2^\circ$ ,  $p = 0.02$ ), no differences were seen among age groups for hip kinematics. Significant differences were also observed between the no pain and pain groups for hip adduction at max knee flexion (pain =  $12.8 \pm 4.8^\circ$ , no pain =  $15.7 \pm 7.7^\circ$ ;  $p = 0.05$ ) and knee valgus at max knee flexion (pain =  $-5.8 \pm 5.0^\circ$ , no pain =  $-2.2 \pm 5.0^\circ$ ;  $p = 0.02$ ); no differences were seen in pelvic obliquity or hip rotation. No significant differences were observed between genders. **Discussion/Conclusion:** These results suggest that age and presence of pain affect LE biomechanics during SLS, especially with respect to peak knee valgus. Although those with pain did not necessarily exhibit poorer biomechanics, this group may be employing an avoidance strategy. SLS can be a helpful clinical tool when evaluating injury risk and pain for the younger athletic population.

## 65. ENHANCING RESIDUAL LIMB PROPRICEPTION IN INDIVIDUALS WITH UNILATERAL TRANSTIBIAL AMPUTATION THROUGH ATTENTIONAL FOCUS STRATEGIES: A CASE STUDY

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Persons with lower limb amputation do not have direct proprioception or sensory feedback of the prosthetic limb. The loss of this feedback loop may contribute to the increase in falls observed in this population (Miller, 2001). However, a person walking with a prosthesis senses the friction and pressure from direct contact of the socket with the residual limb. These sensations felt by the user can be interpreted as static and dynamic characteristics of the prosthesis, known as Extended Physiological Proprioception (EEP) (Doubler, 1984; Simpson, 1973 & 1974). Numerous experiments reported improved motor performance with an external versus internal focus of attention (Wulf, 2013). According to Wulf (2001b), an external focus of attention directs a person's conscious attention to the effects of their movements or specific feature in the environment. This is in contrast to an internal focus of attention, which directs a person's conscious attention to their body's movements or to a specific body part. The purpose of this study was to investigate the difference between internal and external attentional focus training protocols to teach strategies reducing the potential of falls in persons with unilateral transtibial amputation. Subjects were recruited for assessment in the 3D VICON (VICON, Oxford, UK) motion analysis system. The experimental protocol included static and dynamic tasks where subjects were instructed to step to the side following an external stimulus while directing their attention either externally or internally. For the external focus of attention, subjects were asked to concentrate on their prosthetic toe. Subjects were asked to focus on their residual limb for the internal focus of attention. Measures of reaction time, movement time, and ankle trajectory were collected to assess changes in performance. Early results suggest differences between internal and external focus of attention and will be discussed relating the constrained action hypothesis.

## 67. PREVALENCE OF OVERWEIGHT AND OBESITY IN PRESCHOOL AGED CHILDREN IN SAN LUIS OBISPO COUNTY 2006-2014 AND BY TYPE OF SCHOOL AND REGION

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Overweight and obesity (OW/OB) prevalence in children and adolescents in the United States has been rising and over 31% are OW/OB. Recent studies suggest this trend may be leveling off. Weight status in this population is important to monitor because young children who are OW/OB are at risk for OW/OB across their lifespan. **Purpose:** The purpose of the study was to determine the rate of OW/OB among children aged 3-5 years in San Luis Obispo (SLO) County and to identify if differences existed based on year, household income, and type of preschool. **Methods:** The study included a cross-sectional convenience sample of Head Start, California State, and private preschools. In 2006 (n=482), 2009/10 (n=559), and 2014 (n=442), preschool children aged 3 to 5 years were measured for height and weight using standardized stadiometer and digital scale protocols. In 2014 parents completed a questionnaire providing information about child's ethnicity, household income, and primary language spoken at home. **Results:** Children in 2009/10 and 2014 were more likely to be OW/OB than those in 2006 (p=0.0162). There was no difference in OW/OB prevalence between 2009/10 and 2014. In 2014 children who attended Head Start preschools were 2.87 times more likely to be OW/OB than children in private preschools (p=0.0020). Preschoolers in south SLO county were 1.68 times more likely to be OW/OB compared to north SLO County (p=0.0024). Preschoolers in private schools from low income households were more likely to be OW/OB than those who had higher incomes (p=0.0016). **Discussion/Conclusion:** Children from low income households attending private preschools are at greater risk for OW/OB. Efforts that have shown promise to address disparity in OW/OB in low income populations may be useful in private preschool settings.

## 66. PRACTICE VARIABILITY AND SET POSITION MECHANICS IN COLLEGIATE SPRINTERS

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The set position for the short sprints in track and field is a critical position for not only initiating proper acceleration mechanics but also to maximize start performance. Over the past 35 years, an optimization model has been developed that illustrates critical positions of the set position (Mann, 2013). **Purpose:** The purpose of the study was to investigate the effects of incorporating practice variability to learn critical positions of the set position in collegiate sprinters. **Method:** Five collegiate sprinters participated in the study. Pre and post intervention values for block distance percentage, center of mass (COM) horizontal distance to the lead foot and joint angles for the trunk, front hip, front knee, rear hip and rear knee were measured using 2-D analyses. **Results:** Block distance percentage was found to be 10.2% and 4.6% between pre and post trials. Distance COM to lead foot was 3.99 cm and 4.61 cm. The trunk angles were found to be 10.4° and 9.4°. The front hip angles were 8.4° and 7°. The front knee angles were 16.2° and 6.8°. The rear hip angles were 21.8° and 17.6°. Lastly, the rear knee angles were 14.2° and 8.8°. **Discussion:** Results show six out of the seven variables were reduced to values closer to the ideal values. Consistent with the motor learning literature, practice variability was beneficial for collegiate sprinters acquiring critical positions of the set position in sprinting.

## 68. EFFECT OF A FOUR-WEEK RESISTANCE TRAINING PROGRAM ON ANKLE STABILITY AND PROPRICEPTION

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Every year hundreds of young athletes suffer injuries to the ankle, which is among the most common of athletic injuries. Resistance training increases muscular strength, but its effects on balance, stability, and proprioception are not well known. **Purpose:** This study evaluated the effect of resistance training on balance, stability, and proprioception, a group of adolescent athletes ranging from 12-14 years old completed a 4-week study. **Methods:** A resistance-training (RT) group (n = 15) underwent a supervised resistance band training program three times per week while the control (CT) group (n = 14) refrained from performing any additional strength or balance training for the duration of the study. Participants were evaluated at baseline and after 4 weeks on balance and dynamic stability through the use of the Balance Error Scoring System (BESS) and Star Excursion Balance Test (SEBT), respectively. **Results:** The RT group made significant balance improvements as manifest by the BESS test as compared to the CT group. Both RT and CT groups improved significantly in dynamic stability as manifest by the SEBT; however, the RT group performed significantly better than the CT group. **Discussion/Conclusions:** These findings suggest that improvements in balance and dynamic stability, and therefore, proprioception may be obtained via resistance band training alone.

## 69. RESTLESS LEG SYNDROME AND DOPAMINE, FLUX AND WHOLE BODY VIBRATION TREATMENT

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**Background:** Vascular disturbances leading to tissue hypoxia have been named as one of possible causes for RLS. Vibration to the whole body (WBV) in healthy individuals results in increased blood flow. Catecholamines influence blood flow and can be detected in venous blood. **Purpose:** The purpose of this investigation was to determine if WBV will 1) improve skin blood flow, as measured in flux, in individuals with RLS and thus 2) decrease symptoms associated with RLS. To determine if there is a difference in catecholamines between subjects with and without RLS. The data were compared to healthy age-matched subjects. **Methods:** Twelve subjects with RLS underwent two weeks of 14 min intermittent 30-second WBV. Baseline and after 2-week treatment flux and RLS symptom severity (using the IRLS questionnaire) were compared. Flux and catecholamines were compared to control group. **Results:** Baseline flux was significantly lower in RLS group compared to control ( $p=0.05$ ), both groups demonstrated similar flux values after one vibration treatment. The dopamine levels were significantly higher ( $p=0.005$ ) in the RLS group. The IRLS significantly decreased (representing less RLS symptoms) after two weeks of vibration treatment. **Discussion/Conclusion:** Subjects with RLS have decreased pedal skin blood flow but are able to increase flux to the same level as normal subjects. It seems that given a stimulus, flux Dopamine has influence on vasoconstriction. It is elevated in subjects with RLS. This doesn't seem to be related to dopaminergic medication as only 2 subjects who are on medication exhibit increased dopamine levels vs. 4 subjects who don't take dopaminergic medicine have elevated DA levels. The IRLS, a questionnaire reflecting RLS severity, showed a significant decrease in symptoms (from 22 to 17,  $p=0.001$ ) after the two week treatment. This could indicate that vibration has a positive effect on symptoms associated with RLS.

## 70. WALKSCORE, BIKE SCORE AND TRANSIT SCORE AS PREDICTORS OF FITNESS IN OVERWEIGHT AND OBESE ADULTS

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**Background:** Behavioral ecological models are advancing our understanding the role of the built environment (BE) in health and physical activity (PA). Neighborhood walkability is thought to influence walking for transportation and recreation physical activities, but the relationship between BE and cardiorespiratory fitness ( $VO_{2peak}$ ) is unclear. Walkscore® offers an efficient and validated online tool that quantifies pedestrian friendliness, bike accessibility and transit accessibility within 1-km radius around individuals' homes based. Little attention has been paid to the relationship between this tool and the health outcome of  $VO_{2peak}$ . **Purpose:** A secondary cross-sectional analysis assessed the relationship between Walkscore® values (walk, transit, and bike scores) and CRF in overweight and obese adults. **Methods:** Inactive overweight and obese adults ( $n=108$ , age= $41.3 \pm 9.5$  yrs, BMI= $33.9 \pm 6.0$  kg/m<sup>2</sup>, female =77%, white =84%,  $VO_{2peak}$  =24.5 ml/kg/min) provided their residential address and completed a modified Balke submaximal treadmill protocol to assess BE scores and estimate  $VO_{2peak}$ , respectively. We used multivariate linear regression to predict  $VO_{2peak}$  from walk, transit and bike scores (independently), after adjusting for race, gender, income, age, and DXA measured percent total body fat. Categorical variables with more than two levels were recoded into dichotomous variables. **Results:** No significant relations were found for walk, transit or bike score with  $VO_{2peak}$  ( $R^2$ -change walk score =.001, transit score <.001, and bike score =.002, respectively) on overweight or obese sedentary adults in bivariate analyses (zero-order correlations) or multivariate analyses after controlling for covariates. **Conclusion:** The present cross-sectional data suggest that the Walkscore® is poorly related to CRF. Although residential Walkscore® is associated with walking for transportation, factors beyond walkability that promote higher intensity activities are likely to have a more direct impact on fitness levels.

## 71. THE EFFECT OF TGF- $\beta$ RECEPTOR INHIBITION AND EXERCISE ON RAT ACHILLES TENDON STRUCTURAL PROPERTIES

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Exercise increases collagen synthesis and cross-link formation in tendon. Exercise also increases the expression of TGF- $\beta$ 1, which may contribute to the upregulation of tendon collagen synthesis during exercise. The purpose of this study was to evaluate the effects of TGF- $\beta$ 1 receptor inhibition during exercise on tendon collagen and cross-linking. Male Wistar rats were divided into sedentary (SED,  $n=9$ ) or exercised (RUN,  $n=15$ ) groups. Exercised animals completed 4-days of treadmill exercise (60 minutes/days). In both groups, the peritendinous space of one Achilles tendon was injected with LY-364947 (ALK5 inhibitor; INHIB) while the opposite leg was injected with vehicle (SHAM). Injections were given after each exercise bout. ERK phosphorylation was evaluated with Western blotting. Collagen I and III expression was evaluated via qRT-PCR. Tendons were also assayed for hydroxyproline and hydroxylsypyrindinoline (HP) content via HPLC. A section of tendon was stained with H&E for evaluation of cell numbers. Phosphorylation of ERK increased by 2.5-fold in legs given LY-364947 ( $p<0.05$ ) but was not influenced by exercise ( $p>0.05$ ). Neither type I nor type III collagen gene expression was affected by TGF- $\beta$ 1 receptor inhibition or exercise ( $p>0.05$ ). Collagen content was not altered by exercise or LY-364947 ( $p>0.05$ , SED-SHAM:  $237 \pm 26$ , SED-INHIB:  $225 \pm 44$ , RUN-SHAM:  $247 \pm 29$ , RUN-INHIB:  $238 \pm 29$   $\mu$ g collagen/mg dry weight). HP cross-linking was 3-fold lower in the RUN-INHIB ( $100 \pm 27$  mmol HP/mol collagen) when compared to the RUN-SHAM ( $300 \pm 54$  mmol HP/mol collagen) tendon ( $p<0.05$ ). No effect of inhibitor on HP was noted in the sedentary animals. Cell numbers were greater ( $p<0.05$ ) in the Achilles tendon of exercised animals (SED: 7.5 cell/100, RUN: 10.3 cell/100  $\mu$ m<sup>2</sup>) but were not influenced by TGF- $\beta$ 1 receptor inhibition ( $p>0.05$ ). Our data suggest that neither acute exercise nor TGF- $\beta$ 1 receptor inhibition alters collagen gene expression. TGF- $\beta$ 1 appears to be important for regulating Achilles tendon cross-link formation during exercise.

## 72. THE INFLUENCE OF HAND PADDING ON PUNCHING IMPACT

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Combat sports such as mixed martial arts, karate, and boxing are internationally popular. Punching is an integral component to success in these sports, making it a frequent activity during practice/training. This results in frequent injuries to the puncher's hand and the training partners' body/head. Therefore, altering the method used to pad the hand during practice may be important for injury prevention. **PURPOSE:** The purpose of this study was to assess the influence of two different hand paddings on punching impacts in professional athletes. **METHODS:** Thirteen elite male professional boxers and mixed martial artists (age =  $29.23 \pm 5.64$ y; height =  $180.33 \pm 9.04$ cm; mass =  $87.06 \pm 17.89$ kg, number of professional fights =  $17.9 \pm 12.7$ , winning % =  $73.8 \pm 13.8$ %, of victories via knockout/technical knockout =  $35.6 \pm 21.9$ %) wore a standardized 14oz boxing glove and performed 20 repetitions (4 sets of 5) of a maximal punch into a device specifically designed to measure punching impact. Each repetition was separated by 30 seconds, and each set by 5 minutes. All participants performed a 15-minute self-selected warm-up before the protocol. Then, in a randomized order, two of the four sets were performed with a standardized hand wrap (CON), while the other two sets were performed with the hand wraps plus an additional ~1.2cm thick cylinder foam-like pad (commercially available, mass = 4 grams) placed over the knuckles (PAD). **RESULTS:** Punching impact was significantly ( $p<0.05$ ) decreased during PAD ( $25,586 \pm 6,062$  ft. lb./W/sec) when compared to CON ( $23,076 \pm 6,632$  ft. lb./W/sec). **CONCLUSION:** These results suggest the PAD effectively absorbs energy, reducing impact by ~11%. This information may be useful for researchers, coaches, and other parties interested in reducing impact associated injuries during punching activities.

### 73. PRELIMINARY EFFECTS OF mHealth ADAPTIVE INTERVENTIONS ON VASCULAR MARKERS AND CARDIORESPIRATORY FITNESS

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Increasing physical activity (PA) among inactive individuals has proven to be challenging with static-goal interventions (e.g. 10,000 steps/day) showing limited success. We explored effects of novel adaptive interventions, using Behavioral Economic principles, for increasing steps/day on cardiorespiratory fitness (CRF) and carotid-femoral pulse wave velocity (cf-PWV). **Purpose:** To examine unique, additive, and interactive effects of adaptive PA goal setting (vs. static PA goal setting) and immediate financial micro-incentives (vs. delayed rewards) on CRF and cf-PWV using a 2x2 factorial design. **Methods:** Thirty-nine overweight/obese and inactive adults (Age = 33.9 ± 6.7yrs; BMI = 33.96 ± 6.2 kg/m<sup>2</sup>) were randomized to an adaptive or static goal intervention with either immediate micro-incentives or delayed rewards in a 4-month trial to improve steps/day. Pre and post CRF were estimated using a modified, sub-maximal Balke treadmill protocol and cf-PWV was assessed with the Sphygmocor XCEL™ device. An intention-to-treat analysis was carried out and interactions assessed (at α=0.05) via ANCOVA, adjusting for baseline measures. Data are reported as means ± standard error. **Results:** The improvement in VO<sub>2peak</sub> differed between goal type (static 10K vs. adaptive) and reinforcement type (immediate vs. delayed rewards) (p=0.004). Subjects given immediate reward regardless of goal setting type had improvements in VO<sub>2peak</sub> (10K Static Delayed = 2.8 ± 1.2 vs. Immediate = 4.2 ± 1.2; Adaptive delayed = 4.2 ± 1.2 vs. Immediate = 4.4 ± 1.2 ml/kg/min). Improvements in cf-PWV were greater with immediate rewards regardless of goal setting (10K Static Delayed = -0.2 ± 0.3 vs. Immediate = -0.4 ± 0.2; Adaptive delayed = 0.1 ± 0.3 vs. Immediate = -0.3 ± 0.2 m/sec). **Conclusions:** Immediate micro-incentive rewards resulted in greater changes in cardiovascular fitness and arterial stiffness regardless of adaptive or static goal setting. These data may have implications for behavioral interventions focused on cardiovascular risk reduction.

### 75. UPPER EXTREMITY MUSCLE ACTIVITY DURING THE LACROSSE SHOT: EXPLORING THE INFLUENCE OF SHAFT STIFFNESS

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**Purpose:** To determine if lacrosse shaft stiffness influenced upper extremity muscle activity and/or shot velocity. **Methods:** Muscle activity of the biceps brachii, triceps brachii, flexor carpi radialis, and extensor carpi radialis of the arm closer to the head of the shaft was measured (Noraxon telemetry electromyography (EMG), 2400TG2 telemetry, 1500Hz). Subjects (n=5; 20±2.4 years, 79.8±6.87 kg, 177±4.52 cm) with 4.5±2.96 years of lacrosse experience completed shots using four shafts of different stiffnesses. Subjects and research team were blinded to shaft stiffness. Subjects shot 5 times per shaft with order of shaft randomized. Subjects were instructed to shoot with maximum effort from a stationary position (i.e., one step forward with the front foot; the back foot remained on the ground). Subjects were given time to warm up with practice shots on net. A video camera was used to record discrete kinematic events of the shot. Shot velocity was recorded (Stalker Pro2) for each shot and averaged across the 5 trials per condition. Video data was visually inspected and the time of occurrence of maximum elbow flexion, ball release, and maximum elbow extension were identified. EMG data were processed by removing any zero offset, full-wave rectifying the data and averaging across two phases defined by the kinematic discrete events. Muscle activity for each phase and shot velocity was compared between shafts using a repeated measures ANOVA (α=0.05). **Results:** Neither muscle activity for any muscle analyzed nor shot velocity were influenced by shaft stiffness (p>0.05). **Conclusion:** Having a high shot velocity can be advantageous to a lacrosse player. Besides the player ability, lacrosse equipment may be a factor in determining shot velocity. However, in this experiment, shaft stiffness did not have an influence on muscle activity or shot velocity.

### 74. GLOBAL DNA METHYLATION IS ASSOCIATED WITH MEASURES OF BODY COMPOSITION AND AEROBIC FITNESS IN FEMALES

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Global DNA Methylation (GDM), an epigenomic modification has been linked to cardiovascular disease and its risk factors. Our focus was to identify potential relationships between epigenomic alterations and both cardiovascular fitness and body composition measures. **Purpose:** As increases in aerobic fitness have a beneficial effect on cardiovascular disease, one purpose was to determine if a relationship was evident between global DNA methylation and VO<sub>2max</sub>. A secondary purpose was to determine if the relationship extends to body composition measured via Dual X-ray Absorbtiometry (DXA). **Methods:** Fifty-two (male n=25, female n=27) subjects provided a blood sample for DNA isolation, underwent a DXA scan, and completed a maximal exertion exercise test on a treadmill for the determination of maximal aerobic capacity (VO<sub>2max</sub>). Global DNA methylation (GDM) (%) was evaluated utilizing a commercially available ELISA kit, and correlated with BMI, percent body fat (%BF), and VO<sub>2max</sub> using Pearson's correlation coefficient with significance accepted at p≤0.05. **Results:** When the overall group was considered, GDM was not significantly correlated with any measure (BMI r=-0.15, p=0.27; %BF r=-0.20, p=0.14; VO<sub>2max</sub> r=0.24, p=0.09). When separated by gender, males displayed no significant correlations for any variable. In females, GDM was significantly correlated with BMI (r=-0.38, p=0.05), % BF (r=-0.43, p=0.02), and VO<sub>2max</sub> (r=0.39, p=0.04). **Conclusion:** The results provide evidence that as BMI and % body fat increases, GDM decreases in females. In addition, epigenomic modifications appear to be associated with aerobic fitness in women. Future research should be directed toward identifying the gender difference observed from this data. The men in this study had significantly lower body fat (21±9 vs 29±8%) and greater VO<sub>2max</sub> (54±10 vs 46±9 ml/kg/min) compared to the women. It is possible that epigenomic effects are associated with a threshold of body fatness, and future studies should investigate this possibility.

### 76. ACHILLES TENDON CHANGES IN DOWNHILL, LEVEL AND UPHILL RUNNING

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Hill running provides benefits to runners, but there are also potential associated risks. Understanding physical changes to body tissues during up and downhill running is important for avoiding injury during training and competition. Of particular relevance is how hill running affects the Achilles tendon (AT); An estimated 52% of recreational and competitive distance runners have an AT injury at some point. **Purpose:** We examined how hill running affects the AT cross-sectional area (CSA). **Methods:** On separate days and randomized, twenty females each ran for 10 min on one of 3 grades (- 6%, 0%, + 6%). Achilles tendon CSA was imaged using ultrasound, additionally, peak vertical forces and motion were analyzed using force-plates and high-speed (240 Hz) videography at prurun and postrun for all conditions. A metabolic cart and gas analyzer were used to determine treadmill speeds that matched metabolic cost across grades. Data were analyzed using a forward selection regression. **Results:** There was a decrease in AT CSA from prurun to postrun (p = .0001). No difference in AT CSA changes occurred between selected grades (p = 0.284). Peak vertical forces were different across grades (p = .0001), the largest occurring during downhill running and smallest during uphill running. **Conclusion:** Our results suggest that the AT is affected by running and a decrease in CSA appears to be a normal response. The AT CSA change did not differ between grades when the metabolic cost of running is matched, suggesting an adaptive effect of the AT. Since changes in AT CSA were not different between grades, each form of running appears equal and acceptable in regards to how the Achilles tendon reacts. Coaches and athletes can use this knowledge to develop workout protocols that transition runners to hill running and allow them to adapt to these greater forces.

## 77. FEASIBILITY OF MUSIC-BASED MULTITASK TRAINING IN BRAIN INJURY PATIENTS

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Persons with brain injury are at risk for becoming sedentary and the ensuing secondary health issues due to lack of physical activity. **Purpose:** The purpose of the study was to determine whether Dalcroze was a feasible and effective tool for improving postural control, cognitive function and cardiovascular fitness related to fall risk in brain injury patients, that may help them become more active. **Design:** Participants were recruited through Casa Colina for Rehabilitation, Transitional Living Center and were diagnosed with either traumatic brain injury (TBI) or stroke. All participated in the pre-test, the intervention, and the post-test. The Dalcroze intervention took place for 50 minutes a day, twice a week, 10 classes for over 6 weeks, and included a wide range of activities based on music that required the use of memory, attention, coordination and balance. Outcome measures, postural control, cognitive function and cardiovascular fitness were assessed. **Results:** Out of 7 participants, only 3 participants completed the DE intervention including the pre and post tests. There was no measurable improvement in balance, cognitive function and cardiovascular fitness in brain injury and stroke patients compared to usual treatment. **Conclusion:** Dalcroze has shown to be a feasible intervention with brain injury patients. Adherence to the intervention program was high, perhaps in relation to the music component, which has been shown to facilitate exercise adherence. DE intervention can be done with a population with physical limitations. Dalcroze at the dose given was not effective for improvement in postural control, cognitive function and cardiovascular fitness related to fall risk in brain injury patients. It is recommended that longer duration of classes be used in future studies.

## 79. RECOVERY FROM SPINAL SHRINKAGE: A COMPARISON OF FOUR UNLOADING POSITIONS

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Running exposes the spine to repeated applications of low magnitude compressive forces, resulting in the reduction of space between vertebrae and spinal shrinkage. Chronic applications of these forces have been correlated with degenerative injury to intervertebral discs. Spinal unloading allows for recovery from the effects of compressive forces. **Purpose:** This study sought to assess the effectiveness of four supine spinal unloading positions in recovering from spinal shrinkage incurred while running. **Methods:** Twenty-one healthy male and female recreational runners attended 4 data collection days. Subjects performed a 15 min run at a self-selected pace followed by a supine unloading position. Sitting stature (SS) and intervertebral disc height (IVDH) measurements were recorded pre and post running and spinal unloading protocols, using an anthropometer and diagnostic ultrasound. **Results:** Paired samples t-tests revealed each unloading position resulted in a statistically significant recovery ( $p < .05$ ). Raw data suggested that the greatest recovery in IVDH occurred after the supine position with lumbar support (STCH = + 0.34 cm; %CH = + 12.88%), in comparison to the Fowler position, which generated the greatest recovery for SS (STCH = + 8.71 mm; %CH = + 1.12%). Two repeated measures ANOVAs for IVDH and SS indicated that these differences were not statistically significant ( $p > .05$ ). **Discussion:** Overall results are in agreement with previous literature, which suggest that manipulating the body in a supine position yields significant immediate benefits in recovering from spinal shrinkage. Results from this study suggest that all supine spinal unloading positions are effective in providing a statistically significant recovery from spinal shrinkage incurred while running. However, no statistically significant difference was observed in the amount of recovery reported between positions. This research provides beneficial information about effective recovery techniques that are easily executed in a variety of environments.

## 78. NO DIFFERENCES IN BODY COMPOSITION OR FOOD ATTITUDES IN RESPONSE TO AEROBIC INTERVAL TRAINING

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**Purpose:** The purpose of this study was to determine potential differences in body composition and food attitudes as a result of 10 weeks of high intensity interval training exercise. **Methods:** Active participants (5 men and 4 women, mean BMI =  $23.27 \pm 2.5$  kg/m<sup>2</sup>) completed chronic interval training on a cycle ergometer at varied levels of intensity (70-150% of Wmax).  $\dot{V}O_2$ max was assessed prior to training and throughout training at 3-week intervals to set subsequent intensities for training. Training sessions were performed 3 d/wk at the same time of day with at least 24 h recovery between sessions. Body composition was obtained pre- and post-training via skinfolds, skeletal circumferences, and body mass index. In addition, subjects completed the Power of Food survey and Three-Factor Eating Questionnaire which assesses hunger, disinhibition of food, and dietary restraint. Three-day food logs were also completed pre- and post-training. A mixed two-way ANOVA with repeated measures was used to determine effects of interval training on various measures. **Results:** Results demonstrated no significant difference ( $p > 0.05$ ) in body weight ( $70.66 \pm 9.93$  kg vs.  $71.59 \pm 9.62$  kg), body fat ( $14.79 \pm 8.09$  % vs.  $14.15 \pm 6.96$  %), waist circumference ( $73.67 \pm 5.71$  cm vs.  $74.62 \pm 6.77$  cm) or food attitudes ( $p > 0.05$ ) as a result of training. A trend ( $p = 0.11$ ) was revealed for increased Kcal intake in response to training. **Discussion:** Although body composition and food attitudes were not affected by chronic interval training, individual differences were revealed. These data oppose recent findings (Astorino et al., 2013) showing beneficial changes in body composition in response to chronic interval training, so additional study is merited to better understand “responders” and “non-responders” to intense exercise training.

## 80. THE ACUTE EFFECTS OF A STATIC, DYNAMIC AND GENERAL WARM-UPS ON 40-YARD SPRINT TIMES

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The potential adverse effects of static stretching on measures of athletic performance related to power output are well documented, but remain controversial, in application to sprinting. Many studies have shown that alternative warm-up methods may be more beneficial for activating the neuromuscular system, resulting in improved athletic performance. **PURPOSE:** The purpose of this study was to examine the acute effects of pre-exercise static, dynamic, and general warm-ups on 40-yard sprint times in collegiate athletes. **METHODS:** Ten collegiate athletes (5 male and 5 female) ages  $19.9 \pm 1.4$  years, participated this study. On separate days, participants performed one of three ten-minute stretching routines prior to speed testing. The three types of stretching (static, dynamic, and general only) were performed in a randomly selected order. After completing the warm-ups, each participant performed five 40-yard sprints. Each was timed and the average for each person was taken at the completion of the trial. **RESULTS:** Data showed that the dynamic warm-up lead to a significant improvement in 40-yard sprint times as compared to a general warm-up ( $4.79 \pm .37$  vs.  $5.05 \pm .45$ ,  $p = .002$ ). Static stretching also resulted in significantly better 40-yard sprint times as compared to general warm up ( $4.93 \pm .33$  vs.  $5.05 \pm .45$ ,  $p = .005$ ). There was a moderate effect size between dynamic warm up and static stretching ( $d = 0.58$ ). There was no significant difference between dynamic stretching and static stretching on 40-yard sprint times. There were no significant gender interactions. **DISCUSSION:** This study supports the growing body of literature suggesting that mode of warm-up can have a significant impact on athletic performance. This study suggests that stretching prior to activity is significantly more effective than a general warm-up. Additionally, this study suggests that prior to performing short distance sprints, dynamic warm-up program may be the most effect means of pre-competition warm up.

### 81. ORAL BREATHING IS MORE EFFICIENT THAN NASAL BREATHING DURING SUBMAXIMAL TREADMILL EXERCISE

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**INTRO:** When comparing oral breathing versus nasal breathing more volume of air can be transported through the oral passageway, but nasal breathing can lead to slower respiration rates and easier exertion rates. **PURPOSE:** To find the most efficient mode of breathing during different intensities of submaximal aerobic exercise. **METHODS:** Individuals ran at submaximal intensities (50%, 65%, and 80% of  $\text{VO}_2\text{max}$ ) for 5-minute stages. Running speeds were determined based off of  $\text{VO}_2$  max test, with desired speeds resulting in specific intensity. One trial was completed using nasal breathing only and the other trial was oral breathing only. **RESULTS:** Oral breathing had significantly higher respiration rates (RR) at all intensities ( $p < .05$ ). Oral breathing had a significantly higher ventilatory equivalent ratio for oxygen and for carbon dioxide ( $\text{VE}/\text{O}_2$  and  $\text{VE}/\text{CO}_2$ ) ( $p < .05$ ). The end tidal concentration for oxygen ( $\text{ETO}_2$ ) was significantly higher ( $p < .05$ ) in all stages during oral breathing. During stages 1 and 3 the end tidal concentration for carbon dioxide ( $\text{ETCO}_2$ ) was significantly higher in oral breathing ( $p < .05$ ). **CONCLUSION:** Nasal breathing produced longer, slower breaths to compensate for the smaller respiratory passageway compared to oral breathing, resulting in a lower respiration rate. Oral breathing produced more efficient respiration in all stages of the study. Breathing through the mouth allowed for the same volume of air to be transported to the lungs, but greater utilization of oxygen and more expiration of carbon dioxide. There were greater concentrations of oxygen and carbon dioxide at the end of exhalation in oral breathing. Nasal breathing was an adequate mode of breathing, but not as efficient for all aspects of respiration.

### 82. A RESPIRATORY EXCHANGE RATIO = 1.0 OVERESTIMATES THE MAXIMAL LACTATE STEADY STATE

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Maximal lactate steady state (MLSS) is defined as the highest exercise intensity that can be maintained during a 30 minute constant load test without an increase in lactate concentration of more than  $1.0 \text{ mMol}\cdot\text{L}^{-1}$ . Due to the invasive nature of the MLSS protocol, which requires several running trials and blood draws, the use of the respiratory exchange ratio at 1.0 (RER1.0) from a maximum exercise tests has been suggested as an intensity comparable to the MLSS. **PURPOSE:** To investigate the use of RER1.0 as a tool for training recommendations involving MLSS. **METHODS:** Oxygen cost of running ( $\text{VO}_2$ ) and blood plasma lactate concentrations  $[\text{La}]_p$  were measured in 6 adult males (mean age =  $29.2 \pm 4.9$  years, 5 km best time =  $17.0 \pm 0.6$  min) during an incremental maximum treadmill protocol and subsequent 30 minute MLSS trials. The speed (VRER1.0) and heart rate (HRRER1.0) recommendations based on RER1.0 obtained from the max test were compared to the measured speed (VMLSS) and heart rate (HRMLSS) of the confirmed MLSS. **RESULTS:** The VRER1.0 ( $10.5 \pm 0.8$  mph) and HRRER1.0 ( $183 \pm 7.6$  bpm) were significantly higher ( $p = 0.0001$ ;  $p = 0.004$ ) than the VMLSS ( $8.6 \pm 0.5$  mph) and HRMLSS ( $164 \pm 13.4$  bpm), respectively. **CONCLUSION:** Though MLSS requires invasive blood collection from participants, the use of VRER1.0 and HRRER1.0 as obtained from a maximum running test significantly overestimates the intensity of exercise at the MLSS. Training at an intensity of exercise predicted by an RER=1.0 may result in less than optimal performance and early fatigue.

### 83. AUDITORY BIOFEEDBACK CAN DECREASE PERFORMANCE OF FIGURE SKATERS

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**Introduction:** The capability to jump is critical in figure skating. Of the few studies that have attempted to increase jump height (Haguenauer et al, 2005; Law & Ste-Marie, 2005), all have failed to do so. These studies have not focused on increasing knee flexion, a critical component of vertical jumps (Moran & Wallace, 2007; Vanezis & Lees, 2005). Auditory biofeedback has been shown to modify posture, balance and cycling performance in children (Dozza et al, 2011; Nicolai et al, 2010; Liu, & Jensen, 2009) and could also increase knee flexion in figure skaters. **Purpose:** To investigate the effects of auditory biofeedback on the performance of off-ice Lutz jumps. It was hypothesized that audio biofeedback would increase jump height and knee flexion during the execution of the jump. **Methods:** Thirteen female figure skaters (14-17 years of age) with at least 2 years of experience competing and the ability to complete a single Lutz jump were asked to perform 6 off-ice Lutz jumps under 2 conditions: 1) WITH; 2) and WITHOUT auditory biofeedback. Auditory biofeedback was provided via EMG Retrainer. Jump performances were videotaped and images were analyzed with Dartfish software to determine time in the air (msec) and knee flexion (degrees). Muscle activation was assessed using EMG (mV). Separate repeated measures ANOVAs were conducted for each dependent variable. **Results:** The results indicated lower time in the air ( $p = .012$ ) and higher knee flexion ( $p = .049$ ) in the WITH condition. EMG activity did not differ between conditions ( $p = .342$ ). **Discussion:** The results indicate that auditory biofeedback has the potential to modify motor performance of the off-ice Lutz jump, partially supporting our hypothesis. In this study, auditory biofeedback may have directed performers' attention to an internal cue and thereby disrupted performance (Wulf, 2007).

### 84. LIFE-EXPECTANCY DIFFERENCES BETWEEN OLYMPIC SHORT AND LONG-DISTANCE ATHLETES

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**Background:** While studies have found that endurance and strength training have health benefits, some studies have found better cardiovascular and lipid profiles with endurance training. We sought to determine if survival differed between short and long-distance runners. We chose to examine Olympians because all are elite athletes and any death date is likely to be publically available. **Methods:** We identified the top 20 male finishers in the 100 meter dash and the marathon between 1928 and 1960. Females were not examined because the women's marathon was not an Olympic sport until 1984. If an athlete was in more than one Olympics their first Olympics was used. We determined date of death using internet searches and calculated age-specific expected survival using published US life tables. We adjusted life-expectancy for country of origin based on Global Burden of Disease data. **Results:** We identified a death date for 158 of 235 (67%) Olympic athletes (73 100m runners, 85 marathoners). 100 meter runners were younger during the Olympics ( $23.8 \pm 3.0$  vs.  $30.5 \pm 5.6$  years  $p < 0.0001$ ), taller ( $69.8 \pm 2.1$  vs.  $66.5 \pm 2.0$  inches,  $p < 0.0001$ ), and heavier ( $159 \pm 12$  vs.  $131 \pm 12$  lbs.  $p < 0.0001$ ) than marathon runners. Actual survival following the Olympics was slightly greater for 100m runners ( $45.5 \pm 15$  vs.  $43.8 \pm 17$  years) but since marathon runners were older during the Olympics their observed-expected survival was greater ( $3.1 \pm 15$  vs.  $-3.8 \pm 15$  years  $p = 0.01$ ). Adjustment for weight and height reduced the difference in observed-expected survival by less than 10%. **Discussion/Conclusion:** We found that elite long-distance athletes live longer than elite short distance athletes not explained by differences in body habitus. While we were able to control for country of origin, other differences in socio-economic status may contribute to these differences.

## 85. DIFFERENCES IN PARTICIPATION IN UNIVERSITY WORKSITE HEALTH PROMOTION PROGRAMS AND PHYSICAL ACTIVITY BETWEEN FACULTY, STAFF AND ADMINISTRATION

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Despite the numerous documented benefits of worksite health promotion programs (HPPs), participation rates are traditionally low. These low participation rates are due in part to perceived barriers. Barriers to use of HPPs and exercise have been a well-studied topic within the last two decades. However, fewer studies have focused on barriers to participation in HPPs among university employees. The differences in roles and responsibilities on a university campus warrant a more thorough examination of barriers among job classifications. **Purpose:** The purpose of this study was to examine differences in participation in university health promotion programs (HPPs) among faculty, staff and administration. Further, barriers to participation were examined as well as an analysis of those meeting weekly physical activity (PA) recommendations. **Methods:** An electronic survey was sent to all employees at a metropolitan university (n=3603) which inquired about participation in the University HPP, physical activity and perceived barriers to participation. A Chi-square Test of Independence was performed for HPP participation and physical activity amounts between groups, and qualitative themes were identified for perceived barriers. **Results:** Results (n=308) indicated a difference in participation rates ( $\chi^2$ :  $p < 0.001$ ) among faculty, staff and administration, as well as those meeting PA recommendations between job classifications ( $\chi^2$ :  $p < 0.001$ ). Unique barriers were identified for each job classification. **Conclusions:** The results of this study suggest that HPP administrators should recognize the differences in barriers to participation among university employees in order to maximize HPP participation.

## 87. INTERVAL TRAINING FOR MINDBODY WELLNESS

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**Purpose:** An experimental study to examine the effects of CardioWaves interval training (IT) and continuous training (CT) on resting blood pressure, resting heart rate, and mindbody wellness. **Methods:** Fifty-two normotensive (blood pressure  $< 120/80$  mmHg), pre-hypertensive ( $120-139/80-89$  mm Hg), and hypertensive ( $> 140/90$  mm Hg) participants were randomly assigned and equally divided between the IT and CT groups. Both groups participated in the assigned exercise protocol thirty minutes per day, four days per week for eight weeks. Resting blood pressure, resting heart rate, and mindbody wellness were measured pre- and post-intervention. **Results:** A total of 47 participants (15 females and 32 males) were included in the analysis. The IT group had a non-significant trend of reduced systolic blood pressure (SBP) and increased diastolic blood pressure (DBP) while the CT group had a statistically significant decrease in awake SBP ( $p = 0.01$ ) and total SBP ( $p = 0.01$ ) and a non-significant decrease in DBP. Neither group had consistent change in resting heart rate. In the mindbody wellness surveys there was a significant decrease in stress ( $p = 0.002$ ) and an increase in personal security ( $p = 0.03$ ) in the IT group. **Conclusion:** IT and CT reduced resting blood pressure, with CT having a greater effect. Resting heart rate did not change in either group. However, IT did show to be more beneficial to reducing negative effects of stress and improved feelings of personal security.

## 86. RELATIONSHIP BETWEEN CLEAN 1RM AND VELOCITY

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The clean portion of the Clean and Jerk lift requires high velocity and strength in order to lift a heavy barbell. **Purpose:** The purpose of this study was to investigate the relationship between strength (1RM) of a clean and velocity of both the barbell and the lifter. **Methods:** Eight competitive weightlifters (7 men and 1 woman) participated in the study (mean  $\pm$  SD: age,  $24.88 \pm 1.36$  years; body mass,  $86.58 \pm 14.75$  kg; height,  $178.28 \pm 9.75$  cm; clean 1RM,  $103.38 \pm 23.59$  kg). Participants were first tested for their clean 1RM. Seven days later; they came back to lift 85% of their 1RM for 3 repetitions, separated by 1-minute rest. Two velocity transducers were placed on either end of the barbell and one transducer was placed on the waist of the subject. In this way, both barbell and lifter velocities were measured for the ascent (1<sup>st</sup> and 2<sup>nd</sup> pulls) and descent phases of the clean. **Results:** Pearson correlations demonstrated a high significant positive relationship between barbell 1<sup>st</sup> pull velocity and clean 1RM ( $r = .793$ ,  $p < .05$ ). No other relationships were significant ( $p > .05$ ). Barbell ascent velocity was  $1.88 \pm 0.063$  m/s ( $r = .212$ ); barbell descent velocity was  $-1.22 \pm 0.258$  m/s ( $r = .064$ ); human ascent velocity was  $.762 \pm 0.241$  m/s ( $r = .793$ ) and human descent velocity was  $-1.40 \pm 0.242$  m/s ( $r = -.051$ ). **Conclusion:** The first pull of the clean positively correlates with strength. The faster the first pull of the clean, the greater the barbell velocity leading to the second pull. Training should emphasize both max strength and max velocity in order to optimize performance of the clean exercise.

## 88. A COMPARISON OF UPPER BODY STRENGTH BETWEEN ROCK CLIMBING AND RESISTANCE TRAINED MEN

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Studies have shown that advanced rock climbers have greater upper body strength than that of novice climbers or non-climbers. **Purpose:** To compare upper body strength between rock climbing and resistance trained men. **Methods:** 15 resistance trained men (age  $25.28 \pm 2.26$  years; height  $176.92 \pm 4.43$ cm; mass  $84.36 \pm 10.34$ kg; body fat  $9.66 \pm 5.51\%$ ) and 15 rock climbing men (age  $23.25 \pm 2.23$  years; height  $175.57 \pm 8.03$ cm; mass  $66.66 \pm 9.40$ kg; body fat  $6.86 \pm 3.82\%$ ) participated. Rock climbing (RC) men had been climbing at least 2-3 a week for 2 years, able to climb at least a boulder rating of V4-5 and had no current injuries. Resistance trained (RT) men had been total body strength training for at least 2 years, 2-3 times a week with no current injuries. Each participant performed pull-ups to failure, grip strength, and pinch strength. **Results:** RT were significantly older and heavier than RC. RC performed significantly more pull-ups ( $19.31 \pm 4.31$ ) than RT ( $15.80 \pm 4.69$ ). RC had greater relative pinch strength (R  $.27 \pm .10$ ; L  $.24 \pm .07$ ) and relative grip strength (R  $.70 \pm .10$ ; L  $.65 \pm .12$ ) compared to RT relative pinch strength (R  $.19 \pm .04$ ; L  $.17 \pm .05$ ) and relative grip strength (R  $.57 \pm .14$ ; L  $.56 \pm .14$ ). **Discussion:** As hypothesized, RC were able to perform more pull-ups than RT as well as demonstrate greater relative grip, and pinch strength. **Conclusion:** Rock climbing can promote improvement in upper body strength.

## 89. STEPS WALKED IS POSITIVELY CORRELATED WITH REASONING AND MEMORY IN OLDER ADULTS

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Physical activity and sleep have been associated with cognitive function in older adults but more information is needed on this relationship (Colcombe, 2003; Spirduso, Francis, & MacRae, 2005). The purpose of this study was to further illuminate the relationship between physical activity, sleep and cognitive function in older adults, 65 years of age or older, living independently. Twenty participants (15 women, 5 men,  $M_{age} = 76.3$ , range 65-88 years of age) who passed a health and cognitive screen were fitted with a wrist activity monitor (Fitbit Flex). The monitor recorded steps taken, intensity of physical activity, minutes of sleep as well as sleep quality. Participants wore the monitor for 24 hours after which they completed four cognitive assessments: reasoning (Raven's Matrices), short term memory (recall of words), perceptual speed (pattern comparison), and working memory (running memory letter task). Despite a small sample size, significant positive correlations ( $p < .05$ ) were found between steps taken and performance on both the matrix reasoning task ( $r = 0.47$ ) and short term memory task ( $r = 0.55$ ), such that those who took more steps demonstrated greater cognitive functioning. Similarly, very active minutes also correlated marginally with reasoning ( $r = 0.43$ ,  $p = .06$ ) and significantly ( $r = 0.55$ ;  $p < .05$ ) with short term memory. Both steps walked and active minutes showed a positive, but non-significant, relationship with perceptual speed and working memory. In addition, higher sleep quality was positively related, though not significantly, with measures of cognitive function. In conclusion, greater everyday activity was correlated with greater cognitive functioning in healthy community-dwelling older adults.

## 91. ACUTE EFFECTS OF ELASTIC BANDS ON POWER CHARACTERISTICS DURING DEADLIFTS AT VARIOUS LOADS

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The consequences of combining free-weight and elastic bands during resistance exercise are poorly understood. **PURPOSE:** The purpose of this study was to examine the acute effects of elastic bands on peak (PP), relative (RP), and average power (AP) during the deadlift exercise at various loads. **METHODS:** Twelve men (age  $24.08 \pm 2.35$  years, height  $175.94 \pm 5.38$  cm, mass  $85.58 \pm 12.49$  kg, deadlift 1RM  $188.64 \pm 16.13$  kg) completed three conditions at both 60% and 85% of their one repetition maximum (1RM) in random order including: two variable resistance conditions (B1, B2) and one traditional free-weight condition (NB), with 100% of resistance coming from free-weight. B1 was performed such that 80% of the total resistance came from free-weights and 20% from elastic bands. B2 was performed with 65% resistance from free-weights and 35% from bands. The average resistance over the entire deadlift was equated for all conditions. **RESULTS:** At 60% 1RM, no difference was found in PP, RP, or AP between B1 and B2. Both B1 and B2 produced significantly greater PP ( $B1 = 2653 \pm 485W$ ,  $B2 = 2720 \pm 456W$ ,  $NB = 2439 \pm 434W$ ), RP ( $B1 = 31 \pm 6W/kg$ ,  $B2 = 31 \pm 5W/kg$ ,  $NB = 27 \pm 5W/kg$ ), and AP ( $B1 = 1234 \pm 205W$ ,  $B2 = 1249 \pm 231W$ ,  $NB = 1120 \pm 195W$ ) than NB. At 85% 1RM, no difference was found in AP between B1 and B2. However, Both B1 and B2 produced significantly greater AP ( $B1 = 1075 \pm 221W$ ,  $B2 = 1124 \pm 301W$ ,  $NB = 815 \pm 168W$ ) than NB. B2 produced significantly greater PP ( $2543 \pm 631W$ ) and RP ( $27 \pm 6W/kg$ ) than B1 ( $2230 \pm 571W$ ,  $26 \pm 6W/kg$ ); and B1 produced significantly greater PP and RP than NB ( $1894 \pm 511W$ ,  $22 \pm 5W/kg$ ). **CONCLUSION:** Adding elastic bands to the deadlift increases peak and relative power when compared to free-weights only. Interestingly, when lifting at higher intensities (85% 1RM), more resistance from bands (35%) results in higher peak and relative power than does less resistance from bands (20%). However, the choice of band appears to have less impact on power when lifting at lower intensities (60% 1RM).

## 90. PLANTAR PRESSURE MEASUREMENTS AS AN INDICATOR OF FORCE APPLICATION EFFECTIVENESS DURING THE HIGH JUMP APPROACH: A PILOT STUDY

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Of all the jumping events, the approach phase of the high jump is unique as it typically consists of 5 steps on a straight path followed by 5 steps ran around a curve. In theory, to instruct correct execution of the curved section, the jumper should apply medial force to the outside foot and lateral force to the inside foot [2]. **Purpose:** The purpose of this study was to examine mediolateral force ratios during the curved portion high jump approach. It was hypothesized that jumpers will display a pattern where the outside foot would have more force under the medial aspect of the foot (larger force ratios) while the inside foot would have more force under the lateral aspect of the foot (smaller force ratios). **Methods:** Each of the 10 steps during the approach were identified and analyzed independently using F-scan research software. **Results:** Subjects 2 and 4 demonstrated the hypothesized pattern of larger M-L force ratios on the outside foot and smaller ratios on the inside foot. However, subject 3 showed the opposite pattern for steps 5 and 6 while subject 1 had steps 5, 7, 8 & 9 opposite hypothesized pattern. All subjects had predominately lateral forces at step 10 and greatest peak force. **Discussion/Conclusion:** Results differed with the findings of Chang et al. where the inside leg regularly produced smaller peak forces compared to the outside leg. This could be explained by differences in subject pools in the two studies; recreationally fit men with little curve running experience and elite high jumpers with years of practice running on a curve. In addition, the radius of the curve used in the high jump ranges 7-13m while Chang et al.'s study looked at 1-6m. Future work might consider combining kinetic with kinematic measures of curve running to improve high jump performance.

## 92. THE RELATIONSHIP BETWEEN ANKLE ROM MEASURES AND OVER HEAD SQUAT MOVEMENT

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**Context:** Ankle range of motion (ROM) is crucial during complex coordinated movements. It has been speculated a decrease in ankle mobility during repeated athletic movements leads to compensatory movement patterns increasing risk for overuse injury. **Purpose:** Examine the relationship between ankle dorsiflexion (DF) passive-ROM (PROM) measures and overhead squat (OHS) depth. **Methods:** A within-participant design study was performed during a single testing session. Participants included 23 in-season collegiate women's soccer athletes (age:  $19.46 \pm 1.19$  yrs., ht:  $1.65 \pm 0.08$  m, wt:  $59.74 \pm 7.48$  kg). Standard goniometer and ankle lunge test assessed ankle DF-PROM. The OHS movement assessed squat depth. Following three scored trials, participants were grouped into above or below parallel (AP or BP) squat depth then analyzed using an independent T-test. **Results:** Data showed levels of significance for the BP group compared to the AP in ankle DF-PROM [Left ankle: BP ( $23.33 \pm 6.56$ ) and AP ( $15.18 \pm 6.51$ ),  $P = .03$ ]. Right ankle: BP ( $26.00 \pm 5.62$ ) and AP ( $19.53 \pm 5.92$ ),  $P = .04$ ] and ankle lunge test [Left ankle: BP ( $43.00 \pm 13.71$ ) AP ( $27.41 \pm 7.80$ ),  $P = .002$ ]. Right ankle: BP ( $41.83 \pm 9.52$ ) and AP ( $30.41 \pm 7.28$ ),  $P = .03$ ]. **Conclusions:** The results of this study provides a relationship for ankle ROM and OHS depth. Previous research in squat movement demonstrated when ankle ROM is restricted, muscle recruitment patterns are similar to individuals with patellofemoral pain. Further investigation is warranted, including a larger sample size, knowledge of current strength training regimen, and previous injury history.

### 93. NEURAL REACTIVITY TO VISUAL FOOD STIMULI IN THE MORNING AND EVENING: AN fMRI STUDY IN WOMEN

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**Background:** How neural responsiveness to visual food stimuli is influenced by time of day is not currently known. **Objective:** To determine the influence that time of day (morning and evening) has on the neural response to visual food stimuli, as measured by functional magnetic resonance imaging (fMRI). **Design:** Using a crossover design, 15 healthy women were scanned using fMRI while presented with low- and high-energy pictures of food, once in the morning (6:30–8:30 am) and once in the evening (5:00–7:00 pm). Diets were identical on both days of the fMRI scans and were verified using weighed food records. Visual analog scales were used to record subjective perception of hunger and preoccupation with food prior to each fMRI scan. **Results:** Nine brain regions showed significantly higher activation for high-energy stimuli compared to low-energy stimuli ( $P < 0.05$ ). Six areas of the brain showed lower activation in the evening to both high and low-energy stimuli including structures in reward pathways ( $P < 0.05$ ). Subjectively, participants reported no difference in hunger by time of day ( $F = 1.84$ ,  $P = 0.19$ ), but felt they could eat more ( $F = 4.83$ ,  $P = 0.04$ ) and were more preoccupied with thoughts of food ( $F = 5.51$ ,  $P = 0.03$ ) in the evening compared to the morning. **Conclusions:** High-energy food stimuli tended to produce greater fMRI responses than low-energy food stimuli in specific areas of the brain, regardless of time of day. However, evening scans showed a lower response to both low- and high-energy food pictures in some areas of the brain. These data underscore the role that time of day may have on neural responses to food stimuli. These results may also have clinical implications for fMRI measurement in order to prevent a time of day bias.

### 95. COMPARISON OF LOWER LIMB MUSCLE ACTIVATION IN HABITUAL AND NON-HABITUAL MINIMALIST SHOE WEARERS DURING BALANCE TESTING PROTOCOLS

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Recent changes in running footwear have led to an increase in research on the benefits of minimalist shoes. Most of the current research has looked at how minimalist shoes affect locomotion. Unfortunately this is not the only activity during which the general population has begun to wear this footwear. **PURPOSE:** The purpose of this study was to quantify how the habitual wearing of minimalist shoes can affect an individual while performing a balance testing protocol. **METHODS:** In this study, 30 healthy college-age individuals grouped based on their everyday footwear preference. Surface Electromyography (sEMG) electrodes were attached to the gastrocnemius medius, tibialis anterior and peroneus longus muscles of the preferred leg. Manual muscle testing was conducted to determine maximal voluntary contraction (MVC) activity for each muscle of interest. Following manual muscle testing, two balance testing protocols; postural stability and single leg athletic stability, were performed during which data describing muscle activity was collected. All sEMG data were processed using MATLAB software and then analyzed to determine the magnitude of time each muscle spent above 20% of MVC level during balance testing. **RESULTS:** No significant differences were observed for the activity of any muscle when analyzed for a condition\*activity interaction ( $0.157 \leq F_{(1,56)} \leq 0.634$ ;  $0.429 \leq p \leq 0.693$ ). There was no main effect for condition, regardless of muscle ( $0.001 \leq F_{(1,56)} \leq 0.353$ ;  $0.555 \leq p \leq 0.972$ ). There was a main effect for activity for all muscles ( $4.731 \leq F_{(1,56)} \leq 13.283$ ;  $0.001 \leq p \leq 0.034$ ). **CONCLUSION:** These findings support the hypothesis that the wearing of minimalist shoes in everyday activities does not affect the degree to which muscles are activated during the performance of a balance testing protocol. This lack of difference may be attributed to the lack of dynamic movement involved in the tasks.

### 94. IS THERE A PERFORMANCE ADVANTAGE TO INTERNAL FEMORAL ROTATION DURING A BROAD JUMP?

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**Introduction:** Internal femoral rotation, resulting in greater knee valgus angle, occurs in some individuals during broad jumps. Fitness professionals consistently train athletes away from this movement prior to jumping for fear of injury. However, given the knowledge regarding optimal cross-bridge potential and stimulation of the stretch shortening cycle, it is theorized that internal femoral rotation during jumping may recruit additional hip muscle cross-bridges and utilize the stretch shortening cycle resulting in better performance. **Purpose:** To investigate the effect of knee valgus angle on broad jump performance. **Methods:** A sample of 18 males aged 20-29, recreationally trained jumpers performed a brief warm-up followed by 3 control jumps (C) and 3 internally rotated jumps (IR). During the IR trial, participants were given a ball to hold between their knees. The ball was then removed. The participants were then instructed to focus on keeping their knees closer together as if squeezing the ball at the bottom of the countermovement while attempting to jump as far as possible. During the C trial, participants were instructed to jump as far as possible. Fourteen individual retro-reflective markers and rigid body markers were applied to track kinematic data. Jump distance was measured from the starting line to the nearest 1 cm increment of participant's heels. False step trials were not used. **Results:** Knee valgus angle was greater ( $p < 0.05$ ) during the IR trials for both the right ( $C = 4.9 \pm 4.0^\circ$ ,  $IR = 6.4 \pm 4.0^\circ$ ) and left ( $C = 5.7 \pm 4.3^\circ$ ,  $IR = 8.9 \pm 5.1^\circ$ ) leg. Furthermore, C jump distance ( $2.27 \pm 0.25m$ ) was significantly greater ( $p < 0.05$ ) than IR jump distance ( $2.17 \pm 0.25m$ ). **Conclusion:** This data suggests that avoiding valgus knee collapse during broad jumping may be beneficial for injury prevention and performance; therefore fitness professionals should teach clients to avoid hip internal rotation during jumping.

### 96. ADDING GROUP ASSIGNMENTS TO A SEMESTER-LONG ACTIVITY CLASS: CHANGES IN GROUP CONSTRUCTS AND FITNESS

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Group constructs such as groupness and cohesion have been associated with positive outcomes in group exercise classes such as attendance and punctuality. **Purpose:** The purpose of this study was to explore changes in group constructs (groupness and cohesion) during a semester of physical activity classes as well as changes in fitness measures. **Methods:** College students ( $N = 60$ ) in physical activity courses were asked questions related to groupness and cohesion at the beginning and end of a semester. Students also took part in physical fitness assessments including the one minute sit-up test, one minute pushup test, number of steps per week and 1.5 mile run test to see how activity over the semester impacted fitness. As part of the class, students were put in groups and completed several group assignments (e.g., group-initiated hike). **Results:** There was a statistically significant decrease in groupness over the course of the semester ( $t(29) = 2.85$ ,  $p < .001$ ). Similarly, the two attraction to group (ATG) dimensions of cohesion showed a significant decrease (ATG-Task:  $t(29) = 2.14$ ,  $p = .041$ ; ATG-Social  $t(29) = 2.36$ ,  $p = .025$ ). Neither group integration subscale was significant ( $p > .09$ ). For the fitness measures, there was a significant increase in sit-ups ( $t(59) = -9.59$ ,  $p < .001$ ) and pushups ( $t(59) = -9.28$ ,  $p < .001$ ) over the semester. No difference was found for the number of steps in one week ( $p = .114$ ) and 1.5 mile run test ( $p = 1.60$ ). **Discussion:** In contrast to what was hypothesized, the group constructs showed a decrease over the course of the semester. This could be due to students being assigned to their group and having no choice in group composition. This has potential implications for effort and attendance in these classes. However, some of the fitness measures did show increases (sit-up and pushups). Further research is needed factors that contributed to these decreases in group constructs and the role that group constructs play on behaviors in these classes.

## 97. TOTAL ENERGY COST OF A SINGLE BOUT OF CIRCUIT RESISTANCE EXERCISE IN PERSONS WITH SPINAL CORD INJURY

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Circuit resistance training (CRT) in persons with spinal cord injury (SCI) has been shown to satisfy minimum physical recommendations, increase aerobic fitness and muscular strength, better the atherogenic lipid profile, and lessen upper extremity pain in persons with paraplegia and tetraplegia. However, the total energy (kilocalorie) cost of a single CRT session, including excess post-exercise oxygen consumption (EPOC), was previously unknown. Thus, nine persons with chronic traumatic paraplegia underwent a 40 – 45 min CRT exercise which interspersed arm cycle ergometry between resistance maneuvers to amount 3 × 10 repetitions at 60% of maximum for 6 upper body lifts and 20 min of arm cycling. Pulmonary gas exchange data were collected before and during exercise, and up to 120 min post-exercise and used to calculate total energy expenditure, substrate preference, and rates of carbohydrate and fat oxidation. Data from the CRT session was compared a non-exercise control condition (CON). During the 42 ± 4 min CRT bout participants worked at 63 ± 11% and 78 ± 9% of their maximal rate of oxygen consumption (VO<sub>2</sub>) and heart rate (HR), respectively, and expended 166 ± 55 kcal. Compared to control, EPOC following CRT was significantly elevated by 11% during the 120 min post-exercise measurement period. Respiratory exchange ratio (RER) during the post-exercise period was 0.74 ± 0.07 and 0.83 ± 0.04 for CRT and CON, respectively, representing a shift in resting substrate preference toward fat oxidation following CRT. Accordingly, during this time nearly twice as many grams of fat were oxidized in CRT vs CON (14.0 vs 7.5 g fat). A total of 322 ± 21 kcal were expended in response to exercise and recovery. These data demonstrate that if performed thrice weekly, CRT requires energy expenditure sufficient to meet authoritative weekly guidelines for caloric expenditure that promote general health.

## 99. . BLOOD LACTATE LEVELS MEASURED USING FINGER PRICK VS. VENOUS BLOOD DRAW METHODS

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Blood lactate measurements can be a useful tool in developing endurance training programs, and is used in different settings by athletes hoping to improve their performance. In most cases, handheld blood lactate meters are the most practical way to measure blood lactate, and can take measurements from a finger prick or sample of blood drawn intravenously. **PURPOSE:** The purpose of this study was to compare the blood lactate measurements taken from a finger prick versus an intravenous blood draw during steady-state aerobic exercise using the NOVA Lactate Plus handheld meter. **METHODS:** Six male runners, ages 18-39, with a weekly training mileage of 25-60 miles and 5K run times of less than 18:25 participated in this study. Exercise testing determined lactate threshold and VO<sub>2</sub>max for all six volunteers, and maximal lactate steady-state (MLSS) was found for each participant as they completed multiple submaximal steady-state runs. An intravenous catheter positioned in the antecubital vein was used to obtain blood samples during the submaximal steady-state runs. Finger prick samples were taken simultaneously. The NOVA Lactate Plus was used to determine blood lactate levels using the intravenously drawn blood and finger prick samples. Lactate was measured twice from the intravenously drawn blood and once from the finger prick. **RESULTS:** The lactate values from the two samples of intravenously drawn blood were not significantly different (p=0.493) and were highly correlated (R=0.995). The lactate values from the finger prick blood samples were significantly different (p=0.0001) than the intravenous blood samples. On average, the lactate values measured from the finger prick samples were 1.41 mmol/L greater than the lactate values measured from the intravenous blood samples. **CONCLUSION:** Compared to intravenous blood samples, finger prick samples tend to overestimate blood lactate levels. Use caution when using lactate measurements from finger prick blood samples to develop endurance training programs.

## 98. CONSERVATIVE TREATMENT OF SPINAL INSTABILITY

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**Objective:** To present changes in the clinical decision making paradigm for the treatment of spinal instability and to critically discuss a clinical prediction rule (CPR) developed to specifically identify patients with low back pain who are more likely to respond positively to lumbar stabilization exercises. **Summary of Background Data:** The continually growing volume of scientifically sound research combined with the rising popularity of evidence based practice has brought many changes to the way clinical decisions are made. While systematic reviews and meta-analyses used to provide clinicians the “bottom line” about what works and what doesn’t, a newer tool, the CPR, is gaining popularity. Currently, there are 25 CPRs for the physiotherapy management of low back pain. **Methods:** Literature discussing the conservative treatment of lumbar spinal instability published within the last 10 years was reviewed. The derivation to validation processes for CPRs is briefly discussed. **Results:** Within the last 10 years, several meta-analyses and systematic reviews found that stabilization exercises were effective treatment options in reducing (chronic) low back pain. The currently existing CPR for stabilization exercises might not be far enough developed to use in clinical practice and is not validated as of yet. **Conclusions:** Caution should be exercised when using CPRs in the clinic; they are not meant to be strict treatment guidelines, but rather a tool that helps facilitate clinical decision-making.

## 100. DO AS I SAY: THE EFFECTS OF INSTRUCTION ON SELF-CONTROLLED FEEDBACK

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**Introduction:** Self-controlled feedback has been shown to enhance the acquisition of motor skills. However, some studies report participants requested low feedback frequencies while others report participants requested high feedback frequencies. Though task and learner characteristics may explain these conflicting findings it is possible that instructions received also played a role. Therefore, this study investigated the effects of different instructions on feedback requests during the acquisition of a simple motor skill. **Methods:** Forty-two college-aged students were assigned to either condition: NEED (n=21) or WANT (n = 21). Participants in the NEED condition were prompted to “ask for feedback whenever they need it” and participants in the WANT condition were prompted to “ask for feedback whenever they want it”. The task consisted of pressing five computer keys sequentially in exactly 1200ms. Feedback comprised of sequence and constant errors. Participants completed 50 trials. **Results:** In terms of amount of feedback requested, an ANOVA with repeated measures for Block (first half versus last half) identified a main effect for condition (p=.048). No effect for Block or Condition by Block interaction was identified. In terms of absolute error (AE), an ANOVA with repeated measures for type of trial (feedback versus no-feedback) identified a main effect for Trial (p=.018). No effect for Condition or Condition by Trial interaction was identified. **Discussion:** The results indicated participants prompted to ask for feedback whenever they wanted it requested more feedback than those prompted to ask for feedback whenever they needed it. These results are in line with previous literature that states that instruction can change behavior and can explain, at least in part, the conflicting results observed in the self-controlled learning literature. Additionally, the results showed that AE on trials with feedback was lower than AE on trials without feedback, also in line with previous literature.

### 101. DEVELOPMENT OF A PNEUMATICALLY POWERED PLATFORM FOR VERTICAL DISPLACEMENT OF THE WALKING SURFACE: A PRELIMINARY ANALYSIS

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Sensory-motor synchronization is a relatively new area of study that may have application in the rehabilitation of gait for multiple patient populations. While most interventions have utilized visual and auditory cues to achieve training effects, existing evidence suggests that mechanical input may have a stronger effect on walking behavior. **PURPOSE:** The purpose of this project is to design and build a platform that can be used to provide this type of mechanical input through subtle movement of the walking surface. Here we present the first preliminary data regarding subconscious synchronization of walking to a vertically oscillating treadmill. **METHODS:** Six subjects completed 8 walking trials, each 2 minutes in duration. For the first trial, all subjects walked at 2.4mph while the treadmill was held stationary in order to provide an estimate of the subject's preferred stride frequency. The remaining 7 trials were performed while the platform oscillated vertically with a consistent amplitude of 1 inch and a frequency that was varied systematically between  $\pm 10\%$  of the subject's preferred frequency. A motion capture system was used to record subject and treadmill movement and an overhead harness was provided to ensure subject safety. **RESULTS:** Stride synchronization to platform movement varied greatly across conditions ( $70\pm 28\%$  vs  $15\pm 1\%$  frequency locking), but in general occurred most reliably when the frequency of platform oscillation was closest to each subject's preferred value. In addition, changing the frequency of oscillation resulted in changes to stride length, height and duration, though these changes were not statistically significant. **CONCLUSIONS:** These data demonstrate that subjects will synchronize subconsciously to treadmill movement, but the limits of this behavior appear to be sensitive to deviations from preferred stride frequency. Further, this paradigm is effective at inducing changes in both the magnitude and consistency of multiple aspects of gait, which may have application in rehabilitation.

### 103. EFFECT OF A WORKSITE WALKING COMPETITION ON HEALTH-RELATED QUALITY OF LIFE AMONG UNIVERSITY EMPLOYEES

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Worksite health promotion programs (WHPPs) aim to improve the health and wellness of employees, in an effort to improve health related quality of life (HRQOL). HRQOL is a multifaceted concept used to describe the perceived physical and mental state of an individual. The effect of exercise on improving HRQOL is well documented among clinical populations. However, few studies have examined the effect of WHPPs on HRQOL. **Purpose:** The purpose of this study was to investigate the effect of a six-week worksite walking competition (WWC) on HRQOL among university employees. **Methods:** One hundred and nine university employees were included in this study (WWC participants:  $n=47$ , non-participants:  $n=62$ ). The participant group proceeded to complete the six-week WWC, while the non-participant group did not. All study participants completed the SF-12v2 prior to and following the WWC to determine HRQOL score. The SF-12v2 questionnaire reports scores for a physical component summary (PCS) and a mental component summary (MCS). A two-way repeated measures ANOVA was performed on PCS and MCS scores, followed by dependent t-tests for each group. **Results:** The ANOVA failed to show a significant effect for time or an interaction between time and participation for both the PCS and MCS scores. Further, there were no statistically significant changes in PCS or MCS scores ( $p>.05$ ) among either group, following the six-week WWC. **Conclusion:** Although much research deems worksite health promotion programs effective for improving many health indicators, this short-term program was not effective in improving PCS and MCS components of HRQOL.

### 102. COMPARING STATIC AND DYNAMIC ARCH HEIGHT INDEX USING THE OXFORD FOOT MODEL

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**Purpose:** The medial longitudinal arch (MLA) is often categorized as one of the most clinically important structures in the foot. Therefore, determining a valid method to measure and compare both static and dynamic arch height has become increasingly important as biomechanists continue to study the effects of MLA height on gait and running kinetics. **Methods:** Eight healthy college-aged subjects were recruited and arch height measurements were taken in the same day. First, reflective markers were placed directly to the skin of subject's right foot and leg, according to the Oxford Foot Model. Ten infrared cameras in conjunction with Vicon software were used to capture the data. Subjects stood stationary on a treadmill and a 2 second static trial was recorded. Subjects then began a walking warm-up at 3.0 mph for 1 minute, after which the treadmill speed was increased to a comfortable jogging pace and a 10 second dynamic trial was captured at minute 5. Using Vicon, the arch height index was calculated for both trials at peak knee flexion. **Results:** Six of the 8 subjects experienced arch height decreases during dynamic trials ranging from 41.32% to 14.89%. Two subjects showed arch height increases from static to dynamic trials by 32.87% and 54.03%. **Discussion/Conclusion:** Six of the 8 subjects showed an average 33.1% decrease in arch height from static to dynamic trials, which substantiates our prediction that arch height values would decrease in dynamic trials where ground reactions forces are up to 2 times that of standing. However, 2 subjects showed increases in arch height, which may be due to any number of reasons including, difference in gait/foot strike patterns or increased foot intrinsic activation.

### 104. INTER-TESTER AND INTER-MEDIUM RELIABILITY OF THE FMS

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**Background:** The functional movement screen, FMS, is used as a tool for the assessment of injury risk for athletes or other physically active populations such as military members. A number of studies have been conducted regarding the reliability of the FMS, but none has compared the use of video scoring with live, on-the-spot scoring of subjects. **Purpose:** To determine discrepancies between live and video FMS scoring. **Methods:** Participants were 41 German youth, 24 male and 17 female aged 10-16 yrs. While being video recorded, participants were instructed to perform the 7-component FMS test and were scored from 0-3, on-the-spot, by test administrators without reviewing the video. At a later time, raters in the U.S. reviewed all videos and assigned scores. Component and total FMS scores were computed (out of 21). **Results:** A paired samples T-test was employed, using a Bonferroni correction. There was no difference in total FMS score between the two raters ( $p=0.13$ ). However, differences were seen in the hurdle and lunge component scoring. Also of note was the extremely good agreement ( $p=1.0$ ) for the right shoulder component test. The ICC for the two raters was 0.79, indicating good reliability. **Discussion:** The majority of the component scores was the same when graded on the spot versus later with video review. The lunge and hurdle exercise, however, showed a significant difference between the two scoring methods. A second video taken from a different angle may be necessary to accurately grade these exercises. Additionally, the squat exercise is showing a tendency towards significance. A possible explanation for the discrepancies in scores is that these exercises require simultaneous multiple points of evaluation (i.e. tibia, torso, hips, and heels) and these cannot all be monitored accurately without the use of video.

## 105. EFFECT OF SKATEBOARDING STANCE LEG ON UNILATERAL BALANCE

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**INTRODUCTION:** Skateboarding is a unique sport where each leg is placed under different demands for basic operation as it requires single-leg stability to be maintained on an unstable surface in a dynamic environment. Consistent participation might influence unilateral balance, due to the frequency of this movement in the sport. **PURPOSE:** To compare single leg directional stability between stance and push legs of skateboarders. **METHODS:** Ten skateboarders (age=22.40±1.90 yrs; HT= 177.20±7.41 cm; mass= 78.84±22.42 kg; regular stance= 4; goofy stance = 6) participated in a single leg balance test on a Biodex Balance System that measured movement of the lower extremities, in all directions (units=degrees of deflection from level). Three trials were conducted on each leg (2 practice and 1 recorded trial). Participants were instructed to balance on one leg for 20 seconds on an unstable surface (Biodex stability level=2). After completion, the opposite leg was tested. **RESULTS:** There was no significant difference found in anterior-posterior stability between stance leg (3.98±3.49) and push leg (3.82 ± 4.00). For medial-lateral stability, the stance leg (3.02 ± 2.98) demonstrated greater balance than the push leg (3.46 ± 3.59) **CONCLUSIONS:** Based on these results, skateboarders show significant imbalances between their stance leg and push leg in the medial-lateral direction. These results demonstrate a need for training strategies targeting push leg balance.

## 107. TRANSCRANIAL DIRECT CURRENT STIMULATION TO ENHANCE SKILL ACQUISITION IN OLDER ADULTS: THE EFFECT OF STIMULATION TIMING

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Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique that has been shown to enhance motor performance in older adults. However, the optimal tDCS parameters for improving motor function in older adults have not been established. The purpose was to determine the influence of the timing of tDCS on motor skill acquisition in older adults. The study was a sham-controlled, crossover experimental design. Nine older adults (71 ± 6.9 yrs) participated in 3 experiments that were each separated by a 7 day washout period. Each experiment involved practice of a precision grip task (primary practice task; PPT) performed in association with 1 of 3 tDCS interventions (BEFORE, DURING, and SHAM) in counterbalanced order. The PPT involved matching a target sine wave (target force range: 5-25% of maximum) for 10 trials of 30 seconds each followed by a 90 s rest (total practice or stimulation time = 20 min). Thus, tDCS was applied either before or during motor practice for 20 minutes. tDCS was applied to the scalp area overlying the 1st dorsal interosseus muscle representation area of the primary motor cortex. The tDCS current strength was held constant at 1 mA in both of the treatment conditions. SHAM stimulation was applied in the same manner according to established blinding procedures. The force error (primary outcome measure) during the PPT was quantified as the average error in force relative to the target force. tDCS applied both before and during the PPT lead to better performance (21% and 25% lower force error, respectively) compared to SHAM stimulation. However, there was a non-significant (~4%) difference in force error between the BEFORE and DURING conditions. The findings indicate that a single application of tDCS applied either before or during motor practice can increase the rate of motor skill acquisition in older adults.

## 106. A COMPARISON OF BALANCE AND POSTURAL SWAY IN SURFERS VS. NON SURFERS

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Surfing is an activity that requires a high level of balance and postural control, and it is often assumed that surfers exhibit greater balance than non-surfers. However, previous research on this idea is relatively sparse and inconclusive. **PURPOSE:** The purpose of this study was to test the hypothesis that there are differences in postural sway, squat asymmetry, weight shift, and limits of stability between surfers and non-surfers. **METHODS:** Seven surfers and nine age-matched controls (mean age=22.81±2.6 yrs) performed a series of balance-related tests. Two Bertec force platforms were used to assess sway during 60 seconds of quiet standing and bilateral differences in ground reaction force during a body-weight bearing squat. A HUMAC balance assessment board was used to assess limits of stability in eight directions and rhythmic weight shift accuracy while subjects stood on both a hard/stable and soft/unstable surface. **RESULTS:** No significant differences were found in any tests between surfers and non-surfers (magnitude of change in weight shift without foam: 26±6.63 sec vs. 27.56±14.72 sec; with foam: 19.85±4.98 sec vs. 21.56±12.49 sec, limits of stability without foam: 44±7% accuracy vs. 40±10% accuracy; with foam 40±7% accuracy vs. 41±8% accuracy, bilateral GRF differences 89.3±61.97 N vs. 62.4±58.97 N, medial-lateral sway excursion 12.58±10.45 cm vs. 11.07±6.86 cm, and anterior-posterior sway excursion 13.44±3.78 cm vs. 15.17±5.44 cm). **DISCUSSION:** These data support the idea that there is little difference in performance on standard balance assessment protocols between young healthy surfers and age-matched non-surfers. However, because surfing requires balance on a moving surface, use of more dynamic tests may yield different results. Further, surfing may have a larger effect in older adults who are more likely to exhibit deficiencies in balance and control of posture.

## 108. ACUTE WEIGHTED VEST RUNNING EFFECT ON MIDDLE DISTANCE RUNNING PERFORMANCE

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There is a direct association between running mechanics and running economy. Running economy is inherently important as it is inversely related to metabolic cost (L/min), independent of aerobic capacity. The effect of weighted vest running (WVR) on running economy however is inconclusive. Recent evidence suggests that running kinematics improve during and after WVR conditions. **PURPOSE:** To investigate the acute effect of WVR on running mechanics, and on the potential reduction in metabolic demand for a given middle distance running velocity. **METHODS:** Using a crossover design, 10 male recreational trained subjects (AGE 21.5 ± 4.4, HT 175.1 ± 8.2cm, WT 74.3 ± 8.3kg, BF% 12.0 ± 4.8, VO<sub>2</sub>max 53.0 ± 5.2mL/kg\*min) completed a VO<sub>2</sub>max treadmill test to acquire VO<sub>2</sub>max, ventilatory threshold II (VT<sub>II</sub>) and ventilatory threshold I (VT<sub>I</sub>). Subjects ran a 20min weighted vest (WV) and control trial (no vest) at VT<sub>I</sub> between identical pre-post 10min runs at VT<sub>II</sub>. VO<sub>2</sub>, RER, HR, and RPE were measured at 2,4,6,8, and 10min during VT<sub>II</sub> runs. **RESULTS:** Dependent t-tests revealed that running economy expressed as ml/kg\*min approached significance with a 1.87% drop in metabolic work in the pre-post WVR trials (p=.057). Control and WVR trials post VT<sub>II</sub> runs were not significant. RER was significantly lower in pre-post WVR trial conditions (p=.003). Individual differences revealed that a higher VO<sub>2</sub>max is associated with improved running economy after WVR. No difference in HR and RPE were observed. **CONCLUSIONS:** Decreases in RER are indicative of reduced CO<sub>2</sub> production for a given running velocity. Further, subjects with a higher VO<sub>2</sub>max trended towards larger increases in running economy after wearing a WV. WVR immediately prior to middle distance threshold runs can reduce run times. This study warrants further investigation specific to higher trained runners

### 109. INCREASED INVESTMENT IN A UNIVERSITY EMPLOYEE WELLNESS PROGRAM LEADS TO RISE IN PARTICIPATION

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Employee wellness programs have been shown to decrease health care costs, absenteeism, and employee turnover while increasing job satisfaction. Building program participation is vital to the success of any wellness program. **Purpose:** Utah State University increased their monetary investment in employee wellness by approximately 2,000% at the start of fiscal year 2009. The purpose of this study was to compare 8 years of data on wellness participation before and after this large subsidy. **Methods:** Data were obtained for fiscal years 2005-2012 (4 years before and 4 years after the investment) for participation in the university wellness program. Participation was compared before and after the investment using a two-sample *t* test. **Results:** There was a significant increase in employee and spouse wellness participation,  $t(6) = 5.36, p = .0017$  (4 years before  $2,050.3 \pm 2,188.7$ , 4 years after  $9,397.5 \pm 1,648.5$ ). **Discussion/Conclusion:** The large investment in the university wellness program resulted in increased participation. Universities looking to increase employee wellness participation should consider investing in program development.

### 111. THE ATTENTIONAL COGNITIVE BENEFITS OF INDOOR VERSUS OUTDOOR RUNNING

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Moderate intensity running has been shown to enhance cognitive function. Although cognitive function has not been compared between indoor and outdoor exercise, outdoor exercise enhances mood more than indoor exercise. **Purpose:** The purpose of this study was to compare cognitive function following either indoor or outdoor running. **Methods:** Six recreational runners ran 30 minutes at 75% HRR either indoors (I) or outdoors (O) on 2 separate days in a randomized, counterbalanced order. Pre and post tests for each trial were conducted for the Stroop test and Remote Associates Test. (RAT). **Results:** Stroop color word interference times significantly decreased from pre to post in both conditions ( $p < 0.05$  Ipre  $56.87 \pm 9.81$  sec, Ipost  $49.32 \pm 10.3$  sec, Opre  $55.26 \pm 7.75$  sec, Opost  $48.42 \pm 8.51$  sec). Stroop negative priming scores also significantly decreased from pre to post in both conditions ( $p < 0.05$  Ipre  $61.71 \pm 11.75$  sec, Ipost  $54.44 \pm 11.37$  sec, Opre  $58.86 \pm 9.19$  sec, Opost  $51.33 \pm 8.39$  sec). RAT scores did not change pre to post for either condition, and there were no significant differences between conditions for any variable. **Conclusion:** Consistent with other studies cognitive function (evidenced by Stroop times) was improved following a running exercise. However, there does not seem to be a difference in the benefit of exercise whether it is performed indoors or outdoors.

### 110. ACUTE EFFECTS OF ELASTIC BANDS ON FORCE CHARACTERISTICS DURING DEADLIFTS AT VARIOUS LOADS

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The consequences of combining free-weight and elastic bands during resistance exercise are poorly understood. **Purpose:** To examine the acute effects of elastic bands on peak (PF), average (AF), and relative force (RF) while deadlifting at various loads. **Methods:** Twelve men (age =  $24.08 \pm 2.35$  years, height =  $175.94 \pm 5.38$  cm, mass =  $85.58 \pm 12.49$  kg, deadlift 1RM =  $188.64 \pm 16.13$  kg) completed three conditions at both 60% and 85% of their one repetition maximum (1RM) in random order including: two variable resistance conditions (B1, B2) and one traditional free-weight condition (NB) (100% of resistance coming from free-weight). B1 was performed such that 80% of the total resistance came from free-weights and 20% from elastic bands. B2 was performed with 65% resistance from free-weights and 35% from bands. The average resistance over the entire deadlift was equated for all conditions. **Results:** Regardless of intensity (60% or 85% 1RM), force production was inversely related to band resistance ( $p < 0.05$ ) for PF: NB (60% =  $2439N \pm 264$ , 85% =  $2742N \pm 247$ ) > B1 (60% =  $2359N \pm 245$ , 85% =  $2586N \pm 218$ ) > B2 (60% =  $2292N \pm 236$ , 85% =  $2482N \pm 228$ ), AF: NB (60% =  $1568N \pm 182$ , 85% =  $1875N \pm 181$ ) > B1 (60% =  $1488N \pm 163$ , 85% =  $1720N \pm 151$ ) > B2 (60% =  $1415N \pm 168$ , 85% =  $1617N \pm 154$ ), and RF: NB (60% =  $18N/kg \pm 3$ , 85% =  $22N/kg \pm 3$ ) > B1 (60% =  $17N/kg \pm 2$ , 85% =  $20N/kg \pm 3$ ) > B2 (60% =  $16N/kg \pm 2$ , 85% =  $17N/kg \pm 3$ ). **Conclusion:** The amount of elastic band tension (at light and heavy loads) inversely alters force production. Practitioners should consider these implications when making programming choices.

### 112. VALIDITY OF THE MOBILE APPLICATION IN ASSESSING BALANCE

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Technological progressions are providing the population with advanced methods for the objective assessment of human balance. Accelerometry may be a cost-effective and valid tool to assess human static and dynamic balance. Accelerometry utilizes triaxial accelerometer output administered on a mobile device to quantify postural sway. The affordability of the SwayBalance™ application can also increase the accessibility to early recognition of balance deficits. However, literature documenting the use of accelerometry as a valid method for assessing balance is limited. **Purpose:** To compare the validity of the SwayBalance™ accelerometer mobile application to the NeuroCom® Balance Manager force plate, a previously validated balance assessment. **Methods:** This study was approved by the Loyola Marymount University (LMU) Institutional Review Board for Research involving Human Participants. A total of 60 individuals volunteered for the study (28 males and 32 females,  $21 \pm 1.56$  yrs, height  $170 \pm 10.6$  cm, BMI  $23 \pm 3.4$ ). All assessments were performed in the Human Performance Lab at LMU. Participants performed the Modified Clinical Interaction of Stability and Balance (mCTSIB) assessment using the NeuroCom®, in addition to the SwayBalance™ assessment administered on an Apple iPhone 5s. **Results:** Statistical analysis of the average sway quantification showed no correlation between the mCTSIB and SwayBalance™ trials for the "double leg on a firm surface with the eyes closed" position ( $r = 0.000567$ ). **Conclusion/Discussion:** Results indicate that the SwayBalance™ assessment may not be a valid tool to assess static balance. However, this study was conducted on a healthy population, and therefore further studies are needed to assess the validity of the SwayBalance™ assessment in the unhealthy or injured populations. In addition, the SwayBalance™ application is concurrently updating their system to calculate sway in degrees/second, a previously validated measurement in quantifying human balance.

### 113. A COMPARISON OF EXERCISE ABILITY AND FLEXIBILITY BETWEEN CHILDREN IN URBAN AND RURAL AREAS IN KENYA

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**Purpose:** The purpose of this study was to assess the differences in exercise ability and flexibility of children ages 9-12 in rural and urban areas of Kenya using Functional Movement Screen. **Background:** The FMS has been used to assess functionality in athletes, firefighters, and more recently in children. However, those populations are all from Westernized Cultures. In African countries, children grow up differently, having to move more, work more and spending less time in front of computers. Depending on whether they live in a large, industrialized city or in a smaller, under-developed tribal village, this life style changes again. **Methods** Subjects: 10 children from Nairobi and 25 children from Sereolipi, ages 9-12, participated in this study. They were asked to perform the 7 FMS exercises: deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push-up and rotary stability in quadruped positions, while being videotaped. The videos were later viewed for grading purposes by two individuals. **Results** The average total FMS score was 17.2 (out of 21) for the children growing up in the city, 16.4 for the children growing up in the village. There was no statistical difference in the total FMS scores ( $p=0.39$ ). The only component FMS exercise that showed a difference between rural and urban groups was the push-up ( $p=0.02$ ). The distribution in asymmetries was similar between the groups. **Discussion/Conclusion**

We expected there to be a difference in FMS scores between rural and urban children. The urban children looked bigger, healthier and stronger. This is probably because of better available nourishment provided in the city.

### 115. BARRIERS FACED AMONG PARENTS OF PRESCHOOL CHILDREN IN A HOME-BASED PHYSICAL ACTIVITY INTERVENTION

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As with older children, preschoolers are not meeting the physical activity (PA) guidelines. Interventions have targeted parents promoting PA in their children; however, parents may face challenges in implementing daily PA. **PURPOSE:** This study explored the perceived barriers of PA experienced by parents of children attending a local preschool who participated in an 8-week PA intervention. This study also explored the relationship between barriers and PA participation. **METHODS:** Parents in the intervention group ( $n=18$ ) completed pre and post intervention questionnaires. For the intervention, parents attended an initial training session that demonstrated games and activities and use of provided equipment as well as attended two playdates at which they completed an additional questionnaire assessing barriers to providing PA opportunities for their children. Parents listed up to three barriers and rated that barrier upon how limiting it was. Also, reported was the frequency their child participated in PA during the past seven days, along with days of equipment use. **RESULTS:** Time, sickness and prior obligations were the most common barriers reported by parents. At the first playdate, parents ( $n=12$ ) reported an average of 1.7 barriers but barriers and limitations were not related to days of PA or equipment use ( $p>.70$ ). At the second playdate, parents ( $n=14$ ) reported an average of 1.2 barriers. The number of barriers was related to the days of PA participation by the child ( $r=-0.47$ ,  $p=.09$ ) and equipment used ( $r=-.64$ ,  $p=.02$ ). Perceived limitation was related to equipment used ( $r=-.55$ ,  $p=.08$ ) and approached significance for days of PA participation by the child ( $r=-.51$ ,  $p=.11$ ). **CONCLUSION:** Time, sickness and prior obligations were the most common challenges parents face when promoting PA in their children. It is suggested that the number of barriers parents face as well as the perceived limitation of those barriers may negatively relate to their children PA participation.

### 114. ACUTE TESTOSTERONE RESPONSES TO DIFFERENT RESISTANCE EXERCISE INTENSITIES

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**PURPOSE:** To investigate the acute testosterone response to four different resistance-training protocols. **METHODS:** 10 healthy, male, recreationally trained individuals volunteered to participate for the study. Plasma testosterone levels were measured pre-workout, immediately post-workout, and 60-minutes post-workout following a bout of upper and lower body exercise at 70%, 1 RM and 90% 1 RM. Total training volume was constant for each condition, however, weight, sets, and reps were different for each participant. Each exercise condition was performed on a separate day. Capillary blood was taken via finger prick at the time points specified above. Blood samples were analyzed via an Accubind Testosterone ELISA. **RESULTS:** Testosterone levels immediately post-workout following the upper body and lower body moderate intensity (70% 1 RM) conditions were significantly higher compared to pre-workout levels ( $p < 0.05$ ). Testosterone levels immediately post-workout following the high intensity (90% 1 RM) exercise protocols were elevated but not statistically significant ( $p > 0.05$ ). No significant differences were found between upper and lower body training at either intensity level ( $p > 0.05$ ). **CONCLUSION:** It was concluded that 70% 1 RM is a large enough stimulus to observe a significantly higher testosterone response post-workout. 90% 1 RM has been shown previously to be enough of a stimulus, however, this current study did not support those findings. It could be due to the shorter rest periods during the 70% 1 RM workouts. The same amount of work was completed in a shorter time. The significant finding of this study is that when an equal amount of work is performed for either the upper or lower body the acute endocrine response is the same. This is helpful for populations who are unable to train either upper or lower body by demonstrating if the total training volume is constant a significant testosterone response can be observed.

### 116. THE EFFECTS OF SELF-SELECTED MUSIC ON RECOVERY FROM A FATIGUING BOUT OF ISOKINETIC LEG EXTENSIONS

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Previous studies have proven the effectiveness of passive and active diverting activities in alleviating muscular fatigue after strenuous bouts of exercise. To the best of our knowledge, there is limited research investigating the effects of music as a diverting activity in fatiguing exercise protocols. **Purpose:** To investigate the effects of listening to self-selected music as a passive diverting recovery intervention on peak torque, total work, and fatigue index. **Methods:** On two separate occasions, five males ( $21.4 \pm 0.9$  years;  $163.5 \pm 15.0$  cm;  $74.1 \pm 5.7$  kg) and four females ( $23.3 \pm 2.1$  years;  $168.3 \pm 9.8$  cm;  $64.2 \pm 9.8$  kg) performed a fatiguing exercise protocol involving two bouts of 50 maximal isokinetic leg extensions at  $180^\circ\text{s}^{-1}$  using the right limb. Between each bout of maximal exercise, one of the following recovery interventions was completed for two minutes: white noise (passive recovery) or listening to self-selected music (passive diverting activity). The order of interventions was randomized for each participant. **Results:** There was a significant ( $P<0.05$ ) decrease in peak torque from the pre-intervention ( $115.9 \pm 18.9$  N) to post-intervention test ( $109.1 \pm 25.6$  N) for the white noise condition, but not for the self-selected music condition (pre-intervention =  $110.1 \pm 22.8$  N, post-intervention =  $108.8 \pm 24.8$  N). For total work, there was a significant main effect for time ( $P>0.05$ ), where total work performed on the post-intervention test ( $2,454.0 \pm 590.3$  N) was significantly less than the pre-intervention test ( $2,849.0 \pm 680.4$  N). For fatigue index, there was no significant interaction or main effect ( $P>0.05$ ). **Conclusion:** These findings suggest that utilizing self-selected music as a diverting activity can reduce peak torque decline associated with a maximal, fatiguing isokinetic leg extension test.

## 117. METABOLIC DEMANDS OF HEAVY METAL DRUMMING

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**Purpose:** The drum set is a popular musical instrument to play and involves dynamic movement of all four limbs. Many motor control studies have been done on drum set playing, yet not much is known about the physiological requirements of this activity. Therefore, the purpose of this study was to determine the physiological demands of heavy metal drumming. **Methods:** Four professional male drummers (mean  $\pm$  SD age =  $27.3 \pm 3.0$ , height =  $178.4 \pm 3.3$ , body mass =  $82.5 \pm 19.3$ ) performed eight heavy metal songs (four prescribed and four self-selected). Concurrently, oxygen consumption ( $\text{VO}_2$ ) was measured via a metabolic cart, and heart rate (HR) was measured using a heart rate monitor. Following the drum performance,  $\text{VO}_{2\text{max}}$  was determined using an incremental cycle ergometer test. **Results:** The results indicated a mean  $\pm$  SD metabolic cost of  $6.6 \pm 1.5$  METs and heart rate of  $144.2 \pm 25.4$  beats $\cdot$ min $^{-1}$  ( $74.8 \pm 11.8\%$  of age-predicted HR max). Therefore, heavy metal drumming may be classified as vigorous intensity activity (intensity of 6.0 METs or more). Furthermore, the mean  $\pm$  SD relative  $\text{VO}_{2\text{max}}$  value of  $40.0 \pm 10.3$  mL $\cdot$ kg $\cdot$ min $^{-1}$  leads to an aerobic fitness classification of "average" for adult males. **Conclusion:** In conclusion, metal drumming meets ACSM exercise intensity guidelines for the development of health related fitness.

## 119. EFFECTIVENESS OF STUDYING WHEN COUPLED WITH EXERCISE-INDUCED AROUSAL

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The field of cognitive based exercise research has begun to flourish in recent years. Many researchers have made important discoveries indicating that exercise seems to have a positive effect on cognitive testing, particularly in highly trained subjects. **Purpose:** The purpose of this study was to evaluate the effect of exercise on study and memory, by requiring subjects to recall words following exposure to three different treatments, (1) study while exercising, (2) study after exercising, and (3) study without exercising. **Methods:** Physically active subjects were recruited from undergraduate courses. All subjects participated in the three treatment conditions, though in randomized orders. During study appointments, subjects were given a list of 100 carefully selected words and told to memorize as many as possible. They returned 24 hours later to recall as many words as they could remember. No subject reused the same list of words. **Results:** The average number of words recalled for each testing condition were as follows: study while exercising, 52.84 words ( $s = 22.38$ ); study after exercising, 47.85 words ( $s = 22.39$ ); study without exercise, 51.14 words ( $s = 23.46$ ). Modeling produced a significant subject effect ( $p < 0.0001$ ), and an insignificant treatment effect ( $p = 0.6677$ ). **Discussion:** The effect of individual subjects was expected to be significant, as different people are better at memorizing than others. The results indicate that exercise has no effect on the ability of subjects to correctly recall words. **Conclusion:** Exercise is neither beneficial nor inhibitory in the recollection of words, suggesting that studying while exercising is not detrimental.

## 118. THE EFFECTS OF INTERMITTENT ACTUAL AND PERCEIVED COOLING ON REPEATED BOUTS OF HIGH INTENSITY EXERCISE

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Fatigue is one of the limiting factors of exercise performance. A rise in core temperature is one of the causes of fatigue. A popular strategy to reduce fatigue and enhance recovery is to apply cool liquids or ice to the back of neck. It is still unclear if neck cooling affects the perception of temperature or actual exercise performance. **Purpose:** The purpose of this study was to investigate the effects of intermittent neck cooling between repeated bouts of high intensity. **Methods:** Each participant (age= $25.3 \pm 5.0$ y, height= $176.9 \pm 7.5$ cm, mass= $79.3 \pm 9.0$ kg, body fat%= $11.8 \pm 3.1$ %) performed three trials on a cycle ergometer. Each trial consisted of two, 5 minute rounds of high intensity intervals (20s at 50% peak power, followed by 15s of rest, for 5min), plus one round of cycling to exhaustion at 30% peak power. One minute of rest was given between each round. During this rest period, participants received one of three treatments: 1) posterior neck cooling via an ice bag (ICE), 2) posterior neck cooling via a non-thermal cooling spray (SPRAY), or 3) no treatment (CONT). **Results:** Time to exhaustion was not significantly influenced by the conditions (ICE= $101.7 \pm 84.6$ s, SPRAY= $102.3 \pm 74.1$ s, CONT= $98.0 \pm 81.3$ s). Changes in thermal sensation (TS) pre and post application differed significantly between treatments. When collapsed across the first two rounds, ICE and SPRAY induced a lower TS than CONT ( $p < 0.05$ ). Moreover, participants felt significantly cooler during ICE than during CONT after rounds 1 and 2 ( $p < 0.05$ ). No other differences were found between conditions for TS in rounds 1 and 2. However, TS during ICE was significantly lower after the round to exhaustion compared to CONT ( $p < 0.05$ ), and tended to be lower than SPRAY ( $p = 0.088$ ). **Discussion:** Practitioners should be aware of the possible effect of intermittent neck cooling on TS and the possible lack of an effect on exercise to exhaustion performance.

## 120. THE EFFECT OF 10 DAYS OF HEAT ACCLIMATION ON EXERCISE ECONOMY AND EFFICIENCY AT 1600m AND 4350m

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Heat acclimation has been shown to improve exercise economy (workload per given  $\text{VO}_2$ ). Previous examinations suggest heat acclimation may preserve exercise performance at altitude. However, the effects of heat acclimation to maintain exercise performance during acute high altitude exposure have not been fully elucidated. This study examined the effects of heat acclimation as a cross environmental stressor to improve exercise economy and efficiency during acute altitude exposure. Eight trained males ( $\text{VO}_{2\text{peak}}$ :  $53.3 \pm 6.7$  ml/kg/min) performed maximal exercise tests, submaximal exercise bouts, and heat tolerance testing in a temperate environment ( $21^\circ\text{C}$ ) at 1600 m and 4350 m before and after 10 days of heat acclimation ( $40^\circ\text{C}$  and 20% RH) on a cycle ergometer ( $\sim 43\%$  peak power). To investigate heat stress mechanisms, C2C12 myocytes were heat stressed for 24 hours ( $40^\circ\text{C}$ , 5%  $\text{CO}_2$ ). Heat acclimation did not alter  $\text{VO}_{2\text{peak}}$  at 1600 m ( $53.3 \pm 6.7$  vs.  $53.7 \pm 3.7$  ml/kg/min,  $p > 0.05$ ) or 4350 m ( $45.3 \pm 4.1$  versus  $45.9 \pm 3.4$  ml/kg/min,  $p > 0.05$ ) before versus after heat acclimation. Heat acclimation increased exercise economy by 1.6% and 2% at 1600 m with a 0.6% reduction and 0.48% increase at 4350 m at low intensity and high intensity exercise, respectively. In the cell study, heat stress significantly decreased UCP3 expression, reduced mitochondrial uncoupling ( $-71.1\% \pm 1.2\%$ ) and suppressed basal and peak oxidative metabolism ( $-75.5\% \pm 4.9\%$  and  $-64.4\% \pm 5.9\%$ , respectively) compared to controls. Heat stress also significantly increased PGC-1 $\alpha$ , NRF1 and TFAM, leading to increased mitochondrial content. These data demonstrate that while heat stress decreases UCP3 expression, reducing uncoupling and leading to enhanced mitochondrial efficiency, these adaptations are not observed in the whole body. We are unable definitively promote the use of heat acclimation as a cross environmental stressor for improving exercise economy and efficiency at 1600m or 4359m.

## 121. METHODOLOGY FOR EVALUATING HEEL DEFORMATION UTILIZING A VARIABLE SIZED CURSOR SCAN

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We developed a method using dual camera images and custom algorithms to calculate the deformation area of the heel during walking. Posterior and sagittal view images were digitally scanned with a rectangular cursor that measured the length of the flattest portion of the image (dorsal foot). The measurements were combined and deformation area of the heel was calculated. The aim of the study was to explore the effectiveness of variable-sized cursor scans on the accuracy of calculating foot deformation from video images during simulated walking. It was hypothesized that the optimal cursor size for any individual foot would be related to foot size. Thirteen volunteers (4 females, 9 males, 23.0±2.2 yrs, 173.7±9.3 cm, 73.0±11.6 kg) granted institutionally approved consent and simulated heel strike during walking, while heel prints and video images (120 Hz) were obtained. The area of deformation was manually measured from the heel prints. The image processing toolbox in Matlab was used and an edge detection routine invoked to scan each image, with the cursor size systematically modified until the area calculated best matched the heel print area. The cursor size was deemed acceptable (best fit) when the results of a correlated t-test ( $\alpha=0.05$ ) between measured and calculated heel deformation areas were not statistically different. By customizing the cursor size according to the foot length, we were able to achieve more accurate results between measured and calculated area. Correlations between foot size and cursor height ( $r=0.5948$ ,  $r=0.5954$ ) and length ( $r=0.6591$ ,  $r=0.4405$ ) for sagittal and rear images, respectively, were moderate. Although we achieved more accurate foot deformation results, we did not find a strong association between physical size of the foot and optimal cursor size, suggesting that individual foot morphology strongly influences this relationship. Greater sample size may improve our ability to optimize cursor size relative to foot size.

## 123. VIGOROUS-INTENSITY EXERCISE TRAINING DOES NOT ALTER SPONTANEOUS PHYSICAL ACTIVITY LEVELS IN OBESE, SEDENTARY ADULTS

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We determined whether participation in vigorous-intensity exercise training would alter physical activity levels outside of a structured exercise program in obese sedentary adults. Sixteen obese sedentary adults (8 Men: age = 34 ± 8 yrs, BMI = 37.7 ± 7.0 kg/m<sup>2</sup>; 8 Women: age = 38 ± 8 yrs, BMI = 35.1 ± 1.8 kg/m<sup>2</sup>) completed 8 weeks (3 d/wk) of either high-intensity interval training [HIT (n=9): 10, 1-min intervals at 90-95% of heart max (HR<sub>max</sub>)] or continuous vigorous exercise [Continuous (n=7): 30 min at 70-75% of HR<sub>max</sub>] on cycle ergometers. Before training and during the fifth week of training all subjects wore accelerometers (Actigraph GT3x+) for 7 days. Freedson 1998 cut-points were used to quantify sedentary time and time spent in various intensity domains of physical activity. After 8 weeks of training, subjects also completed a physical activity enjoyment scale. There were no within-group or between-group differences in time spent in sedentary, lifestyle, light-, moderate-, or vigorous-intensity activity at baseline and after 5 weeks of training. Although mean sedentary time did not change on a group level (HIT: Baseline = 571 ± 70 min, Week 5 = 554 ± 112 min; Continuous: Baseline = 534 ± 94 min, Week 5 = 511 ± 48 min), there was large individual variability. The change in sedentary time between baseline and week 5 of training was significantly inversely correlated to physical activity enjoyment ( $r = -0.53$ ,  $P = 0.04$ ). Our results suggest that for initially sedentary obese adults, participation in a structured exercise program of either continuous vigorous-intensity exercise or high-intensity interval exercise does not change time spent in various physical activity domains outside of training. However, a low physical activity enjoyment score may lead to increased time spent in sedentary activities.

## 122. WHOLE BLOOD LACTATE LEVELS MEASURED USING THE YSI ANALYZER AND THE NOVA LACTATE PLUS

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The NOVA Lactate Plus is often used to measure blood lactate levels from a drop of blood taken from a finger prick. The NOVA can also be used to measure blood lactate from a drop of blood taken from an intravenous blood draw. Whole blood lactate can be measured from the same intravenous blood sample using the NOVA Lactate Plus and a "gold standard" device such as the YSI 2300 Analyzer. **PURPOSE:** The purpose of this study was to compare blood lactate levels measured using the handheld NOVA Lactate Plus and the YSI from the same blood samples. **METHODS:** Six well-trained men, 18-39 years of age with VO<sub>2</sub>max values ranging between 56 and 65 mL/kg/min volunteered to participate in this study. As part of a larger scale study, each participant completed an exercise test to determine VO<sub>2</sub>max and lactate threshold. Participants then completed multiple submaximal 30-minute steady-state runs on the treadmill to determine maximal lactate steady state (MLSS). During the steady-state runs, blood was withdrawn from the antecubital vein using an intravenous catheter. Whole blood lactate levels were measured from each blood sample using the NOVA Lactate Plus and the YSI. **RESULTS:** Blood lactate measures using the NOVA and the YSI from the same blood sample were significantly correlated ( $R=0.997$ ). Nevertheless, blood lactate levels as measured by the NOVA handheld device significantly overestimated blood lactate levels as measured using the YSI by an average of 1.19 mmol/L ( $p=0.0001$ ). **CONCLUSIONS:** While there was a significant correlation between lactate measurements between the two devices, the NOVA Lactate Plus significantly overestimated blood lactate concentrations compared to the YSI. When using the NOVA Lactate Plus device, use caution when interpreting the results. Overestimating blood lactate levels could result in an underestimation of training or race paces.

## 124. INTER-DAY RELIABILITY STUDY OF INTRINSIC FOOT MUSCLE STRENGTH

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**Introduction/Purpose:** Measuring strength of the intrinsic foot muscles can help researchers evaluate the relationship of muscle weakness and injury incidence leading to exercise regimens targeting the intrinsic foot muscles. Measuring the forces produced during doming and toe-pull exercises is one method of assessing strength. The purpose of this project was to determine the inter-day reliability of these measurements. **Methods:** Twelve feet of healthy college-aged subjects were measured during doming and toe-pull exercises on two separate days. During each test, the subject was placed in a seated position with the knee at 90 degrees. To assess doming strength, a dynamometer was placed on the dorsum of the foot above the navicular tuberosity. The subject performed the doming movement to a maximal plateau for 3 seconds, then relaxed. Toe flexor strength was assessed from the big toe individually, and the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> toes together. During this testing, the dynamometer was attached to the toe(s) via an S-beaner or bar. Each subject pulled to a maximal plateau for 3 seconds, then relaxed. All tests were completed on each foot three times. **Results:** The ICC value comparing the average of the doming trials for each day was .26 (Day 1: 9.3±2.75; Day 2: 9.1±1.43). The ICC value for the big toe tests was .83. The ICC value for the lateral toe tests was .76. **Conclusions:** From these results, we determined that there was poor reliability between day one and day two of testing for the doming trials. However, standard deviation between day one and day two of testing suggests that familiarization with the movement improves consistency of the data. Possible implications from these results include coaching of movements prior to testing to allow for better consistency of data. Toe flexion tests showed better between day reliability.

## 125. KNEE EXTENSION AND FLEXION STRENGTH IN RECREATIONAL SURFERS

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**Background:** A trend for increased leg strength in the leg positioned in the back compared to front of the surfboard has been reported previously in a study with limited sample size. This preliminary data suggests that an asymmetry may exist in surfer's leg strength and that this may be influenced by surfer's stance on the surfboard. **Purpose:** The purpose of this investigation was to test the hypothesis that leg strength in surfers, as assessed by isokinetic knee extension and flexion at contraction velocities ranging from 60-300deg/sec, would be greater in the leg positioned in the back compared to front of the surfboard. **Methods:** Forty-four recreational surfers (5 female, 39 male) with a mean age of 41.0±14.0yrs participated in this study. All subjects reported surfing to be their primary form of physical activity (8.8±5.1hrs/wk). Leg dominance was assessed in all subjects using a ball kicking task prior to measurements of strength. Single leg isokinetic knee extension and flexion strength was measured in both legs using an isokinetic dynamometer (Biodex, System 3). Following a five-minute warmup on a cycle ergometer (Monark), subjects performed five repetitions of maximal knee extension and flexion at contraction velocities of 60, 120, 180, 240, and 300deg/sec. A thirty-second recovery period was provided between each contraction velocity. **Results:** During knee extension at a contraction velocity of 60deg/sec the back leg produced torques that were significantly greater compared to the front leg (front leg 141.4±5.3, back leg 150.1±5.9ft-lbs). There were no significant differences between legs for knee extension and flexion at all other speeds. **Conclusions:** The results suggest that recreational surfer's quadriceps strength is significantly greater in the back leg compared to front leg at slow contraction velocities. These findings are consistent with previously published findings and may suggest an asymmetry in leg strength of recreational surfers.

## 127. MAPK SIGNALLING IN RESPONSE TO REPEATED BOUTS OF ECCENTRIC EXERCISE

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Elements of the mitogen activated protein kinase (MAPK) pathways have been shown to be responsive to muscle damage induced by lengthening contractions (LC). The purpose of this study was to employ a repeated bout paradigm and examine the role of MAPK signaling (JNK, ERK 1/2 and p38 MAPK) in the protective adaptation known as the repeated bout effect. Fourteen men (n=7) and women (n=7) completed 2 bouts of LC separated by 28-d. Biopsies were taken before exercise, 2-d and 27-d following the first bout of LC (B1), and 2-d following the second bout of LC (B2). Multianalyte profiling of biopsy sample homogenates was carried out on a Luminex Magpix multiplexing platform, using a phospho-protein signaling pathway magnetic bead assay. Analyses showed that phosphorylation of the c-Jun N-terminal kinase (JNK) was significantly elevated (200%) 48h following B1 (p<0.05) but not following B2 when compared to pre-exercise values. There were no differences between B1 and B2 at any sampling time-points. No differences were detected in ERK 1/2 or p38 MAPK at any time-points. These data demonstrate sensitivity of the JNK pathway to a bout of LC. Furthermore, that JNK activation persists to 48h following damaging exercise. These findings implicate JNK signaling in the repeated bout effect of eccentric exercise in human skeletal muscle.

## 126. HEART RATE VARIABILITY REMAINS UNCHANGED FOLLOWING THIRTEEN WEEKS AEROBIC RESISTANCE TRAINING (IMPACT) IN POST-TREATMENT CANCER SURVIVORS

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Aerobic resistance training has been shown to improve heart rate variability (HRV) and parasympathetic control of the heart. One of the side-effects of cancer treatment is fatigue which can lead to lower cardiovascular fitness and can negatively influence HRV. **Purpose:** This study aimed to analyze the effects of extended aerobic resistance training on HRV measurements in an adult population. **Methods:** Post-treatment cancer patients (n= 9) attended tri-weekly aerobic resistance training sessions consisting of eight exercises performed consecutively. A 20-minute cardio portion preceded the 20-25 minute resistance-training portion of the sessions followed by balance and flexibility exercises. Pre-assessment and post-assessment heart rate variability measurements were taken using the POLAR RS800CX. **Results:** Paired t-test results indicate no significant differences between baseline and post-intervention measurements in the following variables: high frequency (HF) (p=0.735), low frequency (LF) (p=0.863), very low frequency (VLF) (p=0.416), total power (TP) (p=0.504) and Low Frequency/High Frequency ratio (LF/HF ratio) (p=0.193). **Conclusions:** Thirteen weeks of aerobic resistance training did not affect HRV in post-treatment cancer patients. There was a trend towards significance in LF/HF ratio A longer exercise intervention may be required to observe significant results.

## 128. DIFFERENCES BETWEEN HIP ABDUCTOR AND ADDUCTOR STRENGTH AND MEDIAL TIBIAL STRESS SYNDROME IN COLLEGIATE DISTANCE RUNNERS

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Overuse injuries are among the most common injuries in distance runners. Of these, medial tibial stress syndrome (MTSS) has been observed to have a high occurrence rate. Though the exact mechanism for the occurrence of MTSS has not been fully determined, its connection with hip muscular strength has been suggested. **Purpose:** The purpose of this study was to investigate hip abductor and adductor strength in collegiate distance runners with and without MTSS, using isokinetic dynamometry. **Methods:** A total of 25 collegiate distance runners volunteered for the study (15 non-injured, 10 injured). Participants performed concentric and eccentric muscle actions of the hip abductors and adductors at 30, 150, and 270 °-s-1. **Results:** No significant differences were found in isokinetic hip abductor and adductor strength (N·kg-1 body mass) between injured and non-injured runners. **Discussion/Conclusion:** The results of the study suggested there are no differences in hip abductor and adductor strength between injured and non-injured collegiate distance runners. Various factors may have contributed to finding no differences, such as dissimilarity between the testing protocol and the way the muscles are used during running, the training/competition phase during which testing took place, and the testing protocol which measured strength during non-fatigued conditions. Future research that controls for one or all of these factors may be needed to fully understand the complex relationship between strength and MTSS in collegiate distance runners.

### 129. INFLUENCE OF BODY WEIGHT SUPPORT AND DIRECTION OF LOCOMOTION ON PREFERRED GAIT

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Previously, no research has investigated differences in preferred gait characteristics during forwards and backwards running at varying body weight (BW) support. **Purpose:** To understand how BW support and direction of locomotion influence descriptors of preferred gait. **Methods:** Subjects (n=8; 27.0±11.7 years, 173.8±3.5 cm, 74.0±8.7 kg) performed forward and backward running on a lower body positive pressure treadmill at different levels of BW support (i.e., 0%-80% body weight support). Subjects preferred running speed (PS), preferred stride frequency (PSF), and rate of perceived exertion (RPE) were measured. PS, PSF, and RPE were analyzed using a 2(exercise mode: forward and backward locomotion) x 5(BW support: 0%, 20%, 40%, 60%, and 80%) repeated measures analysis of variance ( $\alpha=0.05$ ). **Results:** PS, PSF, and RPE were not influenced by the interaction of exercise mode and BW support ( $p > 0.05$ ). PS was different between modes ( $p < 0.001$ ) and between BW support conditions ( $p < 0.01$ ). For example, PS increased approximately 3.8%-8.5% and 3.0%-11.9% with decreasing BW support for forward and backward running, respectively. Additionally, PS during forward running was higher than that of backward running at reduced BW support (e.g., 3.4±.9 m/s and 2.5±.5 m/s for forward and backward running at 80% BW support, respectively). Furthermore, PSF ( $p < 0.001$ ) and RPE ( $p < 0.01$ ) were different between BW conditions but not different between direction of locomotion ( $p > 0.05$ ). Specifically, PSF (e.g., a decrease of 13.2% during forward running at 0% BW support vs. 80% BW support) and RPE (e.g., a decrease of 19.9% during forward running at 0% BW support vs. 80% BW support) during forward and backward running decreased with decreasing BW support. **Conclusion:** It seems that BW support may have more of an influence on preferred gait characteristics than direction of locomotion since PSF and RPE were not different between directions of locomotion.

### 131. PHYSIOLOGICAL MEASURES ASSOCIATED WITH INTERPOLATED MEMORY TESTS: A PILOT STUDY

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**Purpose:** The study was designed to investigate the effect of stress on learning. Stress was manipulated by providing quizzes to participants and was measured using salivary amylase. This was an extension of previously published research by Szpunar et al (2013) in which they used a similar technique to measure mind wandering, but did not include physiological measures. **Methods:** Volunteers (N=9) were asked to observe a lecture video that was dissected into 4 segments. After each segment, participants were told that they were either to receive a brief quiz or complete a brief set of math problems of equal length. In reality, one group received a quiz after each segment, whereas another group was only tested after the fourth and final segment of the lecture. In order to equate study strategies, all students were told that there was to be a final cumulative test on the entire lecture, regardless of the frequency of quizzes during the lecture. In addition, mind-wandering probes were incorporated into the design of the experiment. These probes involved asking participants, at random points during the lecture, to say whether or not they are focusing on the content of the lecture. Finally, students answered a number of questions both before and after the final cumulative test to indicate the extent to which they were anxious about the final cumulative test (using a 7-point Likert scale) and how mentally taxing they found the experience of learning from the lecture (also using a 7-point Likert scale). **Results:** Data trends suggest that participants who received a quiz after each lecture segment experienced less stress upon administration of the final cumulative test, received better scores, and reported less anxiety during the final. **Discussion:** Receiving brief tests during lectures appeared to assist in material retention, and decrease stress to test taking.

### 130. EFFECT OF INTERNAL VS. EXTERNAL VERBAL CUE ON FEMALE FRONTAL PLANE KNEE BIOMECHANICS DURING A DROP VERTICAL JUMP

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Over 70% of all sport-related non-contact ACL injuries occur when landing from a jump and the knee collapses into a more valgus position. It has been hypothesized that training with elastic bands around the knees can help prevent valgus collapse during jump landing; however, the cue provided by the trainer/clinician in using those elastic bands has never been examined. It has consistently been shown that external cues produce much better results than internal cues when teaching a movement task. **Purpose:** To determine if providing an external cue reduces the amount of valgus movement and moment at the knee during a drop jump landing with an elastic band around the distal femur. **Methods:** Thirteen recreationally active female participants were instructed to perform a drop vertical jump from a height of 31cm. Each subject performed three jumps per cue (INT and EXT). INT and EXT cues were counterbalanced among subjects to avoid order effects. A Qualisys motion capture system (Gothenburg, Sweden) was used to collect all kinematic data sampling at 240Hz, and AMTI force plates (Newton, MA) collected ground reaction forces at 1200Hz. A paired samples t-test determined if there were differences between conditions. **Results:** No significant differences were found among variables being examined ( $p > 0.05$ ); left valgus angle (0.695±2.01Nm/kg), right valgus angle (0.299±1.60Nm/kg), left valgus moment (-0.047±0.13Nm/kg), and right valgus moment (0.002±0.09Nm/kg). **Discussion:** Our findings are contrary to most of the literature suggesting that an EXT cue produces better results than an INT cue. This could be due to our subject population, which contained all kinesiology students that are aware of common injury mechanisms. Since the amount of valgus seen in these subjects was small, perhaps the cueing was not able to have a significant effect. Future studies should examine subjects who present with larger amounts of valgus during landing.

### 132. A COMPARISON OF FMS BETWEEN MALE AND FEMALE CHILDREN IN KENYA

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**Purpose** This study is to assess the outcome of the FMS with African children ages 9-12.

**Background** The FMS has been used to assess functionality in athletes, firefighters, and more recently in children. However, those populations are all from Westernized cultures. **Methods** Subjects: 15 girls and 20 boys, ages 9-12 performed FMS exercises: deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push-up and rotary stability in quadruped position. Videos were taken and later viewed for grading purposes by two individuals. **Results** The average total FMS score was 16.2 +/- 1.9 (out of 21) between boys (16.5) and girls (15.8) ( $p=0.3$ ). The only component score that showed a difference was the one for the push-up ( $p=.024$ ), where the boys performed better than the girls. 20 of the 35 (57%) children (6 girls and 14 boys) were found to have at least one right-to-left asymmetry with the majority (5 girls, 14 boys) having one and only 2 (1 boy and 1 girl) having two. **Discussion/Conclusion** These data, while a bit higher, are comparable to other research done in Westernized cultures. We expected scores to be higher because the children in Kenya are running, climbing, or doing chores all day long. It is typical to see strength differences between boys and girls, as demonstrated with the push-up exercise. Although there were no other differences in FMS scores between boys and girls there were some notable differences in right-to-left asymmetry. 70% of the boys had asymmetry compared to 40% of the girls. The boys exhibited more asymmetries during the shoulder mobility test and the active straight leg raise than the girls. The hurdle step and the rotary stability in quadruped position are other exercises that test asymmetry, but we saw only little difference there.

### 133. INDIVIDUALS USE THE INITIAL PORTION OF THE TRAJECTORY OF A STIMULUS TO PERFORM A COINCIDENCE-TIMING TASK

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**Introduction:** Sport expertise changes the way individuals process sensory information. Specifically, experts and novices have been shown to use different portions of the trajectory of a moving object in a coincidence timing task (Müller et al., 2009). However, no studies have specifically investigated these differences in relation to softball experience. Therefore, this study aims to identify if expert and novice softball players use different segments of the trajectory of the stimulus to perform a coincidence timing task. **Methods:** College aged Division 1 female athletes volunteered for this study. They were assigned to either the softball player (n=13) or non-softball player (n=13) groups. Participants performed 20 batting swings to intercept a traveling light stimulus that appears to move down a runway. The stimulus decelerated on the runway towards the participants. The Bassin Anticipation Timer was used. The task was performed under 2 occlusion conditions: 1) First third of the track occluded; 2) Last third of the track occluded. Separate repeated measures ANOVAs were conducted for absolute error (AE), constant error (CE), and variable error (VE). **Results:** No significant differences were identified for AE or VE. For CE, difference between conditions ( $p = .001$ ) was identified. **Discussion:** Results indicated all participants performed with significantly higher constant error during trials where the first third of the trajectory was occluded vs. the last third. These results match previous literature indicating expert performance in coincident timing tasks depends on information extracted from the beginning of the trajectory of the stimulus (Müller et al., 2005). However, contrary to what was expected, no differences between groups were identified. It is possible that the task was significantly different from softball, rendering both groups as novices. Perhaps, the experience in softball does not translate into superior performance in the Bassin Anticipation Timing task used in this study.

### 135. AN ANALYSIS OF ASCENT AND DESCENT VELOCITY OF THE LIFTER AND BARBELL DURING A CLEAN

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Research has shown that barbell velocity plays a critical role in successful lifting, and is highest during the second pull phase of a clean. The purpose of this study was to determine the ascent and descent velocity of both the barbell and lifter during a clean. Eight competitive weightlifters (7 men, 1 woman; mean  $\pm$  SD: age, 24.88  $\pm$  1.36 years; body mass, 86.58  $\pm$  14.75 kg; height, 178.28  $\pm$  9.75 cm) participated in this two-day study. On day one, participants performed a brief warm-up, then established a 1-repetition maximum (1RM) in the clean (mean  $\pm$  SD: 103.38  $\pm$  23.59 kg). On the second day, one week later, participants did the same warm-up as day one. They then performed 3 cleans at 85% of their 1RM, resting 1 minute between repetitions. Three velocity transducers were used (1 on either end of the barbell, and 1 attached to the lifter at hip level with a weight belt). Descriptive results (mean  $\pm$  SD) revealed peak bar ascent velocity, 1.88  $\pm$  .06 m/s; peak bar descent velocity, -1.22  $\pm$  .26 m/s; peak human ascent velocity, .76  $\pm$  .24 m/s; and peak human descent velocity, -1.40  $\pm$  .13 m/s. These results show that the barbell reached its maximum velocity during the ascent but was slower during the descent. The lifter, however, had a much slower ascent during the initial pull from the floor, and then rapidly increased velocity as they descended under the barbell. Interestingly, the lifter traveled at a higher velocity under the barbell than the barbell itself during the descent. Establishing data on these velocities may be useful to coaches who are working with athletes to develop maximal speed during different phases of the clean.

### 134. VALIDITY AND RELIABILITY OF CONSUMER-BASED PHYSICAL ACTIVITY MONITORS IN OLDER ADULTS

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**Purpose:** To examine validity and reliability of the Nike+ Fuelband, SenseWear Armband (SWA), Actiheart (AH), and Actigraph (AG) physical activity monitors for estimating total energy expenditure (TEE) during physical activity in older adults. **Methods:** Twenty-five older adults (13 men, 12 women; age=69 $\pm$ 4y; BMI=26.5 $\pm$ 4.3 kg/m<sup>2</sup>) completed two, 60-min semi-structured routines consisting of sedentary/light-intensity and moderate-intensity physical activities. Participants wore Nike+ Fuelband, SWA, AH, and AG devices, while oxygen uptake was measured continuously with Oxycon Mobile metabolic measurement system (criterion). Intraclass correlation coefficients (ICCs), mean absolute percent error (MAPE), and equivalency testing (10% equivalency zone) were used to assess validity. Overestimation and underestimation of mean TEE by device was considered significant if 95% CIs did not include 0. ICC was used to assess reliability. **Results:** ICCs for agreement in TEE estimation against the criterion were: Nike+ Fuelband (0.50), SWA (0.79), AH (0.36), and AG (0.35). MAPE was lower in SWA (11 $\pm$ 8%) than Nike+ Fuelband (22 $\pm$ 15%), AG (24 $\pm$ 10%) and AH (29 $\pm$ 23%). Equivalence testing showed that none of the devices were within the 10% equivalence zone around criterion. Mean TEE differences from the criterion (Mean TEE: 201 $\pm$ 39 kcal) indicated significant overestimation by Nike+ Fuelband (TEE diff: +30 kcal (95% CIs: 13,46)), SWA (TEE diff: +16 kcal (95% CIs: 6,27)), and AH (TEE diff: +42 kcal (95% CIs: 12, 73)) whereas AG (TEE diff: -47 kcal (95% CIs: -35, -60)) significantly underestimated TEE. Test-retest reliability was good for all devices: Nike+ Fuelband (ICC=0.80), SWA (ICC=0.80), AH (ICC=0.87), and AG (ICC=0.77). **Conclusion:** All monitors showed good reliability for TEE estimation. Validity measures indicated moderate to poor agreement vs. criterion, with Nike+ Fuelband, SWA, and AH overestimating and AG underestimating TEE. Age-specific algorithms may be needed to improve the accuracy of EE estimation among older adults.

### 136. THERMOREGULATION, HYDRATION STATUS AND PERFORMANCE DURING A 100 MILE ULTRA-MARATHON

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**Purpose:** This study will determine the relationship between core temperature and hydration status of runners participating in the 2014 Western States 100 mile endurance run. Adequate hydration levels are thought to preserve the performance of those exercising 2 hours or greater. The American College of Sports Medicine recommends that individuals not lose more than 2% of their body weight during exercise. However, body weight losses of  $\geq$ 3%, have shown to be well tolerated in those participating in prolonged endurance exercise. In addition studies have found an inverse relationship between percent body weight loss and finishing times, in that those with greater weight losses tend to finish faster. Nevertheless, athletes still receive mixed messages about adequate hydration, which poses major medical concerns, such as exercise associated hyponatremia. **Methods:** 30 runners of the 2014 WSER agreed to take part in our study. Body weight and core temperature was taken at 5 different locations. A sample of blood was taken at the finish to determine serum sodium concentration. **Results:** It was found that body mass changes was not associated with core temperature, furthermore, body mass changes did not correlate with post-race serum sodium concentration. There was no significant difference between the core temperatures of finishers vs. Non-finishers, and there was not a significant difference between weight changes of finishers and non-finishers. **Conclusion:** We conclude that while participating in extreme endurance exercise, the body can tolerate weight losses of -4% body mass, without significant rises in core temperature and loss of sodium.

### 137. A COMPARISON OF THE AUTOPHAGIC RESPONSE IN PHYSICALLY ACTIVE AND SEDENTARY ADULTS

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Exercise elicits cellular disturbances that disrupt homeostasis resulting in an induction of an important catabolic system called autophagy. Autophagy is a necessary cell survival process that serves to recycle misfolded proteins and organelles to provide an alternate energy source during periods of nutrient deprivation, such as endurance exercise. Failure of autophagy to dispose of cellular byproducts is thought to induce the formation of protein aggregates found in disorders such as Alzheimer's disease, diabetes, heart disease, and cancer. **Purpose:** The purpose of this study was to investigate the response of rapamycin-induced autophagy in sedentary individuals and those who regularly engage in physical activity through the autophagy marker Light Chain 3-II (LC3-II) protein and Light Chain 3-B (LC3B) mRNA. **Methods:** Two groups served as subjects and consisted of five physically active (21.20±1.64yr) and five sedentary (22.40±2.07yr) adults. Activity level was determined by analyzing responses from the Champ's Questionnaire. Peripheral blood mononuclear cells were isolated from whole blood and cells were incubated for 24 hours. Cells were then harvested after 2 hours of rapamycin (RAPA) treatment (0.5nM) or following no treatment (NT). Western blot analysis was used to detect expression of LC3-II protein. qRT-PCR was used to detect changes of LC3B mRNA. **Results:** A significant increase ( $p \leq 0.05$ ) in LC3-II protein expression in response to rapamycin was observed in physically active (2.03±0.78RQ) when compared to sedentary adults (1.92±1.17RQ). No significant differences were observed in LC3B gene expression between physically active and sedentary adults. **Conclusion:** Our findings indicate desensitization of the autophagic response in sedentary individuals. Lack of upregulation in LC3B gene expression suggests a mechanistic blunting of autophagy, which may be spared in adults who regularly engage in physical activity.

### 139. MOBILITY ASSESSMENTS: ARE WE MEASURING MOVEMENT DYSFUNCTION OR MOVEMENT SKILL?

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While many organizations have adopted various forms of movement screens, designers of these assessment tools fail to understand the difference between skill and mobility. Numerous studies within the motor control and learning literature demonstrate how proper verbal instructions and demonstration enhance skill acquisition. The cumulative result of these studies reinforces the importance for movement screens to include instructional descriptions of test-items in a manner in which the results isolate skill from mobility. **Purpose:** To compare performance on a common movement screen with limited instructions and with instructions including verbal instruction, demonstration, and practice. **Methods:** 22 individuals (14 males, 8 females; 22 ± 1.4 years) participated. Each participant performed three overhead squats under three different conditions: baseline with no instruction, instructions taken from the Functional Movement Screen (FMS), and instructions including demonstration, and practice (IDP). Whole body kinematics were recorded using a 12-camera motion capture system. Center of mass vertical displacement, ankle flexion, trunk forward lean, and bar to body distance were extracted. Differences between conditions were assessed using a one-way ANOVA. **Results:** COM displacement was greater in IDP (0.45 ± 0.10m.) than FMS condition (0.32 ± 0.20m.;  $p = 0.003$ ), but not different than baseline (0.39 ± 0.12m.;  $p = 0.047$ ). Forward trunk lean was also greater in IDP (0.33 ± 0.65m.) than FMS condition (0.29 ± .096m.;  $p = 0.013$ ) but not different than baseline (0.30 ± 0.07m.,  $p = 0.048$ ). Ankle dorsiflexion was greater in IDP (21.33° ± 5.22) than FMS condition (17.62° ± 6.26;  $p = 0.01$ ) but not different than baseline (20.94° ± 4.7;  $p = 0.035$ ). Bar to body distance was not different between any conditions. **Discussion/Conclusion:** The results of this study suggest that practitioners using movement screens to identify movement dysfunction strongly consider whether they are seeing actual dysfunction or a lack of movement skill.

### 138. DAILY FUNCTIONAL ABILITY FOLLOWING A TRAUMATIC BRAIN INJURY AT 3, 6, AND 12 MONTHS POST DISCHARGE

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Traumatic brain injury (TBI) is one of the leading causes of death and disability in young adults. The incidence of TBI in the United States has been estimated at 1.7 million each year, resulting in over 50,000 deaths, an estimated 275,000 hospitalizations, and a startling 60 billion dollars in direct medical and indirect costs such as lost productivity.

**Purpose:** To assess daily functional ability of those with a TBI at discharge from rehabilitation and at 3, 6, and 12 months post discharge. **Method:** The Performance Assessment of Self-Care Skills (PASS) was used to assess functional abilities following a TBI and through the course of recovery. The PASS consists of core tasks in functional mobility, personal self-care, activities of daily living, cognitive abilities, and physical abilities and is administered by an Occupational Therapist. The participants were also assessed with cognitive measures (including RBANS and DKEFS) and a quality of life measure (TBI-QOL) upon discharge from rehabilitation and at 3, 6, and 12 months post discharge. **Results:** Out of the 18 participants at discharge, 7 individuals scored a 2.5 or below in one of the PASS areas. The highest score possible was a 3, which did not allow for participants to show much improvement during recovery. However, these results did not match with other assessments of functional abilities and the participant's self-reported recovery. **Conclusion:** It was determined that the PASS was not sensitive enough for this population at discharge from rehabilitation and at 3, 6, and 12 months post discharge. Future research should aim to determine a more sensitive and appropriate tool to assess activities of daily living in individuals who have suffered a TBI.

### 140. THE EFFECT OF DIFFERENT RESISTANCE TRAINING PROTOCOLS ON SKELETAL MUSCLE HYPERTROPHY AND CELL SIGNALING IN SPRAGUE-DAWLEY RATS

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**Purpose:** The primary purpose of this study was to determine the most effective resistance training protocol for inducing muscle hypertrophy in rats. A secondary purpose was to assess cellular signaling proteins involved in protein synthesis. **Methods:** Thirty two Sprague-Dawley rats were randomly divided into 4 groups: 1) control (CON), 2) resistance training 1 (RT1), 3) resistance training 2 (RT2) and resistance training 3 (RT3). Resistance training was performed using ladder climbing for 8 weeks. RT1 animals trained once per day every 3 days using 50%, 75% 90% and 100% of their previous maximal loads (training volume = 7 reps x 19 days = 133 reps). RT2 and RT3 began with a load equal to 50% of their body weight, then increased the next training session by 10% of their body weight. RT2 trained once a day every 2 days (15 reps x 28 days = 420 reps). RT3 animals trained twice a day every 3 days (15 reps x 2 times/day x 19 days = 570 reps). Flexor hallucis longus muscle mass, cross sectional area and the protein concentration of Akt and mTOR were assessed. Data was analyzed using one-way ANOVA with a Least Significant difference post hoc test ( $p < 0.05$ ). **Results:** FHL muscle mass and cross sectional area were greater in all RT groups compared to CON. Akt and mTOR total protein concentration were not different between RT groups, but the expression of both proteins were significantly elevated above CON. **Conclusion:** RT1, a low volume progressive resistance training protocol, is as effective as traditional high volume training protocols (RT2 and RT3) for inducing muscle hypertrophy in rats. This muscle hypertrophy appears related to increased expression of Akt and mTOR, however, further evaluation of protein synthetic pathways are warranted.

#### 141. HIP MOMENTS IN THE DOWNSWING: DIFFERENCES BETWEEN SKILL LEVELS AND RELATIONSHIP TO PELVIC KINEMATICS

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Research has shown that the ability to quickly accelerate the pelvis in the transverse plane early in the downswing is important for a successful golf swing. In order to produce this pelvic rotation, ground reaction forces must be applied to create a force couple. These external forces produce loads on the joints, which can have major implications for performance and injury. **Purpose:** To investigate the differences in sagittal plane hip moments in the downswing between golfers of different skill levels, and examine correlations between sagittal plane hip moments and transverse plane pelvic kinematics. **Methods:** 14 elite and 12 recreational male golfers were fitted with full-body retro-reflective markers. All kinematic data were collected using a 9-camera Qualisys motion capture system. Force plate data was collected simultaneously using two AMTI force plates. A FlightScope 3D Doppler radar was employed to collect ball flight measurements. Each participant hit five golf shots with a 5-iron. **Results:** There was a significant difference in the peak external lead hip extension moment (LHEM) between groups (elite=1.59±0.30 Nm/kg, recreational=1.30±0.41, p=0.047). There were moderate positive correlations between peak LHEM and average transverse pelvic acceleration (r=0.631, p=0.001), and peak trail hip flexion moment (THFM) and peak transverse pelvic velocity (r=0.485, p=0.012). Peak LHEM also had moderate positive correlations to shot distance (r=0.525, p=0.008), clubhead speed (r=0.511, p=0.011), and ball speed (r=0.536, p=0.007). **Discussion:** The results indicate that hip moments may be an important golf performance variable. All participants created an external LHEM and THFM in the early downswing. This implies that golfers must have adequate strength in lead hip flexor and trail hip extensor musculature to absorb these external loads and create the force couple needed to produce pelvic rotation. These results have implications for improving training interventions and injury prevention.

#### 143. EXPRESSION OF EXTRACELLULAR MATRIX-RELATED TRANSCRIPTS IN HUMAN MUSCLE FOLLOWING REPEATED BOUTS OF ECCENTRIC EXERCISE

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**Introduction:** Multiple bouts of eccentric exercise (EC) induce a protective adaptation in skeletal muscle, referred to as the repeated bout effect. Little is known regarding the mechanisms that underlie the repeated bout effect. **Purpose:** To determine how extracellular matrix (ECM) remodeling contributes to the repeated bout effect. **Methods:** Fourteen inactive men (n=7; 23.3 ± 2.1yrs; 178.5 ± 8.3cm and 84.8 ± 23.4kg) and women (n=7; 25.6 ± 2.5yrs; 166.0 ± 8.3cm and 76.6 ± 32.7kg) participated in this study. Subjects performed 2 bouts of EC separated by 28 days. Muscle biopsies were taken before the first bout (B1), and at 2 and 27 days post-B1. On the 28<sup>th</sup> day post-B1, subjects completed a second bout of EC (B2) and a muscle biopsy was taken 2 days post-B2. Isometric strength was assessed as a measure of muscle function and qRT-PCR was used to measure expression of genes associated with multiple levels of the ECM. **Results:** Maximal isometric force decreased significantly relative to the baseline measurement at 2- (25%), 3- (33%), and 4-d (27%) post-B1 and at 2- (17%) and 3-d (17%) post-B2. Isometric force recovered more quickly following B2 compared to B1 (3-d vs. 4-d). Expression of *Col1A1*, *Col3A1* and *Col4A1* were unchanged 2-d post-B1, but significantly increased by 5.7±2.5, 3.2±0.9, and 2.1±0.4 fold, respectively 27-d post-B1. The second bout of EC didn't effect expression of the collagen transcripts. Expression of *ITGA7* increased 4.6±1.5 fold 2-d post-B1, returned to baseline 27-d post-B1 and did not change following a second bout of EC. We found no significant changes in the laminin-encoding transcript *LAMB2* at any time-point. **Conclusions:** Force loss was attenuated following a second bout of EC indicating a repeated bout effect. The pattern of collagen and integrin mRNA expression suggests that ECM remodeling contributes to the repeated bout effect.

#### 142. A PILOT STUDY ON THE EFFECTS OF 13-WEEK EXERCISE INTERVENTION (IMPAACT) ON CARDIORESPIRATORY MARKERS IN POST-TREATMENT CANCER SURVIVORS

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Aerobic resistance training can have positive effects on heart rate (HR), blood pressure (BP), and aerobic endurance. However within a special population such as cancer survivors, the improvement of specific physiological variables may not be as substantial as physiological improvement in a healthy population. **Purpose:** The purpose of this study was to examine the effects of aerobic resistance training on resting HR, BP, and aerobic endurance in post-treatment cancer patients. **Methods:** Post-treatment cancer patients (n=9) participated in 13 weeks of exercise intervention with IMPAACT (Improving Physical Activity After Cancer Treatment), three sessions per week, for one-hour duration each session. The exercise sessions consisted of 15-20 minutes of aerobic exercise, 20-25 minutes of strength training, 5 minutes of balance exercises, and 10 minutes of stretching. Pre-assessment and post-assessment heart rate data was recorded using POLAR electrode transmitters. Aerobic endurance was assessed using the McArdle step test or the 2-minute step test. **Results:** Based on attendance, there was a significant relationship between sessions attended and improvement in resting HR (p=0.015). The results showed no significant change in pre or post assessment resting HR or BP after 13 weeks. There was a trend toward significance in aerobic endurance with the 2-minute step test (p=0.172). **Discussion:** Thirteen weeks of aerobic resistance training did not significantly improve resting HR or BP in subjects. The significance correlation between exercise session attendance and improved resting HR suggests that consistent exercise can have positive effects on resting HR within a population of cancer survivors. The trend towards significance seen with the senior step test shows increasing aerobic endurance in some participants, indicating that a longer exercise intervention could result in greater improvements in fitness. Future research could explore longer durations of exercise prescription, different intensities and methods of exercise and a larger subject pool.

#### 144. ACUTE RESISTANCE TRAINING RESPONSES FOLLOWING A HIGH PROTEIN OR MIXED CALORIE MEAL

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There is evidence that protein ingestion leads to a spike in insulin, which in the absence of carbohydrate could lead to a hypoglycemic response and impaired performance. **Purpose:** The purpose of this study was to compare responses to an acute resistance training bout following 8-12 hrs fasting (F), a high protein (HP; 0gFat, 2gCHO, 42gPro) or mixed Calorie (MC; 8gFat, 28gCHO, 3gPro) meal. **Methods:** Five resistance trained males performed 10 RM loads for 4 sets of machine squat, and 3 sets each of Leg press, leg curl, and Biodex knee extension under the 3 conditions in randomized, counterbalanced trials. Pre and post tests for each trial were conducted for blood lactate, glucose, and the Subjective Exercise Experiences scale (SEES). The total number of repetitions and rating of perceived exertion (RPE) for each exercise were recorded for each session. Knee extensions were performed on a biodex to measure peak torque, total work, and fatigue between sets. **Results:** Positive well-being scores on the SEES were significantly lower in F (16 ±5.34) compared to HP and MC (21±4.36; 20.2±2.95 p<0.05), and fatigue scores were higher in F (24.2± 2.17) compared to both HP and MC (17.2±3.27; 18.2±3.27 p<0.05) following exercise. Lactate increased pre to post in all conditions, but was not different between conditions. There were no differences in glucose, repetitions, or knee extension torque or work for any condition. **Conclusion:** Although meal type did not affect resistance training work or strength measures, both meal types resulted in better subjective feelings during a resistance training bout compared to fasting. Taking protein before exercise does not appear to affect exercise performance or physiological blood markers differently than eating a mixed Calorie meal. From this data it is recommended that some type of nutrient be ingested before resistance training to avoid negative subjective responses.

#### 145. THE EFFECT OF TEN DAYS OF HEAT ACCLIMATION ON EXERCISE CAPACITY DURING ACUTE ALTITUDE EXPOSURE (4350m)

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Acclimation to one environmental stressor may enhance adaptations to various other stressors in humans; this phenomenon has been described as cross-tolerance. Approaches to induce altitude acclimation in a relatively short time frame are needed, thus the purpose of our study was to examine the effect of heat acclimation (HA) on exercise capacity during acute altitude exposure (4350 m). Eight trained men residing at approximately 1600 m performed tests of maximal aerobic capacity ( $VO_{2max}$ ) at 1600 m and 4350 m, a 16 km time-trial (TT) (4350 m), and a heat tolerance test (1600 m) before and after a 10 d HA protocol (40°C, 20% RH). Blood samples were taken at rest pre- and post-HA to estimate changes in plasma volume with HA. Heat acclimation was achieved, as indicated by significantly lower post-exercise heart rates ( $p < 0.01$ ) and rectal temperatures ( $p = 0.042$ ) on the last versus the first day of HA. Heat acclimation did not alter plasma volume ( $p = 0.61$ ,  $1.8 \pm 9.9\%$ ) or  $VO_{2max}$  at 1600 m ( $4.02 \pm 0.58$  L/min vs.  $4.03 \pm 0.43$  L/min,  $p = 0.88$ ), or at 4350 m ( $3.40 \pm 0.33$  L/min vs.  $3.46 \pm 0.38$  L/min,  $p = 0.48$ ). Time-trial performance was improved by 27.6 sec after HA ( $p = 0.06$ ) at altitude, which was revealed to be a 95% worthwhile effect according to magnitude based statistics. Our findings do not support the use of HA to significantly improve  $VO_{2max}$  during acute altitude exposure. However, the improved TT performance suggests that HA was beneficial for adaptation to acute high altitude exposure (4350m).

#### 147. SINGLE LEG BALANCE OF SKATEBOARD VS. PUSH LEGS

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**INTRODUCTION:** Skateboarding may create balance differences between the stance and push legs. The requirements of transportation skateboarders are to skate a minimum of three times a week for at least one hour a day, over a six month period. This can influence leg balance via repetitive single leg specificity. **PURPOSE:** To compare single leg balance between stance and push legs of transportation skateboarders. **METHODS:** Ten skateboarders (age=  $22.40 \pm 1.90$  yrs; HT=  $177.20 \pm 7.41$  cm; mass=  $78.84 \pm 22.42$  kg; regular foot= 4; goofy foot= 6) participated in a single leg balance test on a Biodex Balance System that measured movement of the lower extremities. Three trials were conducted on the stance and push legs (2 practice trials and 1 recorded trial). Participants were instructed to balance on one leg for 20 seconds on an unstable surface (stability level=2). After completion, the opposite leg was tested. **RESULTS:** There were no balance differences between the stance and push legs in the four concentric zones surrounding absolute stable (zone A). However, ANOVA demonstrated a main effect for the time participants spent in the four zones. Zone A ( $76.15 \pm 10.82\%$ ) was greater than zone B ( $10.35 \pm 4.10\%$ ), zone C ( $5.60 \pm 2.82\%$ ), and zone D ( $7.90 \pm 6.81\%$ ). **CONCLUSIONS:** Based on these results, skateboarders were able to maintain stability on an unstable surface, yet there was no difference between stance and push legs. This may be a result of skateboarders spending a long duration of time in single or double leg balance stances, despite the need for interval single leg pushing. Future research should examine time spent in stance, strength and flexibility differences between legs.

#### 146. "GET FIT SENIORS", A SERVICE LEARNING EXPERIENCE IN KINESIOLOGY

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**Purpose:** The W.I.L.L. "Get Fit Seniors" is a community-based physical activity program that extends for six weeks, offers two one-hour sessions per week and it is offered twice a semester since its inception. Its purpose is to positively impact the overall health of older adults, and to provide an academic setting where students can offer a service to the community as they apply their knowledge and skills to assist this population. Emphasis of the intervention is placed on cardiovascular endurance, muscle strength, muscle endurance and flexibility. **Methods:** The program has served 100 older adult participants (mean age  $67.1 \pm 5.7$  years, mean height  $1.70 \pm 10$  m, mean weight  $76.81 \pm 20.9$  kg). 59 of the participants were females and 41 males. The senior fitness test was used twice to assess all participants. The first time was done at the beginning of each six-week period as a baseline; the second at the end of each six week program. After the assessment participants were we grouped based on their fitness and functional levels; a student assistant was assigned to each group, and was responsible of prescribing exercise to the group. Paired samples T-tests were done to compare test results at the beginning and end of each six-week period. **Results.** Results indicate differences in results for weight ( $t(11)=-.8170$ ,  $p = 0.05$ ; lower extremity muscular strength ( $t(11)=-.0128$ ,  $p = 0.05$ ; upper extremity ( $t(11)=-.0013$ ,  $p = 0.05$  and cardiovascular endurance ( $t(11)=-.1134$ ,  $p = 0.05$ ). Most participants increased their levels of fitness and functional levels. **Conclusions** Although the interventions were only two days a week for every six-week period, positive changes were observed in various fitness categories, supporting the premise that even small amounts of physical activity or exercise can have positive effects on older adults' health. An increase of physical activity was also observed after participating in the program.

#### 148. EFFECTS OF TWO REGIMENS OF HIGH INTENSITY INTERVAL TRAINING (HIT) ON ACUTE PHYSIOLOGICAL AND PERCEPTUAL RESPONSES

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High-intensity interval training (HIT) has demonstrated similar cardiovascular and metabolic adaptations versus endurance training (Burgomaster et al., 2008). Few studies, however, have investigated acute physiological changes during HIT. **Aim:** The aim of this study was to compare acute changes in heart rate (HR), blood lactate (BL),  $VO_2$ , calorie expenditure, level of enjoyment, and rating of perceived exertion (RPE) during two different modes of HIT. **Method:** Twelve active adults (four women and eight men), ages  $24.17 \pm 6.25$  years, initially performed a  $VO_{2max}$  test to determine workload for two different intensities of HIT on the cycle ergometer. The sprint interval training session (SIT) consisted of eight bouts of 30-seconds of all-out cycling at 130% of maximum watts. HIT consisted of eight 60 s bouts at 85% of maximum watts. The order of sessions was randomized for each subject. Heart rate,  $VO_2$ , lactate concentration, feeling, and rating of perceived exertion were continuously assessed throughout exercise. **Results:** Repeated measures ANOVA revealed a significant difference between HIT and SIT for  $VO_2$  ( $p < 0.001$ ), RPE ( $p = 0.03$ ), and blood lactate ( $p = 0.049$ ). Conversely, there was no significant difference between regimens for HR ( $p = 0.49$ ) or feeling ( $p = 0.12$ ). There was a significant difference ( $p = 0.002$ ) in calorie expenditure between regimens. **Conclusion:** During HIT, subjects burned significantly more calories and reported lower exertion than SIT. The higher  $VO_2$  and lower BL in HIT versus SIT reflected dissimilar metabolic perturbation between regimens, which may elicit unique adaptations long-term. Although not reflected in the results, six subjects insisted they preferred SIT versus HIT. Therefore, the preferred HIT regimen varies between persons and is dependent upon personality and potentially muscle fiber type. However, if an individual is seeking to burn more calories and to perceive less exertion during exercise, HIT is the recommended routine.

## 149. THE IMMEDIATE EFFECTS OF CORE STABILITY AND MOTOR CONTROL EXERCISES ON THE OVERHEAD DEEP SQUAT

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**Objective:** This study investigated the use of corrective exercises that attempt improve core stability and increase the functionality of the overhead deep squat. Using the overhead deep squat assessment of the Selective Functional Movement Assessment (SFMA)®, we screened for subjects who fell into the category of Stability and/or Motor Control Dysfunction (SMCD). A treatment program with exercises called rolling was implemented to increase muscle activation and motor control of the core muscles. **Design:** The control group and exercise groups consisted of 14 and 22 participants respectively who could not complete an overhead deep squat according to SFMA® criteria. **Methods:** This study was approved by the Loyola Marymount University (LMU) Institutional Review Board for Research involving Human Participants. A total of 60 individuals volunteered for the study (28 males and 32 females,  $21 \pm 1.56$  yrs, height  $170 \pm 10.6$  cm, BMI  $23 \pm 3.4$ ). All assessments were performed in the Human Performance Lab at LMU. **Interventions:** Participants in the control group were instructed to rest on the ground for ten minutes approximately the same amount of time it took for participants in the exercise groups to perform a series of flexion and extension rolling patterns. **Results:** Out of the 60 participants, 22 (36%) were able to complete the overhead deep squat during the initial assessment. All 14 participants who were separated into the control group showed no improvement upon reassessment. Of the 22 participants in the exercise group, 17 (77%) showed improvement in their overhead deep squat upon reassessment. **Conclusions:** Following the rolling exercises that focused on increasing core activation there was a 77% increase in participants that could complete the overhead deep squat upon reassessment. Future plans for this study includes increasing the subject pool to include more data and using the more researchers to maintain consistency when evaluating participants.

## 151. ACCUMULATION OF VERY LIGHT-INTENSITY PHYSICAL ACTIVITY OR STANDING DURING A WORKDAY REDUCES AMBULATORY BLOOD PRESSURE IN PREHYPERTENSIVE ADULTS

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**INTRODUCTION:** Accumulation of slow walking (1 mph) on a treadmill desk throughout a workday can lower ambulatory blood pressure (ABP) during and after work hours. The contribution of posture to this effect is unknown. **PURPOSE:** To compare ABP response to a worksite walking (WALK), standing (STAND), Cycling (CYCLE) and sedentary (SED) day in adults. **METHODS:** Nine overweight (BMI =  $29 \pm 3$  kg/m<sup>2</sup>) prehypertensive ( $130 \pm 15/76 \pm 11$  mmHg) adults ( $30 \pm 15$  yr) participated in this randomized repeated-measures study. Four conditions (WALK, STAND, CYCLE, SED) were randomly performed one week apart. WALK, STAND, and CYCLE conditions consisted of periodically increasing activity time to 2.5 hours over the course of an 8-hour work day. WALK (1.0 mph) and STAND (0.0 mph) were completed on a treadmill placed underneath a TREKDESK. During the CYCLE condition subjects pedaled on a Monark cycle ergometer at a cadence and energy expenditure equivalent to WALK. Subjects remained seated during the SED condition. Participants wore an ABP cuff (Oscar 2, SunTech Medical) from 8 am until 10 pm on all conditions. Linear Mixed Models were used to detect condition differences in systolic (SBP) and diastolic (DBP) blood pressure. Chi square was used to detect frequency difference of BP thresholds. **RESULTS:** There was a whole-day (during and after work hours) SBP and DBP treatment effect ( $P < 0.001$ ). SBP during STAND ( $132 \pm 4$  mmHg), WALK ( $133 \pm 5$  mmHg) and CYCLE ( $129 \pm 4$  mmHg) were lower when compared to SED ( $137 \pm 4$  mmHg) ( $P < 0.001$ ). CYCLE was lower than WALK ( $P = 0.003$ ). For DBP, only CYCLE ( $70 \pm 4$  mmHg) was lower than SED ( $73 \pm 4$  mmHg;  $P = 0.008$ ). Compared to SED, WALK, STAND and CYCLE reduced SBP load (% of readings  $> 140$  mmHg) by 5%, 4%, and 14%, respectively ( $P < 0.005$ ). **CONCLUSION:** Compared to sitting, accumulating 2.5 h of light physical activity or standing during an 8-h workday may help reduce ABP during and after work hours.

## 150. FOCUS OF ATTENTION EFFECTS ON FORCE PRODUCTION DURING OLYMPIC LIFTS

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Successful completion of a snatch requires the lifter to apply forces sufficient to displace the bar high enough that they can catch it in an overhead squat position. Therefore, instructions for this lift should emphasize application of force. Previous studies have reported that instructions which direct the attentional focus of the performer externally yield greater improvements in performance than instructions which direct the participant's attentional focus internally. However, how attentional focus affects the forces generated by the lifter has not been examined. **Purpose:** The purpose of this study is to examine how focus of attention affects vertical ground reaction forces in the snatch. **Methods:** Eight experienced lifters (age: 24.5 years, experience lifting: 3.1 years) performed snatch lifts under baseline (B), internal (IF), and external focus of attention conditions (EF). Vertical force production was measured using an in-shoe plantar pressure system. **Results:** Peak force was not different between conditions (B:  $2241.8 \text{ N} \pm 559.8$ ; IF:  $2316.8 \pm 491.0 \text{ N}$ ; EF:  $2345.7 \pm 475.8 \text{ N}$ ;  $p = 0.575$ ). Propulsive impulse was lower in the EF condition than in the baseline condition (EF:  $611.2 \pm 66.7 \text{ N*s}$ ; B:  $667.1 \pm 67.2 \text{ N*s}$ ;  $p = 0.009$ ). But there were no differences in propulsive impulse between EF and IF condition (IF:  $624.9 \pm 71.9 \text{ N*s}$ ;  $p = .395$ ). **Discussion:** The results of this study suggest focus of attention cues affect the impulses but not peak forces generated during the snatch. Future analysis should combine force production with kinematics of the lift to better understand attentional focus effects on performance outcomes.

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