

**2013 Annual Meeting
Central States Chapter
Of the
American College of Sports Medicine**



**October 17th & 18th, 2013
University of Central Missouri
Warrensburg, Missouri**



**AMERICAN COLLEGE
of SPORTS MEDICINE.**

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Meeting Information

Intended Audience

ACSM members, students and professionals interested in the field of sports medicine and exercise science.

Meeting Objectives

At the conclusion of this activity, participants should be able to:

- Recognize contemporary controversial issues related to sports medicine, exercise science, and health promotion
- Apply knowledge of the effects of exercise on diseases such as Alzheimer's
- Demonstrate knowledge of cardiovascular disease risk in football players
- Be able to design and mater presentation techniques
- Identify new approaches to, and perspectives on, problems in exercise science and sports medicine through interaction among scientists and clinicians in related fields.
- Provide a forum for members and students to present research related to exercise science and sports medicine
- Recognize the importance of research in understanding problems related to physical inactivity.

ACSM continuing Education Credits (CEC's)

The American College of Sports Medicine's Professional Education Committee certifies that this annual meeting meets the criteria for 10 credit hours of ACSM continuing education credit. Credit is awarded for these CECs by attending the Central States Chapter ACSM Annual Meeting. The Central States ACSM is an approved Provider of CEC for the ACSM. A certificate documenting completion of 10 CEC's is at the back of this program.

Name Badges

Name badges must be worn at all times to gain admittance in the poster session, educational sessions, and ACSM social events. Please hold on to your badge!

Future Meeting Site

The next meeting will be held in October 2014 under the direction of Dr. Andrew Fry, University of Kansas. Exact location to be determined.

Welcome to the Annual Meeting of the Central States Chapter of the American College of Sports Medicine. This year's meeting emphasizes exercise, physical activity, and nutrition on physical and mental health. The meeting begins with a very exciting presentation on "*Exercise, The Magic Bullet*" by internationally known and sought after speaker Dr. Len Kravitz from the University of New Mexico. Following this will be two very stimulating presentations regarding the effect of exercise on psychological factors. The first presentation will be brought by Dr. Jeff Burns, leading researcher in the field of Alzheimer's disease. Following this will be Dr. Joe Weir from the University of Kansas with an enlightening presentation on exercise and brain function regarding fatigue. After a short break, Ms. Ashley Binns from the University of Arkansas will bring information regarding dietary thermogenesis followed by four outstanding student presentations. Following Thursday's presentation please check out the poster session in the Ballroom as students and professionals exhibit their recent research and be sure to attend the always lively Student Quiz Bowl where each of the schools in the chapter will be showing their academic prowess in a competition for cash awards and most importantly bragging rights.

Friday morning we will kick off the day with Dr. Mike Israetel presenting fitness characteristics and performance followed by a presentation by Dr. Len Kravitz that no one should miss that wants to put pizzazz into their next presentation. After a short break, Dr. Susan Sisson will bring information to us regarding a much needed and important topic of how child care centers influence on health and physical activity. Honor award Recipient Dr. Jeff Potteiger will follow Dr. Sisson with a presentation on Football and cardiovascular disease risk.

Lunch, provided by the chapter and sponsored by The Gatorade Sport Science Institute, will be served in the Union Ballroom. During this time our featured Gatorade speaker Ms. Michelle Macedonio will be speaking on nutrition's role in recovery from injury. Ms. Macedonio is a licensed and registered dietitian and Board Certified Specialist in Sports Dietetics, and is the owner of *Nutrition Strategies*®.

After lunch, professionals members should be sure to attend the business meeting while students are encouraged to attend a special presentation to learn about an often overlooked but critical part of their future related to job search, salary negotiation, and opportunities for employment at the student meeting. Following these sessions the final presentation of the day will be a lively one led by Dr. Stavoros Kavouras, an expert and notable researcher in the field of hydration and performance. Enjoy the CSACSM Annual Meeting and Welcome to the Campus of the University of Central Missouri!

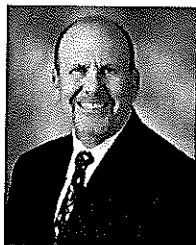
Steve Burns, Ph.D.

Past-President CSC ACSM

**A Special thank you to the Central States ACSM Board of Directors
For all of the contributions**

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**Central States Chapter
Of the
American College of Sports Medicine
FALL 2013 MEETING SCHEDULE**

Thursday, October 17th, 2013

10:00-11:45	Registration	Hall Outside Union 236/238
11:45-12:00	Greetings from University of Central Missouri President Dr. Chuck Ambrose Opening remarks: Steve Burns, PhD, Past-President CSC ACSM	Union 236/238
12:00-1:00	Keynote Speaker Len Kravitz, PhD University of New Mexico <i>Exercise the Magic Bullet</i>	Union 236/238
1:00-1:15	Break	
1:15-2:00	Jeff Burns, MD University of Kansas Alzheimer's Disease Center <i>Evidence for Exercise in the Fight Against Alzheimer's Disease</i>	Union 236/238
2:00 - 2:45	Joe Weir, PhD University of Kansas <i>Fatigue – Brain, Muscles, and Semantics</i>	Union 236/238
2:45-3:00	Break	
3:00 - 3:45	Ashley Binns, MS, PhD candidate University of Arkansas <i>Dietary Thermogenesis: A Small Percentage of Energy Expenditure with a Large Impact</i>	Union 236/238
4:00 - 5:00	Student Presentations Undergraduate: Jenna M. Burchfield University of Arkansas <i>Hydration Biomarkers: Creating a New Hydration Assessment Technique</i> Masters: Sam Robert Emerson Kansas State University <i>Changes in Cardiopulmonary Function During Exercise From Pre-to-Post Puberty</i> Doctoral: Mike Lane University of Kansas	Union 236/238

*mTor Pathway Phosphorylation and Endocrine Responses
Following Heavy Resistance Exercise with Leucine and Whey
Protein Supplementation*

Doctoral: Larissa Boyd
Oklahoma State University

*The Acute Effects of Whole-Body Vibration Training or
Walking on Hamstring Flexibility in Older Adults*

5:15	Poster Presentations	Union 240
6:30	Quiz bowl President: Joe Pujol, PhD, FACSM Southeast Missouri State University	Union 236/238

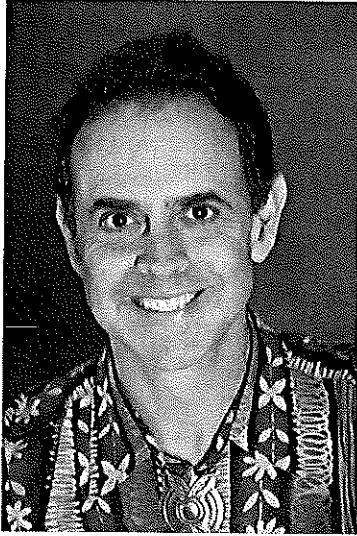
Friday, October 18th, 2013

8:30-8:45	Greeting from University of Central Missouri, College of Health, Science & Technology, Dean Alice Griefe Opening remarks: Steve Burns, PhD, Past-President CSC ACSM	Union 236/238
8:45-9:30	Mike Israetel, PhD University of Central Missouri <i>Fitness Characteristics and Sport Performance</i>	Union 236/238
9:30-10:15	Len Kravitz, PhD University of New Mexico <i>Mastering Presentations</i>	Union 236/238
10:15-10:30	Break	
10:30-11:15	Susan Sisson PhD University of Oklahoma <i>Child Care Center Influence on the Health and Health Behaviors of Preschoolers</i>	Union 236/238
11:15-12:00	Jeff Potteiger, PhD, FACSM Grand Valley State University <i>Can Playing American Football Increase the Risk For Cardiovascular and Metabolic Disease?</i>	Union 236/238
12:00-1:30	Lunch	Union 240
12:45-1:15	Gatorade Speaker (Lunch) Michele Macedonio, MS, RD, CSSD, LD Nutrition Strategies <i>Nutrition's Role in Recovery and Rehabilitation of Injured Athletes</i>	Union 240

1:30-2:15	Professional Business Meeting - Andy Fry, PhD, University of Kansas	Union 240
1:30-2:15	Student Meeting - Jason Wagoner PhD and Jeremy Barnes PhD Southeast Missouri State University <i>Employment Trends in the Fitness Industry</i>	Union 236
2:15-2:30	Break	
2:30-3:15	Stavoros Kavouras, PhD, FACSM, FECSS University of Arkansas <i>Hydration and Performance, New Data in an Old Story</i>	Union 236/238
3:15	Closing Remarks - Steve Burns, PhD University of Central Missouri	Union 236/238

Featured Keynote Speaker

Len Kravitz, PhD



Len Kravitz received his Ph.D. in Health, Physical Education and Recreation from the University of New Mexico (UNM) in 1994. From 1996-99 he served as the Program Director of Exercise Science and Graduate Coordinator of Wellness at The University of Mississippi. Since 1999 he has served as Coordinator of Exercise Science, in the Dept. of Health, Exercise and Sports Sciences, at UNM. Dr. Kravitz is recognized and highly respected nationally and internationally for his contributions to the fitness and health industry. He has published 32 refereed journal articles and recently completed the 10th edition of his popular textbook, Anybody's Guide to Total Fitness. Len has authored 200 articles in peer-reviewed professional journals in addition to several monographs, text chapters and manuals. Since arriving at UNM, he has co-authored over 30 peer-reviewed articles with Exercise Science students. Dr. Kravitz was the first person (1987) to be

awarded the "Fitness Instructor of the Year" award from IDEA (The Health and Fitness Organization of the United States) and in 1999 the Canadian Fitness Professional Organization, the largest fitness organization in North America, awarded him the distinguished "International Presenter of the Year" award, and in 2006 he was given the prestigious honor of being selected Fitness Educator of the Year by the American Council on Exercise (2006). In 2008, Dr. Kravitz was awarded the Canadian Fitness Professional Association Lifetime Achievement Award. Dr. Kravitz has delivered 37 research-related presentations and over 200 invited lectures on fitness, health and exercise science at international conferences in Portugal, Spain, Taiwan, Brazil, Germany, Italy, Australia, Canada, Japan, England, Norway and the United States. His teaching philosophy is straightforward: "In all of my teaching approaches and strategies, I strive to guide students and professionals so they will love to learn, and continue learning."

Featured Gatorade Speaker (Lunch)

Michele A. Macedonio, MS, RD, CSSD, LD



Michele Macedonio, MS, RD, CSSD, LD, a licensed, registered dietitian and Board Certified Specialist in Sports Dietetics, is the owner of *Nutrition Strategies®*, a nutrition consulting business in Cincinnati, Ohio providing communications, education, and individual counseling in nutrition for sports and physical performance, cardiovascular health, and wellness. Michele earned her Bachelor of Science degree in Home Economics and Dietetics from Marywood College, completed her dietetic internship as

a commissioned officer in the US Public Health Service, holds two Masters degrees, Nutrition and Health Sciences Education, from Case Western Reserve University, and has been a sports dietitian and nutrition consultant for over 25 years.

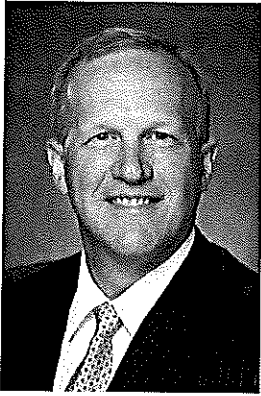
An active member of the Academy of Nutrition and Dietetics (AND), formerly the American Dietetic Association, and its dietetic practice group, Sports, Cardiovascular and Wellness Nutrition (SCAN), Michele has held numerous leadership positions including

- 10 years as Editor-in-chief of *SCAN'S PULSE*, professional publication
- 2004-2005 as SCAN Chair, and
- Director of Sports Dietetics-USA from 2008-2013

Michele is the 2007 recipient of SCAN's highest honor, the *SCAN Achievement Award*. In addition to providing nutrition consulting to individual professional and elite level athletes, Michele has served as the team dietitian for two professional soccer teams, the *Cincinnati Bengals* NFL football team, the *Cincinnati Reds* MLB baseball team, and Xavier University Men's Basketball Team. Michele also provides nutrition consultation, presentations, and marketing communications to food and beverage industry.

Michele is the author of numerous articles and book chapters on nutrition for sports and performance and is co-author of *The Athlete's Guide to Making Weight*, published by Human Kinetics, 2009.

Honor Award Recipient

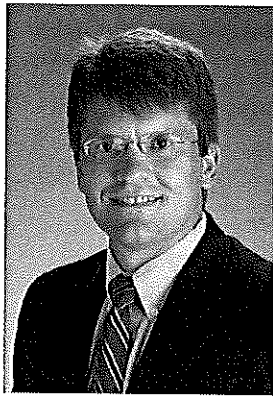


Jeffrey A. Potteiger, Ph.D., FACS

Jeffrey A. Potteiger, Ph.D., FACS is currently the Dean of Graduate Studies and Professor of Movement Science at Grand Valley State University. He received his Ph.D. from Auburn University, his M.S. degree from McDaniel College, and his B.S. degree from Indiana University of Pennsylvania. Dr. Potteiger has been a faculty member at Indiana State University, the University of Kansas, Virginia Commonwealth University, and Miami University. He has over 100 published research articles, books, and book chapters. Dr. Potteiger has served in university administrative roles as a graduate program director, department chairperson, dean, and associate provost for research. Dr.

Potteiger was a member of the Central States Chapter of ACSM from 1993-2001 having served as Chapter President in 1996-97. Dr. Potteiger has been a member of the Board of Trustees for ACSM and serves as chairperson of the Health and Fitness Advisory Committee. In his current role at GVSU, he provides leadership, oversight, and support for all aspects of graduate education.

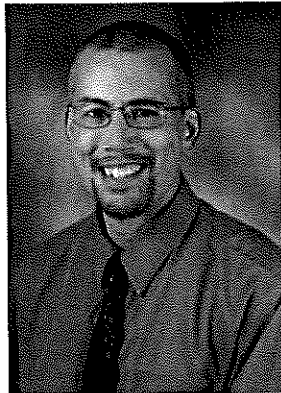
Session Presenters



Jeffrey M. Burns, MD

Jeffrey M. Burns, MD is the Edward H. Hashinger Professor of Neurology and the Associate Director of the University of Kansas Alzheimer's Disease Center. Dr. Burns also directs the Clinical and Translational Science Unit and is the Associate Director of the Heartland Unit for Neuroscience Trials. Dr. Burns graduated with a degree in English and Japanese from the University of Notre Dame and attended medical school at the University of Kansas School of Medicine. After medical school, Dr. Burns completed his residency in neurology at the University of Virginia followed by a post-doctoral fellowship in Alzheimer's disease at Washington University in St. Louis. Dr. Burns

completed his Masters of Science in Clinical Research at the University of Kansas School of Medicine. Dr. Burns and his wife grew up in Prairie Village, KS. After training, Dr. Burns returned to the Kansas City area to start a research program focused on the treatment and prevention of Alzheimer's disease. The program has grown tremendously since then and is now recognized as one of the 29 nationally-designated Alzheimer's Disease Centers.



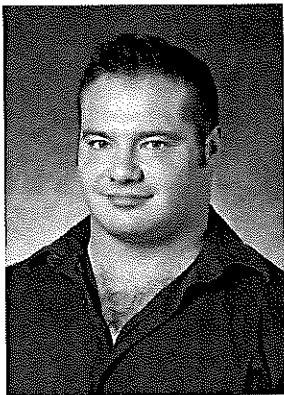
Joe Weir, PhD

Joseph Weir received his PhD in exercise physiology from the University of Nebraska-Lincoln. Dr. Weir is professor and chair of the Department of Health, Sport, and Exercise Sciences at the University of Kansas. Previously, he was on the faculty at Des Moines University and at Teachers College, Columbia University. He is a Fellow of the American College of Sports Medicine and the National Strength and Conditioning Association. His primary research interests focus on muscle strength and muscle fatigue.



Ashley Binns, MS

Ashley Binns is a second year doctoral student at the University of Arkansas. As an undergraduate, she was a dual major in Nutrition and Kinesiology, with a concentration in fitness specialization. In 2012, she completed her Master's degree in Exercise Science, where her thesis research examined the thermic effect of food in recreationally active females, based on protein content of a meal. Most recently, she has had the opportunity to work on a project examining dietary thermogenesis among normal weight and overweight children, based on protein content of breakfast. She intends to apply findings from these studies to her current interests, focusing on aging research and education with an emphasis on the interactive effects of protein consumption and exercise to reduce the rates of sarcopenia.



Michael Israetel, PhD

Assistant professor, University of Central Missouri- born in Moscow, Russia, earned his PhD in Sport Physiology at East Tennessee State University, where he also served as a strength coach and sport scientist to Division I Athletes. Michael's educational background complements his experiences as a competitive powerlifter and bodybuilder. While his greatest passion is teaching, Michael also takes great pride in his nutritional and training consultation to elite strength and combat athletes around the world, experiences which he regularly parlays into classroom lessons.



Susan B. Sisson, PhD, CHES

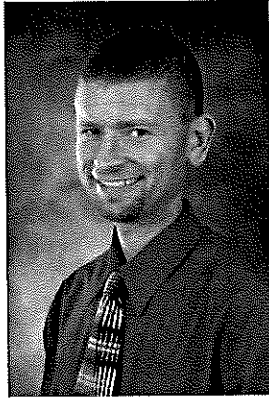
Dr. Sisson conducts her research in the Behavioral Nutrition and Physical Activity Laboratory in the Department of Nutritional Sciences at the University of Oklahoma Health Sciences Center. Research in the lab focuses on physical activity and sedentary behavior epidemiology and related risk behaviors such as the consumption of poor quality food. Other research interests include the influence of the physical and social environment on food consumption and physical activity behaviors and the impact of sedentary lifestyle on chronic diseases such as obesity as well as intervention development and evaluation to combat sedentary lifestyle and poor food choices. Children and disadvantaged populations are of particular interest.



Stavros A. Kavouras, PhD, FACSM, FECSS

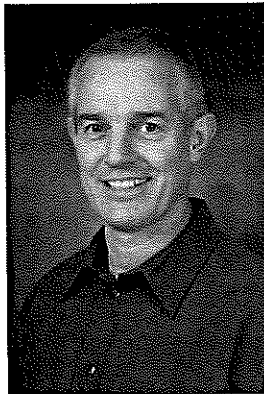
Dr. Stavros Kavouras is an Assistant Professor at the University of Arkansas. He is an expert in the area of hydration and its effects on both health and exercise performance. Dr. Kavouras' training includes: Post-doctorate in Human Physiology from Yale University, School of Medicine; Ph.D. in Human Exercise Physiology from the University of Connecticut, Human Performance Laboratory, and Master of Science in Exercise Physiology and Nutrition from University of Colorado at Colorado Springs. Dr. Kavouras is the author of more than 75 peer review articles and book chapters and he has given lectures in more than 20 countries around the world. He is a Fellow of the American College of Sports Medicine & the European College of Sports Science and elected member of the American Physiological Society.

Student Meeting Presenters



Jason Wagganer, PhD

Dr. Wagganer is entering his fourth year as an Assistant Professor at Southeast Missouri State University, teaching courses within the undergraduate Health Management and graduate-level Nutrition and Exercise Science programs. These courses include Health Perspectives, Research Methods, Exercise Physiology, Kinesiology, Physiology of Conditioning, Exercise in Health and Disease and Cardiovascular Exercise Physiology. His research interests lie in the area of cardiovascular disease risk factors as they relate to post-exercise blood lipid and lipoprotein concentrations. In 2000, he obtained the Health/Fitness Specialist certification offered by the American College of Sports Medicine. Prior to coming to Southeast, Dr. Wagganer was an assistant professor at Greensboro College while completing his PhD at the University of North Carolina at Greensboro.



Jeremy Barnes, PhD

Dr. Jeremy Barnes is a professor and Coordinator in the Department of Health, Human Performance and Recreation at Southeast Missouri State University. He teaches courses in the BS in Health Management and the MS in Nutrition and Exercise Science Programs. He is certified as a Health/Fitness Specialist by the American College of Sports Medicine. His research interests include body composition assessment and the evaluation of health promotion programs. He has directed health promotion and wellness programs in corporate, community, and university settings.

Abstracts

Student Oral Presentations

THE ACUTE EFFECTS OF WHOLE-BODY VIBRATION TRAINING OR WALKING ON HAMSTRING FLEXIBILITY IN OLDER ADULTS

L.J. Boyd & B.H. Jacobson, FACSM. *Oklahoma State University, Stillwater, Oklahoma. email: larissa.boyd@okstate.edu

Older adults become less independent with age due to decreases in muscle mass, muscular power, neuromuscular facilitation, and range of motion. An estimated one in three older adults over the age of 65 experience a fall annually. As a result, hip fractures may occur, which are fatal in 12%-20% of cases. **PURPOSE:** The purpose of this study was to compare the immediate effects of Whole Body Vibration (WBV) and walking on flexibility in individuals over age 65. **METHODS:** Participants ($N=24$) over the age of 70 years ($M=77.80\pm 8.64$ years) were randomly assigned to a control group (CG), vibration training group (VG), or walking group (WG). Hamstring flexibility was tested at pre- and post-test utilizing the modified sit-and-reach. Each group received an intervention between measurements. Subjects in the CG sat for 10 minutes, WG participants walked for 10 minutes, and the VG completed a 10 minute vibration program at level five. **RESULTS:** A group by time interaction did occur on the left ($F=11.36$, $p=.000$, $\eta^2=0.52$) and right ($F=3.47$, $p=.05$, $\eta^2=0.25$) hamstrings. Mean differences from pre- to post-test indicated significant improvements in right hamstring flexibility ($p<.05$) in the walking group from pre- ($M=-10.32\pm 3.61$ cm) to post-test (5.56 ± 3.35 cm). Changes in the vibration training group approached significance ($p=.079$). Left hamstring flexibility significantly improved in the VG from -1.91 ± 3.56 inches to -0.32 ± 3.61 cm and WG from -11.27 ± 3.56 cm to -5.88 ± 3.61 cm ($p<.05$). **CONCLUSION:** When comparing flexibility among all three groups, walking provided the largest improvement in flexibility. However, the WG began at a lower level of flexibility than the other two groups, while the VG possessed the highest level of flexibility at pre-test. Evidence suggests both WBV and walking could improve flexibility in older adults over 70 following a 10 minute intervention. Further research should examine the benefits of chronic training in order to expand empirical knowledge of WBV training and flexibility in older adults.

HYDRATION BIOMARKERS: CREATING A NEW HYDRATION ASSESSMENT TECHNIQUE

Jenna M. Burchfield, Matthew S. Ganio, Stavros A. Kavouras, FACSM, J. D. Adams¹, Melina A. Gonzalez, & Christian B. Ridings; ¹Human Performance Laboratory, Department of Health, Human Performance, and Recreation, University of Arkansas, Fayetteville, Arkansas

Despite the necessity of euhydration, an optimal, user-friendly, accurate hydration assessment technique fails to exist for the general population. **PURPOSE:** The purpose of this study was to investigate a new hydration assessment technique, which utilizes no equipment or technical expertise to administer. We hypothesized that the number of urine voids over a 24-hr time period correlates to hydration status. **METHODS:** Forty-seven healthy individuals ($n=24$ females) participated (age 22 ± 4 years, body mass 76 ± 17 kg, height 1.64 ± 0.27 m, body fat $20.4\pm 8.7\%$). Participants abstained from caffeine and alcohol during the experiment. Participants were educated on how to record diet, fluid intake, and void output measurements. For 24-hours participants voided at a normal urge into a standard medical-grade container. Participants indicated volume, time, and urge of each void. *Ad libitum* fluid and food intake also were recorded over the 24 hrs. Total 24-hr urine volume, osmolality, specific gravity (USG), and color were measured. Subjects were classified as euhydrated ($USG\leq 1.020$) or hypohydrated ($USG>1.020$) according to standard criteria. **RESULTS:** Euhydrated ($n=41$) versus dehydrated ($n=6$) individuals had more voids (6 ± 2 versus 4 ± 1 , respectively, $P=0.02$), greater 24-hr urine volume (2007 ± 863 versus 1193 ± 434 ml, $P<0.001$), lower urine color (2 ± 1 versus 4 ± 1 , $P<0.001$), lower USG (1.012 ± 0.004 versus 1.023 ± 0.003 , $P<0.001$), and lower osmolality (431 ± 143 versus 841 ± 137 mOsm/kgH₂O, $P<0.001$). As hypothesized, void number moderately correlated to hydration status as identified by USG ($r=0.37$, $P<0.001$), and osmolality ($r=0.38$, $P<0.001$). **CONCLUSION:**

Void number positively correlated with USG and urine osmolality. This indicates that individuals with higher void numbers are more hydrated than those with lower void numbers over a 24-hr time period. Using void number as a hydration biomarker could be an optimal technique for the general public to self-assess hydration, considering it is as simple as counting void numbers over a 24-hr period.

Funding provided by the University of Arkansas College of Education & Health Professions and the Office of Research & Economic Development.

CHANGES IN CARDIOPULMONARY FUNCTION DURING EXERCISE FROM PRE- TO POST-PUBERTY

Sam Robert Emerson¹, Stephanie P. Kurti¹, Sara K. Rosenkranz², Joshua R. Smith¹, & Craig A. Harms¹, FACSM ¹Departments of Kinesiology and ²Human Nutrition, Kansas State University, Manhattan, Kansas

Ventilatory constraint, i.e. expiratory flow limitation (EFL), during exercise leads to an increased work of breathing, dyspnea, respiratory muscle fatigue, and adverse cardiovascular outcomes which can all affect exercise tolerance. EFL is due to an imbalance between pulmonary capacity and ventilatory demand during exercise. We have recently reported that EFL is highly prevalent in prepubescent children and is much greater than that reported in adults. It is unknown how maturation from pre- to post-puberty affects pulmonary function, specifically EFL, during exercise. **PURPOSE:** Therefore, the purpose of this longitudinal study was to investigate the changes in cardiopulmonary function from pre- to post-puberty. **METHODS:** Nineteen children (ages 12-16 yrs; 10 boys, 9 girls) were recruited from 40 prepubescent children who completed testing in our lab ~5 years ago. Subjects completed pulmonary function tests (PFTs) before and after an incremental exercise test to exhaustion (VO_2max) on a cycle ergometer. EFL was determined using the percent tidal volume (V_T) overlap method. **RESULTS:** Sixteen of the 19 subjects (8 boys, 8 girls; 84%) exhibited EFL pre-puberty. Six of the 19 subjects (4 boys, 2 girls; 32%) exhibited EFL post-puberty. Of the subjects that experienced EFL post-puberty, all had experienced EFL pre-puberty. Forced vital capacity (FVC) significantly increased (~100%) from 2.1 ± 0.4 L (mean \pm SD) at the pre-puberty assessment to 4.3 ± 0.7 L at the post-puberty assessment. Absolute VO_2max significantly increased (~125%) from 1.09 ± 0.3 L/min to 2.38 ± 0.6 L/min; relative VO_2max significantly increased (~23%) from 32.4 ± 8.4 ml/kg/min to 38.1 ± 7.3 ml/kg/min. Maximal ventilation significantly increased (~120%) from 46.4 ± 10.3 L/min to 98.6 ± 20.8 L/min. V_E/V_{CO_2} coupling at VO_2max significantly decreased (~12%) from 43.5 ± 6.4 at pre-puberty to 37.5 ± 4.0 at post-puberty. **CONCLUSION:** These data suggest that the prevalence of EFL declines as children mature from pre- to post-puberty, likely due to greater increase in lung volume (FVC) than increases in $V_E\text{max}$ and VO_2max , accompanied by a decrease in V_E/V_{CO_2} coupling. This increase in pulmonary function at maximal exercise may contribute to the improved exercise capacity seen in adolescents and adults compared to children.

MTOR PATHWAY PHOSPHORYLATION AND ENDOCRINE RESPONSES FOLLOWING HEAVY RESISTANCE EXERCISE WITH LEUCINE AND WHEY PROTEIN SUPPLEMENTATION

M.T. Lane, T.J. Herda, A.C. Fry, M.A. Cooper, M.J. Andre, P.M. Gallagher, J.L. Seeman. University of Kansas, Applied Physiology Laboratory, Lawrence, KS Email: mlane@ku.edu

Leucine ingestion, via circulating insulin, reportedly activates skeletal muscle activation of the mTOR pathway, contributing to a hypertrophy response. There is limited evidence of this occurring for humans in response to heavy resistance exercise. **PURPOSE:** To compare the post-resistance exercise effects of leucine and whey protein supplementation on muscle mTOR pathway phosphorylation and the endocrine profile. **METHODS:** Twenty recreationally active males ($X \pm S D$; Age = 27.8 ± 2.8 yrs, Hgt = 1.78 ± 0.07 m, Wgt = 81.3 ± 11.0 kg) served as subjects. On visit 1, subjects gave a muscle biopsy of the vastus lateralis m. (baseline) and were tested for 10 repetition maximum (RM) on leg press and leg extension machines to determine baselines for strength and skeletal muscle Akt(S473), mTOR(S2448) 4E-BP1(Thr70), P70S6K(Thr 421), and S6(5G10) phosphorylation. Prior to biopsy, serum samples were collected and subsequently analyzed via ELISA for cortisol, glucose and insulin. On visit 2, subjects were randomized to ingest either leucine+whey protein (10g+10g; supplement) or a non-caloric placebo. Visit 3 was 3-5 days after the baseline session in a double-blind crossover design where subjects were given either the placebo or supplement with the order being randomized. During this visit, 5 sets of 10 RM were performed on the leg press and leg extension. Immediately after completion of each training session, subjects ingested the placebo or the supplement, followed by a serum sample 30 min and muscle biopsy 45 min later. The procedure was repeated 7-9 days later utilizing the opposite drink. SDS-PAGE and western blots were used to

quantify total and phosphorylated signaling proteins. A one way repeated measures ANOVA was used to determine the differences between each group ($\alpha < 0.05$; * > baseline; † > placebo). **RESULTS:** Phosphorylation of each signaling protein for both conditions were normalized to baseline for each subject ($X \pm S D$ baseline = 1.00 ± 0.0). Relative phosphorylations were as follows; Akt, supplement = $1.33 \pm 0.34^{*†}$, placebo = $1.12 \pm 0.32^{*}$; p70s6k, supplement = $24.69 \pm 24.29^{*}$, and placebo = $15.66 \pm 13.67^{*}$; S6, supplement = $135.17 \pm 121.16^{*†}$, and placebo = $66.86 \pm 67.45^{*}$. No differences were reported for mTOR or 4E-BP1. Insulin ($\text{pmol} \cdot \text{L}^{-1}$) was 15.4 ± 17.3 , $85.6 \pm 69.9^{*†}$, and 22.5 ± 29.2 for baseline, supplement, and placebo, respectively. No differences were observed for cortisol or glucose. **CONCLUSION:** Supplementation of leucine plus whey protein directly after heavy resistance exercise increases the anabolic signaling in the muscle more than placebo ingestion.

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Undergraduate Student Poster Presentations

1. HABITUAL AND MAXIMUM GAIT SPEEDS AMONG SEDENTARY, RECREATIONALLY ACTIVE, AND MASTERS ATHLETE OLDER ADULTS

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Gait speed predicts survival rates in older adults with faster speeds indicating better survival. Previously, gait speed has been evaluated in geriatric populations, but comparisons of these less active populations to masters athletes (MA) are currently unclear. **PURPOSE:** Therefore the purpose of this study was to evaluate gait speed measures among sedentary (SED), recreationally active (RA), and MA older adults. **METHODS:** Groups of SED ($n = 20$, age = 61.0 ± 5.8), RA ($n = 57$, age = 63.5 ± 8.4), and MA ($n = 25$, age = 57.5 ± 7.9) participated in this study. SED and RA groups were established based on outcome scores on the Rapid Physical Activity Questionnaire and MA were categorized based on involvement in sanctioned, athletic competition within past 6-months. Subjects were asked to complete four different gait tasks: habitual speed (HS), fast speed (FS), dual-task habitual speed (DT-HS), and dual-task fast speed (DT-FS). Timing gates were used to record gait speed (s) over a 10-meter distance. Participants started 5-meters before the start gate and ended 5-meters after the stop gate. During the DT-HS and DT-FS, subjects were asked to count down backwards from a given number by three's until reaching the finish line. Two trials were recorded for each task and average speed was calculated. **RESULTS:** MA (2.08 ± 0.63 m/s) had significantly ($p < .05$) higher FS compared to SED (1.94 ± 0.30 m/s) or RA (1.99 ± 0.53 m/s). Similar differences were observed for DT-FS (SED = 1.77 ± 0.32 m/s, RA = 1.80 ± 0.51 m/s, MA = 1.89 ± 0.63 m/s). MA also had significantly smaller changes between FS and DT-FS speeds compared to SED (12%) and RA (13%). No significant differences were noticed for HS or DT-HS among groups. **CONCLUSION:** MA are able to reach higher maximal gait speeds compared to SED or RA older adults which is important as the ability to increase and maintain gait speed have been suggested to predict mortality rates. Interestingly, MA better maintained maximal gait speed when presented with a dual-task component, indicating MA may more efficiently maintain cognitive patterns with age.

2. THE INFLUENCE OF TRAINING STATUS ON PEAK FIRING RATES DURING MULTIPLE REPETITIVE ISOMETRIC TRAPEZOID MUSCLE ACTIONS AT 50% OF MAXIMAL VOLUNTARY CONTRACTION

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PURPOSE: This study examined motor unit (MU) peak firing rates (PFR) and duration of MU activity of the vastus lateralis (VL) in resistance trained (RT) and aerobically trained (AT) individuals during repetitive contractions. **METHODS:** Five RT (5 males; age = 25 ± 4 yrs) and 5 AT (2 males and 3 females; age = 19 ± 1 yrs) volunteered for this study. The RT could back squat \geq twice their body weight (207.5 ± 27.5 kg) and the AT ran an average distance of 61 ± 15 miles \cdot h^{-1} . Electromyography (EMG) sensor (Delsys, Boston, MA) was placed over the VL. Each participant completed 3 isometric maximal voluntary contractions (MVC) prior and 1 following the repetitive tasks. The isometric trapezoid muscle actions at 50% MVC were calculated from the highest MVC (peak force [N]). For the isometric trapezoid muscle actions, the force was increased at a rate of 10% MVC/s to the desired force level for 12 s followed by a decrease of 10% MVC/s back to baseline. The muscle action was performed 20 consecutive times or until the desired force level was not matched (8 s rest between contractions). Decomposition of the the surface EMG signals were used to extract the peak firing events of single MUs. The PFR (pulses per second [pps]) and duration of MU activity (s) were calculated for each MU. A two-way mixed factorial ANOVA (training [AT vs. RT] x time (pre vs. post)) was used to examine differences in MVCs. A two-way mixed factorial ANOVA (training [AT vs. RT] x repetition (1st vs. Final)) was used to examine differences in PFR and duration of MU activity. **RESULTS:** The five AT were able to successfully complete 20 repetitive muscle actions, however, none of the RT were able to complete the 20 muscle actions (mean \pm SD, 14.0 ± 4.8). There was no change pre- (480.8 ± 149.5 N) to post-MVC (426.2 ± 96.2 N) for the AT ($P = 0.158$), however, MVC decreased (pre = 1035.4 ± 197.1 N, post = 667.0 ± 102.2 N) for the RT ($P = 0.002$). For PFR, there was a decrease from the 1st to last repetition for the AT ($P = 0.001$, 1st = 21.0 ± 4.3 pps, 20th = 19.4 ± 5.2 pps) and RT ($P = 0.008$, 1st = 19.0 ± 4.2 pps, last = 18.1 ± 4.8 pps), however, duration of MU activity decreased from the 1st to last repetition for only the RT

($P < 0.001$, $1^{\text{st}} = 14.8 \pm 2.1$ s, last = 13.2 ± 2.0 s) and not for the AT ($P = 0.124$, $1^{\text{st}} = 16.1 \pm 1.6$ pps, $20^{\text{th}} = 16.0 \pm 1.5$ s). Finally, the 1^{st} and last repetition PFR and duration of MU activity were greater for the AT than the RT ($P < 0.001$). **CONCLUSION:** The AT had greater PFR and longer duration of MU activity than the RT. PFR decreased in a similar manner during the repetitive tasks for the AT and RT, however, MVC and duration of MU activity decreased for the RT but not for the AT. Thus, duration of MU activity may be a more sensitive indicator of fatigue than PFR.

3. PERCENTAGE OF POSITIVE LEFT VENTRICULAR HYPERTROPHY IN ANAEROBIC, AEROBIC, AND SEDENTARY MALES.

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Different intensities of exercise such as aerobic and anaerobic activities may have different effects on the heart. The aim of this research was to explore the differences of aerobic, anaerobic, and sedentary lifestyles on left ventricular hypertrophy (LVH) and QRS axis. **PURPOSE:** The purpose of this study was to discover if aerobic athletes, anaerobic athletes or sedentary individuals have different Electrocardiograms. **METHODS:** Ten sedentary males ages 18-25 volunteered for this study and underwent a resting 12-lead EKG assessment. EKGs previously conducted in 2011 from football (anaerobic $n=12$) and cross country (aerobic $n=10$) males were used to determine heart axis and left ventricular hypertrophy (LVH) of the heart. LVH was determined by a subject meeting the criteria for one of the three formulas. Formulas were: sum of the depth of S wave in V1 + height of R wave in V5 or V6 $> 35\text{mm}$, R wave in lead aVL $> 11\text{-}13\text{mm}$, and increased QRS voltage measured as the R wave in the lead I + S wave in lead III $\geq 25\text{mm}$. The QRS axis was determined by using the Hexaxial Diagram. Normal QRS axis ranges from -30° - $(+100^\circ)$. **RESULTS:** Left ventricular hypertrophy was observed in 30% of anaerobic athletes (3/10), 25% of the aerobic athletes (3/12), and 20% of the sedentary group (2/10). The mean QRS axis was 82.5 for anaerobic and aerobic athletes and 70.2 for the sedentary group. **CONCLUSION:** The anaerobic group had a higher percentage of subjects that were positive for LVH. There seems to be more cases of LVH in anaerobic than aerobic to be LVH positive. The QRS was in the normal range for all three groups.

4. MEASUREMENT OF MAXIMAL FORCE EXERTED BY FEMALES DURING ASSISTED PULL-UPS

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The pull-up (PU) is a common exercise used to strengthen the upper body (UB). However, females often do not have enough UB strength to perform an unassisted PU (UPU). One method of assisted PU is to have the feet supported by a spotter and the lifters use their legs to help reduce the weight lifted by the UB. It has not been quantified how much actual resistance is experienced by the UB using this method. **PURPOSE:** To measure the maximal force exerted by the UB while performing a set of assisted PUs with pronated (PUP) and supinated (SUP) hand grips. **METHODS:** 12 females (mean \pm SD: age= 22 ± 2 y; height= 63.7 ± 3.8 in; weight= 142 ± 25 lb) participated. All participants performed an initial test to verify that they could not perform 10 UPU. Participants then performed 2 sets of 10 PU (1 PUP, 1 SUP) in randomized order on a PU bar attached to a force plate. Maximal force exerted during each PU was normalized to body weight (BW). **RESULTS:** A 2 X 10 (grip X repetition) repeated measures ANOVA was performed to evaluate differences. There was no significant difference in maximal force experienced between grips ($P = 0.13$) but there were significant differences in maximal force over the course of the ten repetitions ($P=0.002$). **CONCLUSION:** Females, on average, lifted 93% of their BW during PUP and 98% of their BW during SUP. As the number of repetitions increased, the % of BW lifted decreased showing a pattern of fatigue. While using a lat pull-down machine or an assisted PU machine would be more ideal for accurate measurement of training load, this information could be used by strength coaches to estimate the approximate training load for this type of assisted PU if those devices are not available.

5. A COMPARISON OF TWO UNDULATING PERIODIZATION PROGRAMS: DAILY VS. INTRA-WORKOUT

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Resistance training has long been used as a means of increasing muscular strength. Coaches, athletes, and fitness enthusiasts alike are continually searching for training methods that will maximize results. Undulating periodization, which manipulates training variables such as sets, repetitions, and intensity on a weekly or monthly basis, is a common practice used by those attempting to optimize training outcomes. In recent years, two variations on this type of training - daily undulating periodization and intra-workout undulating periodization - have become popular training protocols. However, there has been little research comparing the two methods. **PURPOSE:** The purpose of this investigation was to compare a six-week intra-workout undulating periodization program (IWUP) with an intensity-matched, six-week daily undulating periodization program (DUP) on measures of strength in recreationally active young adults. **METHODS:** Ten participants were randomized into two groups (IWUP and DUP). Each participant completed estimated one-repetition maximums (1-RM) on three exercises (machine bench press, machine hack squat, and machine bicep curl) which were used to determine workloads for the program. Both groups performed those same three exercises, for the same number of sessions (2 times/week for 6 weeks), and exercise sets (3 sets of each exercise). The differences were that IWUP completed one set of five repetitions (1x5) at 70% 1-RM, 1x10 at 60% 1-RM and 1x15 at 50% 1-RM for all 3 exercises, during every training session. DUP completed 3x5 at 70% 1-RM for each exercise on the first day of training, 3x10 at 60% 1-RM on the second day, and 3x15 at 50% 1-RM on the third day. This pattern was repeated every three training sessions. Estimated 1-RMs were again performed at the end of each program. **RESULTS:** Independent sample t-tests on gain scores revealed no differences between groups on machine bench press ($t=-.200$, $p=.846$), machine hack squat ($t=.448$, $p=.667$), or machine bicep curl ($t=.343$, $p=.740$). **CONCLUSION:** This study was not able to demonstrate any differences between the two periodization programs on strength gains on the measured lifts. Therefore, the choice of which one to use may be dependent upon the personal preferences of the coach, athlete, or fitness enthusiast.

6. THE EFFECTS OF CAFFEINE ON AEROBIC AND ANAEROBIC EXERCISE

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Nutritional supplementation of caffeine as a pre-workout additive has become a widely used substance to enhance anaerobic and aerobic performance, especially in physically active individuals. **PURPOSE:** The purpose of this study was to examine the effects of caffeine on anaerobic and aerobic exercise. **METHODS:** Ten physically active male individuals in the ROTC program at the University of Central Missouri were recruited to perform two Wingate tests, 48 hours apart. One trial they ingested a supplement with caffeine (MiO Energy) and the other trial with the placebo (MiO Liquid Water Enhancer), which did not contain caffeine. Subjects then performed two tests using the Astrand submax single stage bike protocol to estimate VO_2 max, 48 hours apart in which one trial they ingested the caffeinated supplement and one trial without caffeine using the placebo. **RESULTS:** The anaerobic testing used the 30-second Wingate test at approximately equal peak power outputs for caffeine ingestion vs. the placebo (1099.00 watts/kg \pm 1.51, 1094.64/kg \pm 1.51 respectively). The mean VO_2 max testing were 3.25 l with caffeine versus 3.48 l using the placebo. **CONCLUSION:** The hypothesis that the ingestion of caffeine as pre-workout supplements having a positive effect on anaerobic performance but does not help aerobic activity was not supported by the data. Wingate testing measurement of peak power indicated no significant difference using caffeine versus the placebo. The results of the aerobic testing indicated equal mean VO_2 max levels for caffeine ingestion vs. the placebo.

7. STIMULATE THE BODY THOROUGH PRE-WORKOUT

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Recent use of pre-workout supplements has increased exponentially giving rise to the need for well controlled studies to determine if using pre-workout supplements enhances an individual's workout. **PURPOSE:** The purpose of this study was to determine the acute effect a pre-workout supplement has on heart rate, mental focus, and one rep. maximum when performing a bench press. **METHODS:** This was a single blind study using; 12 participants who regularly exercised (11 males, 1 female) but did not already take a pre-workout supplement were studied. Variables measured were heart rate (HR), mental focus, and one rep. maximum. Participants came for a total of four

visits; an introduction, a control (C) trial (water), an experimental (E) trial (single serving of Juggernaut™), and a placebo (P) trial (sugar water) was ingested. **RESULTS:** Mean values for 1RM were C= 89.02 kg ± 24.90 kg; E=94.50 kg ± 27.05 kg; P= 92.42 kg ± 26.54 kg. Mean values for HR were C=125.83 ± 19.68 bpm; E= 136.333 ± 18.41; P= 132.75 ± 17.96. Mean values for mental focus were C= 95.917% ± 6.156%; E= 97.625% ± 3.724; P= 97.292% ± 2.701%. **CONCLUSION:** These results suggest that an individual's heart rate, mental focus, and one rep maximum on bench press will increase after taking the pre-workout supplement.

8. BATTLE OF THE SEXES: ARE MEN REALLY STRONGER THAN WOMEN WHEN COMPARING THEIR FAT FREE MASS?

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The comparison between males and females has always been apparent, especially in the aspect of strength. The current experiment is designed to test this comparison. **PURPOSE:** The purpose of this experiment was to compare the lean muscle efficiency of ROTC females versus ROTC males. **METHODS:** Fourteen ROTC subjects volunteered for this study, (eight males and six females). The subjects were (age 20 ± 3 years) all members of the ROTC program at the University of Central Missouri. A Bod Pod test was performed to estimate body fat as well as a VO_{2max} treadmill test relative to lean muscle mass, to determine maximum oxygen consumption. A treadmill and a Pavaromedics Metabolic Cart was used to measure VO_{2max} and consisted of the subjects running until volitional exhaustion. **RESULTS:** The results from these tests were used to determine VO₂ consumed relative to fat free mass (FFM) in order to compare the two sexes. The data collected indicated that males had an efficiency ratio of 61 ± 5.21 ml/kgFFM/min and females had an efficiency ratio of 61.18 ± 5.21 ml/kgFFM/min. **CONCLUSION:** It was concluded that females' lean muscle were equally as efficient as males' when body fat was absent from data collection.

9. THE INFLUENCE OF RESISTANCE AND AEROBIC TRAINING ON MOTOR UNIT CONTROL PROPERTIES DURING AN ISOMETRIC TRAPEZOID MUSCLE ACTION AT 70% OF MAXIMAL VOLUNTARY CONTRACTION

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PURPOSE: The purpose of this study was to examine motor unit (MU) control strategies of the vastus lateralis (VL) between resistance trained (RT) versus aerobically trained (AT) individuals. **METHODS:** Five RT (5 males; age = 25 ± 4 yrs, body mass = 96 ± 20 kg) and 5 AT (2 males and 3 females; age = 19 ± 1 yrs, body mass = 56 ± 10 kg) volunteered for this study. The RT individuals performed 4 - 8 h·wk⁻¹ of resistance training and could back squat ≥ twice their body weight (207.5 ± 27.5 kg). The AT individuals performed 7 - 10 h·wk⁻¹ of running with an average distanced run of 61 ± 15 miles h·wk⁻¹. Electromyography (EMG) sensor (Delsys, Boston, MA) was placed over the VL. Each participant completed 3 isometric maximal voluntary contractions (MVC). The isometric trapezoid muscle action at 70% MVC was calculated from the highest MVC. For the isometric trapezoid muscle action, the force was increased at a rate of 10% MVC/s to the deserved force level for 12 s followed by a decrease of 10% MVC/s back to baseline. Decomposition techniques were applied to the surface EMG signals to extract action potentials and the firing events of single MUs. For each MU, the recruitment (REC) and derecruitment (DEREC) thresholds and firing rates at recruitment (IFR) and peak firing rates (PFR) were calculated. Linear regressions were performed on the IFR and PFR versus REC and the REC versus the DEREC. Statistical procedures were performed on the linear regression coefficients to examine possible differences between the RT and AT. **RESULTS:** All relationships were significant with the R² ranging from 0.40 to 0.75. For IFR and PFR versus REC relationships, there were no significant differences (P > 0.05) between slopes for the RT (mean ± SE, -0.113 ± 0.010, -0.298 ± 0.024) and AT (-0.114 ± 0.008, -0.311 ± 0.017). In contrast, the Y intercept for the PFR versus REC for the AT (32.4 ± 0.791) was greater (P < 0.05) than the RT (29.8 ± 0.978). For the DEREC versus REC, the RT (1.13 ± 0.051) had a significantly greater slope (P < 0.05) than the AT (0.77 ± 0.034). **CONCLUSION:** The data from the present study indicated within muscle differences between individuals as a function of training status. The AT had greater peak firing rates across the force spectrum (i.e., greater Y intercept value) than the RT individuals. In addition, the RT individuals tended to derecruit MUs at higher force levels (i.e., greater slope value) than initial recruit force levels in comparison to the AT individuals and, thus, suggesting there was greater MU potentiation in the RT individuals.

10. THE INFLUENCE OF TRAINING STATUS ON FIRING RATES AT RECRUITMENT DURING TWO CONSECUTIVE ISOMETRIC TRAPEZOID MUSCLE ACTIONS AT 50% OF MAXIMAL VOLUNTARY CONTRACTION

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PURPOSE: This study examined motor unit (MU) firing rates (FR) at recruitment threshold of the vastus lateralis (VL) in resistance trained (RT) and aerobically trained (AT) individuals during two consecutive contractions. **METHODS:** Five RT (5 males; age = 25 ± 4 yrs) and 5 AT (2 males and 3 females; age = 19 ± 1 yrs) volunteered for this study. The RT could back squat \geq twice their body weight (207.5 ± 27.5 kg) and the AT ran an average distance of 61 ± 15 miles h^{-1} . Electromyography (EMG) sensor (Delsys, Boston, MA) was placed over the VL. Each participant completed 3 isometric maximal voluntary contractions (MVC). The isometric trapezoid muscle actions at 50% MVC were calculated from the highest MVC. For the isometric trapezoid muscle actions, the force was increased at a rate of 10% MVC/s to the deserved force level for 12 s followed by a decrease of 10% MVC/s back to baseline. The muscle action was performed twice with 8 s rest between contractions. Decomposition of the the surface EMG signals were used to extract the firing events of single MUs. The FR (pulses per second [pps]) and force at recruitment, expressed as a percentage of MVC (%MVC), were calculated for each MU. A two-way mixed factorial ANOVA (training [AT vs. RT] x repetition (1st vs. 2nd)) was used to examine differences in FR and recruitment thresholds. **RESULTS:** For FR, there were no differences ($P = 0.180$) between the 1st and 2nd repetition for RT (mean \pm SD, 1st = 6.5 ± 1.5 pps, 2nd = 6.6 ± 1.7 pps) and AT (1st = 7.2 ± 1.8 pps, 2nd = 7.4 ± 1.9 pps), however, the AT had overall higher FR than the RT ($P < 0.001$). For recruitment thresholds, the force at which the MUs were recruited decreased from the 1st to 2nd repetition for the AT ($P < 0.001$, 1st = 30.0 ± 13.0 %MVC, 2nd = 27.1 ± 11.7 %MVC) and RT ($P < 0.001$, 1st = 29.8 ± 10.2 %MVC, 2nd = 26.3 ± 10.3 %MVC). Finally, there were no significant recruitment threshold differences for the 1st ($P = 0.539$) and 2nd ($P = 0.540$) repetition between AT and RT. **CONCLUSION:** The AT had greater FR than the RT, however, there was no change in FR at recruitment from the 1st to 2nd muscle action. In contrast, there were no differences in recruitment thresholds between AT and RT, but the recruitment thresholds were lower for the 2nd muscle action in comparison to the 1st muscle action. Therefore, FR at recruitment may be influenced by training status, however, the downward shift in recruitment thresholds in a repetitive task is unlikely to be influenced by training.

11. WII FIT ACTIVE 2TM EXERCISE EFFECTS ON HEART RATE AND VO₂ ON NCAA ATHELETES AND SEDENTARY INDIVIDUALS

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People assume that since the Wii Fit Active 2TM claims it gets them off the couch, it is considered a substantial workout. People do not know if the Wii Fit Active 2TM meets the standards set by the American College of Sports Medicine (ACSM) for the recommended minimum amount of kcals used per week. **PURPOSE:** The purpose of this study was to see if athletes and sedentary met the minimum kcal expenditure of 700 kcals per week set by ACSM. **METHODS:** Eight sedentary and eight athletes from the University of Central Missouri performed a 20-25 minute Wii Fit Active 2TM workout in the Human Performance Lab while being connected to the metabolic cart to measure their VO₂ and heart rate. **RESULTS:** The study found that athletes used 5.7 ± 1.6 kcals per minute which means they would have to work out for 123 minutes per week to reach 700 kcals. Sedentary individuals used $4.2 \text{ kcals} \pm 1.4$ per minute which means they have to work out 167 minutes per week to reach the minimum ACSM recommendations. The study also found that the average heart rate of an athlete was 60.75% percent of their age predicted maximum heart rate and the sedentary group was 73.43% of their max heart rate. **CONCLUSION:** The athletes and sedentary both would meet minimum guidelines for physical activity if they completed 123 minutes and 167 min respectively in conjunction with the Wii Fit routine.

12. COMPARISON OF KINETIC AND KINEMATIC VARIABLES DURING JUMP STATION AND MARKERLESS MOTION CAPTURE VERTICAL JUMPS

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A previous study conducted in our lab revealed a significant difference in vertical jump measures obtained by using a standard jump station and markerless motion capture. **PURPOSE:** The purpose of this study was to determine if kinematic and kinetic variables contributed to differences in vertical jump height. **METHODS:** Seventeen recreationally active college subjects (9 male, 9 female) volunteered to participate in this study. Subjects reported to a motion capture facility for one testing session. Following a five minute jog warm-up, subjects completed three randomized trials of three different jumps. One jump required the subject to focus on a target they had to reach for on the jump station, another required the subject to look forward as they jumped to the target on jump station, while one jump did not use the jump station. One minute of rest was taken between jumps; five minutes rest was taken between jumping trials. All jumps were initiated from a standard two-legged stance with a countermovement. Each jump was filmed using a 14-camera marker-less motion capture system. **RESULTS:** Repeated measures analysis of variance (ANOVA) tests revealed significant differences in right hip and both right and left ankle joint torque measures across trials, as well as significant differences in the minimum hip, knee, and ankle joints across trials. These differences were observed specifically between the jumps performed with the markerless motion capture system as subject jumped freely and not for a specific target, and when they jumped at the jump station.

Joint Torque

Right Hip	$F(2,32)=3.311, p<0.05$
Right Ankle	$F(2,32)=8.569, p<0.05$
Left Ankle	$F(2,32)=3.881, p<0.05$

Joint Angle

Right Hip	$F(2,32)=73.90, p<0.05$
Left Hip	$F(2,32)=20.12, p<0.05$
Right Knee	$F(2,32)=65.61, p<0.05$
Left Knee	$F(2,32)=73.16, p<0.05$
Right Ankle	$F(2,32)=6757, p<0.05$
Left Ankle	$F(2,32)=2590, p<0.05$

CONCLUSIONS: Understanding lower body kinematics that may influence kinetic variables such as joint torque, and how these variables could change determining on the type of jump testing used could provide critical information for proper vertical jump assessment.

13. CHANGES IN STRENGTH AND POWER VARIABLES FROM PRE- TO POST-COMPETITIVE SEASON IN COLLEGIATE CHEERLEADERS

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Research performed on cheerleading focuses on injury rates. There is minimal research about strength and power levels of cheerleaders (CL) and how these variables change during a season. These variables may be a factor for the high injury rates experienced by CL. **PURPOSE:** To measure body composition, strength, and vertical jump ability before and after a cheerleading season. **METHODS:** 36 collegiate CL (23 Females; age = 20 ± 1 y; height = 65 ± 3 in; weight = 124 ± 18 lb; 13 Males; age = 22 ± 2 y; height = 69 ± 2 in; weight = 176 ± 25 lb) were assessed for % body fat, isometric maximal strength using a mid thigh pull (IP) and a shoulder press (IPR), and vertical jump ability in both static (SJ) and countermovement (CJ) conditions at the beginning of their competitive season and after their final competition (~ 4 months). These CL had regular practices, but no organized strength program. Body composition was determined using standardized 7 site protocols. 3 repetitions of IP and IPR were performed maximally for 5 seconds on a force plate and the maximal force obtained was normalized to body weight and averaged. 3 repetitions of SJ and CJ were performed on a force plate and jump height was averaged. **RESULTS:** 2 x 2 (Gender X Pre/Post) repeated measure ANOVAS were performed for each variable. Only CJ height significantly decreased from the preseason to postseason (Table 1). **CONCLUSION:** This study is the first to

evaluate CL's strength levels using the IP and IPR providing normative data for comparison with other athletes. The CL maintained strength levels throughout the season without an organized strength program. However, the CL experienced a decrease in CJ performance that could have an influence on their ability to perform stunts during competition.

Table 1: Pre- and Post-Season Measurements.

Gender	% Body Fat		Isometric Press (Force/Body Weight)		Isometric Pull (Force/Body Weight)		Static VJ (in)		Countermovement VJ (in)	
	M (13) F (23)		M(13) F(23)		M(12) F(20)		M (12) F (22)		M (12) F (22)	
Mean ±SD										
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Male	10.8* ±3.5	10.0* ±3.9	1.0* ±0.1	1.0* ±0.1	2.6* ±0.5	2.6* ±0.6	13.6* ±3.2	12.9* ±2.8	16.7* ±2.9	16.1* ±2.7‡
Female	16.6 ±3.7	16.5 ±3.1	0.7 ±0.1	0.7 ±0.1	1.8 ±0.4	1.8 ±0.4	10.0 ±1.8	9.8 ±1.2	11.8 ±1.5	11.5 ±1.2‡

* = Significantly different ($P < 0.05$) than females

‡ = Significantly lower ($P < 0.05$) than pretest values

14. DETERMINING MOVEMENT VELOCITY USING FILM CAPTURE APPLICATIONS

Tony Ramos, Joseph Sherman, Scott Richmond; Missouri State University

PURPOSE: The purpose of this study was to test the validity of an application that measures velocity of objects by video capture while comparing it to a proven velocity calculation by using the movement of a barbell during a Power Clean. **METHODS:** Five previously resistance trained participants volunteered for the study. Participants completed an approved Informed Consent document before testing. Body Weight (BW) was taken and calculation of 50% and 75% of BW was performed. Participants completed 3 repetitions (reps) of power clean at 50% of their BW and 3 power cleans at 75% of their BW with a minute rest in between each rep. Two different devices were used to determine movement velocity of the reps. The first device utilized the application that measures velocity directly by video capture. The second device used an application that allowed for hand calculations of velocity by video capture and simple conversions. **RESULTS:** An independent samples T-test showed that the 50% reps showed significant differences between the two applications ($p=.040$), and the 75% reps showed no significant differences between the two applications ($p=.155$). **CONCLUSION:** Higher percentages of body weight performed during a power clean showed no significant differences between the two applications, while lower percentages showed significant differences. This preliminary data leads us to believe that the application may be more accurate with heavier weights due to decreased movement velocities. A follow-up study involving larger sample sizes and percentages of body weight needs to be performed to further explore these findings.

15. THE RELIABILITY OF A COMMERCIAL ACCELEROMETER UNIT DURING ANAEROBIC TESTING OF COMPETITIVE ATHLETES

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Accelerometers are a tool that can be used to objectively measure frequency, duration, and intensity of a physical activity and exercise. An easily accessible tool such as an accelerometer could be beneficial to a widespread range of athletes. **PURPOSE:** This aim of the present study was to test the reliability of designated G-force measures obtained by a commercial accelerometer. **METHODS:** Fourteen competitive athletes (10 male, 4 female) volunteered to attend one anaerobic testing session. At the beginning of the session athletes completed a required warm-up consisting of a 5 minute jog, stretching of major muscle groups, and two progressive 50 yard sprints. After the warm-up the accelerometer was placed on the athletes' back between the shoulder blades and anchored at two points with adhesive. Athletes then completed two 40 yard dashes with a 5 minute rest interval between trials. **RESULTS:** Data from the accelerometer unit was analyzed using software created by the unit developer. Based on the G-forces recorded by the accelerometer unit, the software created explosion, right-left symmetry, efficiency, and propulsion scores. Paired samples t-tests determined no significant differences between trial 1-trial 2 scores for explosion [$t(13)=0.186, p<0.05$], right-left symmetry [$t(13)=0.181, p<0.05$], efficiency [$t(13)=-1.984, p<0.05$], and propulsion [$t(13)=-1.969, p<0.05$]. **CONCLUSION:** The lack of significant difference in these measures shows the test/re-test reliability of the Impulse accelerometer.

16. EFFECTS OF ACUTE DIETARY NITRATE CONSUMPTION ON RUNNING PERFORMANCE ASSESSED IN 'REAL-WORLD' ENVIRONMENT

Andrew J. Sheets & Brian S. Snyder, Truman State University, Kirksville, Missouri

Dietary nitrate supplementation has been shown to lower the oxygen cost of exercise and improve exercise performance. **PURPOSE:** The purpose of this study was to determine if dietary nitrate supplementation in the form of beetroot juice 'shots' improved 5 kilometer race performance in an ecologically valid race-like setting. **METHODS:** 11 male and 2 female runners ran two 5k races, two weeks apart in a double blind, crossover design in which they drank 2 x 70 mL 'shots' of concentrated beetroot (~8 mmol Nitrate) juice or a nitrate-depleted beetroot juice placebo 2.5 hours before each race. **RESULTS:** Beetroot juice consumption resulted in a significantly slower 5k race performance (1371+/-253 s vs. 1350+/-249 s, $P=.042$). There was no significant difference between the kilometer split times. **CONCLUSION:** Our study found acute dietary nitrate consumption in the form of beetroot juice resulted in a significantly slower 5k race performance.

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17. THE RELATIONSHIP BETWEEN BODY FAT PERCENTAGE AND SWEAT LOSS

Kate E Smith, Ty H. Balty, Megan N. Fortney; University of Central Missouri, Warrensburg, Missouri

Society has developed a negative association between body fat and amount of sweat produced during exercise. **PURPOSE:** The primary purpose of this study was to explore the relationship of body fat and sweat volume during exercise. **METHODS:** Participants were 6 males and 3 females between the ages of 18 and 22. Subjects ingested a Temperature pill (HQInc. Plametto FL) two hours prior to exercise. Subjects were weighed and assessed for body fat percentages, which ranged from 7.4% to 42.3% (mean = 18.2%). To determine pre-trial hydration subjects were assessed for urine specific gravity, then cycled at moderate intensity for 45 minutes. Subjects cycled in the same temperature-controlled room set at 25.5°C. Core temperature was recorded every 5 minutes. After exercise, subjects were weighed to calculate total sweat loss during exercise. **RESULTS:** Sweat loss of subjects ranged from -0.4 to 0.7kg. The mean sweat loss was 0.3kg. In testing for a relationship between body fat percentages and sweat loss a Pearson correlation was conducted [$R^2 = .02, p = .668$]. **CONCLUSION:** These results suggest that body fat percentage is not related to sweat volume during exercise.

18. A COMPARISON OF HIGH- AND LOW-VELOCITY RESISTANCE TRAINING: IMPACT ON BALANCE CONFIDENCE AND EXERCISE SELF-EFFICACY

Cody Sadowsky, Antonio Ross, Melissa Powers & Paul House; University of Central Oklahoma, Edmond, OK

Falls are currently a considerable health problem among the elderly population. **PURPOSE:** The purpose of this study was to determine if high-velocity resistance training improves balance confidence and exercise self-efficacy more than low-velocity resistance training. It was expected that high-velocity training would have a greater impact on balance confidence and exercise-self efficacy than low-velocity training. **METHODS:** A group of 14 participants (age 71 ± 6 years) were randomly assigned to a high-velocity (HV) or low-velocity (LV) resistance training group. The HV group was instructed to lift the weight "as quickly as possible", and then lower over 2-3 seconds. The LV group lifted the weight over a 2-3 second period and lowered over 2-3 seconds. The participants trained for 12 weeks at 60% of 1-repetition maximum. The subjects completed eight exercises that targeted all major muscle groups. The Activities-specific Balance Confidence Scale and the Self-efficacy for Exercise Scale were administered at baseline, 6-weeks, and 12 weeks. Repeated measures ANOVA were used to analyze differences between groups over time. **RESULTS:** Researchers found no significant interaction or main effects for balance confidence or exercise self-efficacy ($p > .05$). Due to the small sample size, univariate effect sizes were calculated for each variable. A small decrease in balance confidence occurred over the 12 weeks ($d = 0.30$), while a moderately large effect was observed for exercise self-efficacy ($d = 0.81$). **CONCLUSION:** In this study, both high and low velocity resistance training resulted in a slight decline in balance confidence and exercise self-efficacy. The decline may be due to the fact that participants were high functioning and began with high levels of confidence and self-efficacy. The resistance training intervention may have made participants more aware of their balance and activity limitations. Some of the limitations of this study include high functioning participants, small sample size, and short time frame of the study (12 weeks).

19. EFFECTS OF EXERCISE ON BONE DENSITY

K. Stone, D. Brocksmith, and S. Burns; University of Central Missouri, Warrensburg MO

Having a high bone density is important to reduce the risk for osteoporosis and fractures. Therefore, it is important to understand the effects of different modes of exercise on bone mineral density (BMD). **PURPOSE:** The purpose of this study was to determine which type of exercise may be most effective in increasing BMD (football vs. swimming). **METHODS:** Participants were 15 male football players and 8 male swimmers. The subjects total was measured by using a dual-energy X-ray absorptiometry (DEXA, Lunar Prodigy, GE) machine in the Human Performance Lab on the campus of the University of Central Missouri. **RESULTS:** The results were that the average BMD of football players ($1.42\text{g/cm}^2 \pm 0.08\text{g/cm}^2$) was higher than the average BMD of the swimmers ($1.25\text{g/cm}^2 \pm 0.10\text{g/cm}^2$) with a P value of < 0.05 . **CONCLUSION:** The results suggest that athletes who participate in high-impact exercise weight bearing (football players) have a higher bone density than athletes who participate in low-impact non-weight bearing exercise (swimmers).

20. THE RESPONSE OF HEART RATE IN INDIVIDUALS WITH DEVELOPMENTAL AND/OR INTELLECTUAL DISABILITIES WHEN PERFORMING A WALKING EXERCISE WITH AND WITHOUT WALKING STICKS

Jessica Stout, Ken Bias; University of Central Missouri, Warrensburg MO

Individuals with developmental and/or intellectual disabilities need just as much if not more physical activity when compared to individuals without developmental and/or intellectual disabilities. **PURPOSE:** To promote a healthy lifestyle behavior in individuals with developmental and/or intellectual disabilities by comparing the average heart rates with and without walking sticks. **METHODS:** For this study, Transformation Health Responsibility Independence Vocation Education (THRIVE) students (N=20) at the University of Central Missouri (UCM) walked 1.5 miles on an indoor track for three different trials without walking sticks, and 3 trials with walking sticks. Trials took place in an Adaptive Physical Education class setting. Each student wore a heart rate monitor and walked with their student mentors, previously assigned. After each trial was completed, the average heart rate was recorded. The mean of the average heart rates was recorded for the trials with and without walking sticks. **RESULTS:** A paired T-test was used in order to compare the means of the average heart rates. The results indicated that THRIVE students achieved a significantly higher average heart rate 138.3 bpm \pm 17.8 versus 130.3 bpm \pm 14.6 ($p < 0.05$) when using walking sticks. **CONCLUSION:** Participants achieved a higher average heart rate when using walking sticks, compared to walking without walking sticks. Based on this data, the use of walking sticks may benefit individuals with developmental challenges by safely increasing the intensity of physical activity.

21. BODY TEMPERATURE LOWER WHEN EXERCISING ON BIKE IN HEAT

Nicki Wall, Josh Deitch, Steve Burns, University of Central Missouri, Warrensburg MO

When a person exercises in a hot environment a logical assumption is that the higher the environment temperature higher body temperature would rise given that intensity stayed the same. **PURPOSE:** The purpose of this study was to determine if body temperature during exercise on a bike in elevated temperature (28°C) compared to exercising at normal room temperature (22°C). **METHODS:** Nine Subjects were tested in two different trials on the Bike Ergometer. The first trial consisted of cycling for 30 minutes at 85% of the maximal heart rate at room temperature. The second trial consisted of cycling for the same duration and intensity at an elevated room temperature of (29°C). Subjects did a 5 minute warm up session to elevate their heart rate to 85% of their maximal heart rate prior to time starting. **RESULTS:** Results indicated that the cool environment led to a body temperature of 36.86°C \pm 0.17, and the hot environment resulted in a body temperature of 37.06°C \pm 0.14. A t-test was conducted indicating significant difference in the means ($p < 0.05$). **CONCLUSION:** This study suggests that there is no difference in body temperature while exercising on a bike in elevated environmental temperatures compared to a more neutral temperature based on the data.

22. EFFECT OF AMMONIA INHALANTS ON WINGATE PERFORMANCE

Kyle Witherbee, Joseph Sherman, Anthony Ramos, Scott Richmond; Missouri State University, Springfield, Missouri

PURPOSE: The purpose of this study was to observe the effects of ammonia inhalants on Wingate performance. The hypothesis was that ammonia inhalants would increase the performance of short-term anaerobic exercise (Wingate). **METHODS:** Three male participants were recruited from the University and surrounding areas. Participants had previous resistance training experience characterized by the ability to perform a bench press with 1 times their body weight and squat 1.5 times their body weight. Each participant completed an approved informed consent document before testing. The test involved performing a Wingate anaerobic test (with 7.5% body weight) on a cycle ergometer after inhaling one of three substances. Participants completed a 5 minute warm-up then immediately before beginning the test the participant would inhale one of three, randomly chosen substances for two seconds (Ammonia inhalant, Control 1 (Vicks Vapor Rub), Control 2). After 48 hours rest the participants returned and would perform the same procedure except inhaling one of the other two substances. After another 48 hour period the participant would return to perform the final procedure. **RESULTS:** A One-way ANOVA showed there were no significant differences in Peak Power ($p = .941$), Peak power per kg ($p = .895$), Mean power ($p = .916$), Mean power per kg, ($p = .836$), Power drop ($p = .825$) or Power drop per kg ($p = .753$). **CONCLUSION:** Based on these preliminary findings, ammonia inhalants do not effect anaerobic exercise performance. These results are consistent with other performance effects currently in the literature. As this project continues and a larger sample size is tested more conclusive findings may become evident.

Masters Student Poster Presentations

23. ACADEMIC PERFORMANCE AND PHYSICAL ACTIVITY OF COLLEGE STUDENTS

Jamie Aweau, Marvin Stucks, Michael Colacicco, Greg Farnell, Ed Cunliff, & Melissa Powers University of Central Oklahoma, Edmond, Oklahoma

Participation in regular physical activity provides many benefits to general health. Among children and adolescents, physical activity also appears to have a positive impact on academic performance. The relationship between physical activity and academic performance of college students is not well studied. **PURPOSE:** The purpose of this study was to explore patterns of physical activity in relationship to self-reported GPA of students who completed the American College Health Association's National College Health Assessment (ACHA-NCHA). **METHODS:** The ACHA-NCHA was administered in a core general health course to 1,600 students. The response rate was 64% (n = 772). This study examined patterns of moderate exercise, vigorous exercise, and strength training (number of days participating) as well as meeting physical activity guidelines (yes or no) by GPA (A, B, C, D/F) using non-parametric tests and descriptive statistics. All analyses were conducted separately for males and females. **RESULTS:** More males (55.0%) than females (41.4%) reported meeting the physical activity guidelines. For GPA, more females reported A/B (82.4%) compared to males (77.4%). When examining the exercise participation variables by GPA, one difference approached significance ($p = .06$). Women reporting higher GPA (A or B) were more likely to participate in moderate exercise on a greater number of days than those with a lower GPA. The percent of females reporting zero days of moderate activity increased as the self-reported GPA decreased (22% for A to 42.9% for D/F). On the other hand, the percent of females reporting 4 days of moderate exercise decreased as GPA decreased from 9.2% for A to 0.0% for D/F. Unfortunately, so few women report high levels of moderate activity that it is hard to confidently make inferences from these data. No significant trends were observed for males. The difference in GPA by meeting physical activity guidelines was non-significant in both males and females ($p > .05$). **CONCLUSION:** No significant patterns of physical activity by GPA were observed in this analysis; however, this topic deserves further study due to limitations associated with this data set such as self-reporting. Further study of physical activity and GPA should be conducted using measurement of actual physical activity levels and GPA among college students.

24. THE ACUTE EFFECTS OF LOWERBODY DEEP TISSUE FOAM ROLLING ON PEAK AND AVERAGE MUSCULAR TORQUE.

Brandon J. Behara, Bert R. Jacobson FACSM, John H. Sellers, Garrett M. Hester; Oklahoma State University, Stillwater, OK

One of the most popular and recent strategies in the attempt to increase sports performance is a massage technique called myofascial release (MR). This technique was created as a means to reduce fibrous adhesions or myofascial trigger points that reside between layers of fascia/connective tissue. These fibrous adhesions are thought to be brought on by injuries, muscle imbalances, over recruitment of muscle fibers, overworked muscles, recurring micro trauma, and/or inflammation, all of which have the potential to decrease sports performance and limit range of motion. Foam rolling is a recent innovation for massaging the muscles. **PURPOSE:** The purpose of this study was to compare the acute effects of a single-bout of lower extremity deep tissue foam rolling and a dynamic warm up on knee flexion and extension strength. **METHODS:** Subjects consisted of a convenience sample of 14 Division I offensive lineman (18-22 yrs.) Following a briefing on objectives of the study, all subjects completed an IRB approved consent document. A randomized crossover design was used in the testing. Subjects peak and average leg extension and leg flexion torque were tested using a isokinetic dynamometer before and after either no treatment, and; 8 min of foam rolling of the gluteus maximus, quadriceps, hamstrings, and gastrocnemius, or dynamic stretching on three separate days one week apart. **RESULTS:** No pre- to post test significant differences among the groups were found for peak leg extension torque ($p=0.61$), average leg extension torque ($p=0.44$), peak leg flexion torque ($p=0.88$), or average leg flexion torque ($p=0.02$). Perceived muscle comfort ranges were significantly greater after foam rolling ($p=.02$). **CONCLUSION:** While subjective comfort following foam rolling was noted, foam rolling did not significantly alter leg extension or flexion peak and average torque. It appears that foam rolling is favored due to a massage-like post-feeling, however: no strength advantage can be claimed following treatment.

25. PHYSICAL ACTIVITY AND WEIGHT STATUS OF COLLEGE STUDENTS

Nicole A. Doyle, ByeongKwon Lim, Michelle M. Miller, Shea N. McMullin, Brian L. Myers, Jacilyn A. Olson, PhD., Melissa D. Powers, PhD.; University of Central Oklahoma, Edmond, Oklahoma

The benefits of physical activity for health and weight management are widely known, but many people often try to lose or gain weight without changing their levels of activity. The American College Health Association's (ACHA) National College Health Assessment (NCHA) data were utilized to review certain physical activity patterns of college students. **PURPOSE:** This project sought to examine patterns of physical activity and weight status among college students. **METHODS:** Data were collected from the ACHA-NCHA survey distributed in the spring of 2012. 722 participants were surveyed over various topics such physical activity and weight status. The data were analyzed by descriptive statistics, also using the frequencies and percentages tab while splitting the file by gender. Categories of the weight status variable are: lose weight, gain weight, maintain weight and do nothing. **RESULTS:** The results showed that an overwhelming percentage of male and female college students do not meet physical activity guidelines. Among women trying to maintain their weight, 59% do not meet the guidelines, and for those wanting to lose weight, only 43% meet the guidelines. Forty-seven percent of males that are trying to maintain their weight do not meet the guidelines, whereas only 56% of those wanting to lose weight, report meeting the activity guidelines. **CONCLUSION:** The findings of this research study showed an overwhelming amount of students that report wanting to lose weight but they are not meeting the guidelines. The number of women who meet the guidelines is even lower than men. Recommendations for health educators might include educating students on the total package of wellness. Implementing fitness groups on campus with positive reinforcement and accountability could help students take ownership of their health. Goal-setting with peer groups, and incentives, such as free parking passes for the furthest parking lots, might spark student's interest. Future studies should look at the society as a whole, including the workplace, costs involved, and regional weight status demographics.

26. POWER OUTPUT IN STANDING CYCLING

Andrew Gai and Toby Chambers; University of Central Missouri, Warrensburg, Missouri

PURPOSE: In the sport of cycling, standing pedaling is often used to increase power whether it be during a hill climb or a flat sprint at an increased resistance. The purpose of this study was to examine whether standing while pedaling increased any variables measured by a 30 second anaerobic Wingate test. **METHODS:** Nine male, physically active subjects completed 2 -30 second Wingate tests. One test was a standard test in which the subject had to remain seated during the entire test. The other test required the subject to stand up and pedal 5 seconds after the load was applied to the wheel for the remaining of the protocol. **RESULTS:** Averages for seated cycling were 650.6 W \pm 48.8 for mean power, 1010.9 W \pm 88.21 for peak power, 20.13 W/s \pm 3.82 for fatigue ratio, and 173 \pm 9.49 mean rpm's. For standing cycling the averages were 610.6 W \pm 51.12 for mean power, 1045.78W \pm 111.31 for peak power, 21.71 W/s \pm 4.34 for fatigue index, and 164 \pm 13.57 mean rpm's. **CONCLUSION:** Standing cycling only yielded a desirable difference in peak power, and had a negative effect on fatigue index. Therefore, standing pedaling could be a technique used to increase absolute power output.

27. EFFECTIVENESS OF A WEIGHT LOSS PROGRAM COMPETITION IN A WORKPLACE ENVIRONMENT

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Obesity is a major problem in the United States. A possible method of reducing the prevalence of obesity in the community is to have weight loss competitions in the workplace that promote healthy living. **PURPOSE:** The aim of this study was to examine if a weight loss competition presented in the workplace will produce positive changes in health parameters. **METHODS:** Seventeen employees of a state Health Department (five men, initial bodyweight = 223 \pm 26lbs; thirteen women, initial bodyweight = 210 \pm 35lbs) volunteered for the study. Five of the seventeen participants also volunteered for a subgroup to measure body fat percentage (Initial BF = 37 \pm 8%) and waist circumference (Initial WC = 40 \pm 8in). Following the initial weigh in participants' bodyweight was assessed and recorded at three, three to four week intervals. The assessment of the small participant subset was started three weeks after the initial weigh in and also reassessed at three to four week intervals. Body fat percentage was measured using a handheld bioelectrical impedance device (Omron, HBF-301). Waist circumference was measured with measuring tape at the belly button (in). All three assessments (BW, BF, WC) were analyzed using a repeated measures ANOVA. **RESULTS:** Participants recorded a significant decrease in bodyweight from the initial

assessment to all subsequent assessments (initial, 213±33lbs to second, 207±32lbs, $p<0.01$; third, 207±33lbs, $p<0.01$; and final 205±33lbs, $p<0.01$) and from the second and third assessment to the final assessment (both $p<0.05$, respectively). Of the subset assessments only WC was significant (initial=40±8in to second=38±8in; $p<0.01$)

CONCLUSION: A weight loss competition is a successful way to extrinsically motivate individuals to lose weight. Additionally, as a result of a weight loss competition there can be an initial decrease in waist circumference but a lack of change in the body fat percentage; these observations could be because of a decrease in overall body mass including lean mass not just loss of body fat.

28. COMPARISON OF STRETCHING PROTOCOLS ON MAXIMUM SPEED OUTPUT

Josh Jaramillo², Ali Boolani¹, Bert Jacobson², Enoch Hill¹, ¹Tennessee State University, ²Oklahoma State University

Stretching is a common activity prior to sport performance. However, the efficacy of stretching as it relates to activity, in addition to the type of stretching remains questionable. Furthermore, while lack of range of movement may hinder some activities, it is also questionable if flexibility is associated with speed. **PURPOSE:** The purpose of this study was two-fold: to compare types of pre-activity stretching and to correlate the degree of flexibility with short distance (40 yd.) speed. **METHODS:** Following IRB approval 50 subjects volunteered for the study. Pre-tests included a warm-up and a timed 40yd sprint followed by randomly assigning the subjects to either 10-min static or dynamic stretching, after which a post-test 40yd sprint was timed. The second day began with an initial warm-up, a pre- 40yd sprint, and counterbalanced stretching bouts followed by a post-40yd sprint. To assess the relationship between flexibility and sprint speed, the sit-and-reach test was administered and the results were correlated with subjects' speed. **RESULTS:** ANOVA with repeated measures yielded significantly better ($F=3.89$; $P<0.01$) in forty yard dash times by the dynamic stretching group over the static stretching group. Additionally, there was not any significant association found between flexibility and speed in the 40yd sprint. **CONCLUSION:** The data supports previous research suggesting that dynamic stretch is superior to static stretch and that dynamic stretch positively affects sprint performance. Degree of flexibility, as measured by the sit-and-reach is not a predictor of speed, but rather muscle type ratio may be more accurately a determinant of speed. It is suggested that for speed performance, dynamic stretching be included in the warm-up protocol.

29. TELEVISION VIEWING DURING DINNER & ENERGY INTAKE & CHILD HEALTH IN PRESCHOOL AGE CHILDREN

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Food consumption patterns among U.S. children (2-18 years) primarily consist of energy-dense/nutrient poor foods, as evidence by an increased overall daily consumption of 109 kilocalories (kcal), from 1989 to 2008. Television viewing (TVV) as a chosen sedentary behavior influences dietary intake among young children in that it lessens or delays satiety, exposes unhealthy food advertisement, and alters meal time habituation and food choices. **PURPOSE:** The purpose of this study is to determine the association between eating dinner while TVV, energy intake and child health in preschool age children. **METHODS:** This cross sectional study included preschool-aged children (3-5 years) voluntarily recruited from 15 child care centers across the state of Oklahoma. Food consumption and frequency of eating dinner while TVV were reported by the child's caregiver via telephone by trained interviewers. A three Dinner Dietary Recall (3DDR) was used to obtain the child's 3 previous dinners. 3DDR data was analyzed to calculate calories consumed which were averaged across the 3 days. Frequency of eating dinner while TVV was assessed by the following question: "How often does <child's name> eat dinner in front of the TV each week (wk)?" and responses were categorized as Never (0 days/wk), Sometimes (1-3 days/wk), and Often (≥ 4 days/wk). Height and weight were measured in centimeters and kilograms, respectively. Body Mass Index percentile (BMI%ile) was calculated based on age and sex. Mean \pm SD and frequency were calculated. **RESULTS:** Seventy-two children (57% girls; 3.7 ± 0.70 yrs; 47% white; 26% overweight or obese; $63 \pm 29^{\text{th}}$ %ile) had an averaged energy intake across the three dinners of 435 ± 140 kcal. Frequency of eating dinner while TVV was 52% never, 34% sometimes, and 14% often. **CONCLUSION:** Results from this study describe the frequency of eating dinner while TVV, energy intake and BMI%ile of preschoolers in Oklahoma. Previous literature does not focus on frequency of TVV during dinner in preschool age children, rather on dietary intake in general. Disparities in previous literature indicate a need for further investigation on the associations between on frequency of TVV during dinner, energy intake and child health among preschool age children.

30. MITOCHONDRIAL TRANSCRIPTION AND TRANSLATION INITIATION FACTOR PROTEIN EXPRESSION ENHANCEMENT THROUGH HIGH-VOLUME RESISTANCE TRAINING

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Exercise is known to stimulate muscle protein synthesis through transcription and translation of nuclear DNA leading to muscular hypertrophy and mitochondrial biogenesis. To our knowledge, the effect of exercise on mitochondrial translation has yet to be tested even though proteins coded by the mitochondria are paramount to metabolic health. **PURPOSE:** This investigation aims to determine if transcription factor A of the mitochondria (TFAM) and mitochondrial translation initiation factor 2 (mtIF2) protein expression is enhanced following high-volume resistance training and see if any difference exists in obesity compared to lean controls. **METHODS:** Zucker Rats (N=30, 16 lean, 14 obese) engaged in either a resistance training protocol or remained sedentary. The exercised rats (n = 8 lean and 8 obese) undertook a resistance exercise protocol involving a hind limb 'squat-like' exercise while the remainder (n=8 lean and 6 obese) were sedentary. Sixteen hours following the final bout of resistance exercise, the animals were euthanized and mixed fiber gastrocnemius muscles were removed and immediately frozen in liquid nitrogen. Samples were later analyzed for TFAM and mtIF2 protein expression via Western blot analysis. Data were analyzed using a 2x2 ANOVA (exercise vs. sedentary X lean vs. obese); α was set at $p \leq 0.05$. **RESULTS:** TFAM protein content increased by 54.62% ($p < 0.05$) with exercise in lean and obese animals. Resistance exercise seemed to increase mtIF2 protein content by 58.23% though this finding was not statistically significant ($p > 0.05$). No significant difference in TFAM and mtIF2 was observed between lean and obese responses to exercise. **CONCLUSION:** Resistance exercise increased the expression of mitochondrial transcription factors and appears to increase expression of mitochondrial translation factors in lean and obese animals indicating enhanced capacity for transcription and translation of mitochondrially encoded genes with high volume exercise training. These data suggest that resistance training could lead to increased metabolic proteins derived from the mitochondrial DNA in mammals. Enhanced mitochondrial protein synthesis would likely lead to increased oxidative phosphorylation enzymes such as those used in the electron transport system indicating a possible pathway for resistance training improvements on whole organism metabolic health.

This investigation was funded by the Sydney & J.L. Huffines Institute for Sports Medicine & Human Performance at Texas A&M University.

31. PREDICTING MAXIMAL OXYGEN CONSUMPTION IN NORMAL WEIGHT CYCLISTS USING LEAN LEG MASS

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The criterion measure for cardiorespiratory fitness (i.e., ability to perform aerobic activity for prolonged sessions) is maximal oxygen uptake (VO_{2max}), which is associated with muscle mass. Measuring VO_{2max} is time consuming and requires specific facilities; creating an alternative way to predict VO_{2max} using lean leg mass would increase accessibility in estimating VO_{2max} . Graff et al. (2013) developed a formula for prediction of VO_{2max} from lean leg mass specific to obese individuals. **PURPOSE:** To assess the ability of body mass, total lean body mass and total lean leg mass to predict VO_{2max} in normal body weight cyclists using a previously established VO_{2max} predictive equation. (Graff et al., 2013). **METHODS:** Twenty-four normal weight subjects (18 men, 6 women, mean \pm SD; BMI: 23.5 ± 3.6 kg/m²; age: 38.7 ± 11.9 ; ht: 177.4 ± 5.7 cm; wt: 74.3 ± 12.9 kg) participated voluntarily. A total body Dual Energy X-Ray Absorptiometry scan was used to assess body composition. The same day, subjects performed a maximal graded exercise test to assess VO_{2max} using indirect calorimetry. A self-selected VO_{2max} cycle ergometer test was performed to volitional exhaustion. A multiple regression equation, using the stepwise method, was executed using SPSS (v19) software. **RESULTS:** Total body mass was 74.3 ± 12.9 kg, total lean body mass 57.9 ± 8.9 kg, total lean leg mass 19.8 ± 3.0 kg, measured VO_{2max} 3.95 ± 0.8 L·min⁻¹. Using the Graff et al. (2013) equation ($VO_{2max} = (0.23 \times \text{kg lean leg mass}) + 0.078$) predicted VO_{2max} was 4.63 ± 0.7 L·min⁻¹, with lean leg mass being the strongest predictor of VO_{2max} ($p < 0.001$). Graff et al. found a variance of 76.8% in VO_{2max} ($r=0.877$)

explained by lean leg mass, compared to our variance of 55.4% ($r = 0.744$) with a standard error of the estimate of $0.575 \text{ L} \cdot \text{min}^{-1}$. **CONCLUSIONS:** Predicted $\text{VO}_{2\text{max}}$ overestimated the measured $\text{VO}_{2\text{max}}$ by $0.68 \text{ L} \cdot \text{min}^{-1}$. Therefore, while lean leg mass was strongly associated with predicted $\text{VO}_{2\text{max}}$ there was a large difference between measured vs. predicted $\text{VO}_{2\text{max}}$, most likely due to applying normal weight cyclist data into the Graff et al. (2013) equation.

32. PHYSICAL ACTIVITY LEVEL, BMI PERCENTILE, AND MOTOR SKILLS IN PRESCHOOL-AGED CHILDREN AT CHILDCARE

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Greater participation in moderate-to-vigorous physical activity (PA) is associated with higher motor skill abilities in preschool-aged children, but previous studies have measured motor skills with lengthy test batteries and not a more feasible and accessible screening instrument. Sedentary activity (SA) and motor skills have been studied, but no known relationship exists. Furthermore, body mass index (BMI) is not associated with motor skills; however, gross motor skills only have been previously measured. **PURPOSE:** To determine the association of PA across the intensity spectrum (sedentary, light, moderate, and vigorous) and BMI percentile with motor skills in preschool-aged children at childcare. **METHODS:** Children 3-5 years of age were recruited from childcare centers in urban and rural Oklahoma for this cross-sectional study. Children wore an accelerometer for 1-2 days while at childcare. BMI percentile was calculated from measured height and weight. A motor screening tool was used to assess both gross and fine motor skills, which were summed into a motor domain score (MDS). Linear regression was used to examine the relationship between activity, BMI percentile, and MDS. **RESULTS:** The sample included 159 participants (52.8% male; 4.3 ± 0.8 years; BMI percentile $M=66.2 \pm 28.4$; 35.2% overweight or obese, $\geq 85^{\text{th}}$ percentile). The mean duration of accelerometry wear time was 365.9 ± 100.5 minutes/day (6.1 ± 1.7 hours/day). After controlling for wear time, light PA ($\beta=0.283$, $t(2)=2.67$, $p<0.01$), vigorous PA ($\beta=0.245$, $t(2)=2.76$, $p<0.01$), and BMI percentile ($\beta=-0.296$, $t(1)=-3.874$, $p<0.001$) were significantly related to MDS. SA and moderate PA were not associated with MDS. Light PA ($R^2=0.06$, $F(2,156)=5.14$, $p<0.01$), vigorous PA ($R^2=0.07$, $F(2,156)=5.40$, $p<0.01$), and BMI percentile ($R^2=0.07$, $F(2,156)=5.40$, $p<0.01$) each attributed to a significant proportion of variance in MDS. **CONCLUSION:** These results suggest that light PA, vigorous PA, and BMI percentile are associated with motor skills in this population. Specifically, light and vigorous PA were greater and BMI percentile was lower when MDS was higher. Childcare centers should encourage children to engage in activity conducive to motor skill development.

33. THE EFFECTS OF HYPERCHOLESTEROLEMIA ON SKELETAL MUSCLE REGENERATION: A LOOK INTO PROTEIN SYNTHESIS AND CELL CYCLE REGULATION

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Hypercholesterolemia is a pathology in which total serum cholesterol is above 240mg/dL. Having high cholesterol puts one at risk for developing cardiovascular disease (CVD), the number one cause of death in America. ApoE helps regulate serum cholesterol levels by adding in transport of cholesterol into the cells, as well as, to the liver. Mice genetically altered to produce no apoE (apoE-KO) present a model that demonstrates the effects of hypercholesterolemia. Damage to skeletal muscle, whether caused by injury, resistance exercise, or disease stimulates a complex regenerative response. The effects of high cholesterol on the skeletal muscle regenerative response are not known. **PURPOSE:** To determine if skeletal muscle regeneration is altered in apoE-KO mice by measuring protein synthesis regulator IGF-1 and cell cycle regulator cyclin D1. **METHODS:** Female C57/BL6 (WT) and apoE KO were assigned to either an uninjured or injured group. To induce skeletal muscle damage, the tibialis anterior (TA) was injected with bupivacaine. In the uninjured group, the TA was injected with phosphate buffered saline. TA muscle was extracted 3 days post-injection. Quantitative PCR was conducted to determine gene expression for IGF-1 and cyclin D1. **RESULTS:** TA mass to tibia length decreased 20.8% (2.4 ± 0.1 vs. 1.9 ± 0.2 mg/mm) ($p < 0.05$) 3 days post injection in WT mice. In apoE-KO mice, TA mass to tibia length decreased 15.4% (2.98 ± 0.19 vs. 2.52 ± 0.12 mg/mm) ($p < 0.05$) 3 days post injection. IGF-1 gene expression increased 5-fold ($p < 0.05$) and 3.5-fold ($p < 0.05$) during skeletal muscle regeneration in WT and apoE-KO mice, respectively. Cyclin D1 increases 1.75-fold ($p < 0.05$) in WT mice 3 days post-bupivacaine injection. However, cyclin D1 gene expression

increased 12-fold ($p < 0.05$) 3 days post-bupivacaine injection in apoE-KO mice. **CONCLUSION:** This data shows that hypercholesterolemia associated with apoE-KO mice induced a greater increase in cyclin D1 gene expression than observed in the WT mouse. A deficiency in the apoE gene has no effect on IGF-1 expression but does however have a differential effect on cyclin D1 expression.

The apoE-KO mice were a kind gift from Rigel Pharmaceuticals.

34. VALIDITY OF UCHEK IPHONE APPLICATION ON ASSESSING DEHYDRATION FROM URINE SAMPLES

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The widespread acceptance of smartphones presents an opportunity for the development of mobile health applications and accessories. These devices can help reduce costs and improve accessibility of healthcare. **PURPOSE:** To determine the validity of the uChek iPhone application on measuring hydration status compared to urine refractometry and urine dipstick applicators. **METHODS:** Fifty-three urine samples were analyzed for urine specific gravity (USG) by a refractometer under a well-lit area. Urine strips (Multistix 10 SG Reagent Strips) were used to record USG by the Multistix label compared to an 8-color control stick, and was then analyzed by the uChek application. **RESULTS:** Sensitivity analysis showed that overall accuracy of USG via strips and uChek were 68 and 67.3%, respectively. Specifically, the sensitivity of a positive urine test for dehydration ($USG \geq 1.020$) was 55.6% with the strips and 51.9% with the iPhone app. The specificity for detecting hypohydrated persons was 36.4% and 31.8% for the strips and iPhone app, respectively. **CONCLUSION:** We concluded that the iPhone application uChek is not accurately detecting dehydration mainly due to limitations of the urine strips.

35. MODERATE INTENSITY EXERCISE AND POSTPRANDIAL GLUCOSE EXCURSIONS IN DIABETIC INDIVIDUALS

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Physical activity improves insulin sensitivity but the extent to which postprandial glucose is improved is not fully understood. **PURPOSE:** To examine the effects of moderate-intensity aerobic exercise in sedentary prediabetic or type II diabetic individuals compared to sedentary healthy individuals on postprandial glucose excursions. **METHODS:** An exercise intervention group (EIG) and a control group (CG) completed pre- and posttests consisting of a 3-day analysis of postprandial glucose using a continuous glucose monitor. Subjects of the EIG ($n = 6$) were sedentary, diagnosed with either prediabetes or type II diabetes, and completed 8 weeks of moderate-intensity aerobic exercise for 30-45 min on 3-5 days/week. Subjects of the CG ($n = 7$) were sedentary healthy individuals which completed 8 weeks of nonintervention. **RESULTS:** An independent samples *t*-test indicated no significant differences between groups from pre- to posttest in peak postprandial glucose excursions [$t(11) = 0.572$, $p > .05$]. **CONCLUSION:** Results of this study indicate moderate-intensity aerobic exercise performed for 30-45 min on 3-5 days/week is not effective in eliciting an overall change in postprandial glucose in sedentary prediabetic or type II diabetic individuals compared to sedentary healthy individuals.

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36. THE EFFECT OF AMMONIA INHALANTS ON STRENGTH PERFORMANCE IN MALE WEIGHT-LIFTERS

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PURPOSE: Today athletes and weight lifters are going to extreme measures to gain an advantage in performance. As a result pre-workout supplements have become very popular. Ammonia Inhalants have been reported to have a similar effect to pre-workout supplements because they are suggested to increase consciousness and physical strength. Still the effect of Ammonia Inhalants on strength performance is unknown. The purpose of this study was to examine the relationship between two measures of strength performance with Ammonia Inhalants. **METHODS:** The participants in this study were 25 male weight lifters. Participants were tested in the back squat and bench press at 85 percent of their calculated 1 repetition max (1RM) during two different exercise sessions. The participants inhaled either the Ammonia Inhalant or the placebo prior to performing as many repetitions as possible in the back

squat and bench press at 85 percent of their 1RM. **RESULTS:** A dependent T-Test and ANOVA were used to analyze differences between the placebo and the Ammonia Inhalant. There was no significant difference between the amount of repetitions performed in the back squat ($p = 0.403$) or the bench press ($p = 0.422$) after inhaling the AI compared to the placebo. There was also no significant difference between the calculated 1RM for both back squat and bench press when using AI, placebo or initial testing session (no substance inhaled). **CONCLUSION:** Although more research is needed on the effects of AIs relating to exercise performance, our data suggests that there is no significant link between the two. More research with a larger sample size may illicit different results. Also, testing the participants at a higher percentage of their 1RM or slightly increasing the dose of Ammonia could also bring about different results as well. We suggest that AIs be administered on a case to case basis, depending on the person's health and personal preference. While there were no differences in performance, this study does not account for any potential psychological impact of AIs. Therefore, if an individual has no pre-existing medical conditions and feels that AIs do improve their performance then there are no reasons why they may not use them in low doses.

37. COMPARISON OF LOWER BODY POWER BETWEEN SEDENTARY, RECREATIONALLY ACTIVE, AND MASTERS ATHLETE OLDER ADULTS

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Maintenance of lower body power is essential to perform activities of daily living (ADLs). Long-term conservation of functional power has been related to increased physical activity, however the level of activity required to maintain functional power is unclear. **PURPOSE:** Therefore, the purpose of this study was to compare sedentary (SED), recreationally active (RA), and masters athlete (MA) older adults' ability to generate lower body power and velocity during the five time sit-to-stand exercise. **METHODS:** Groups of SED ($n = 20$, age = 61.0 ± 5.8), RA ($n = 57$, age = 63.5 ± 8.4), and MA ($n = 25$, age = 57.5 ± 7.9) volunteered for this study. SED and RA groups were established based on resultant scores from the Rapid Physical Activity Questionnaire and MA were categorized based on participation in sanctioned, athletic competition within the past 6-months. Lower body peak power (PP), average power (AP), peak velocity (PV), and average velocity (AV) were measured using the Tendo Weightlifting Analyzer (TWA). The TWA was attached at the hip of each participant and they were then instructed to sit in a chair with feet flat on the floor, arms crossed over the shoulders, and hands on the acromion processes. The participant then completed five consecutive chair-stands as quickly and safely as possible without removing the arms from the shoulders. **RESULTS:** MA had significantly ($p < .05$) higher PP (12.11 ± 2.03) and AP (7.10 ± 0.14) compared to RA (10.42 ± 4.27 and 6.52 ± 2.68 , respectively) or SED (9.21 ± 3.83 and 5.76 ± 2.34 respectively). Similar significant differences were noticed for PV and AV among SED (0.96 ± 0.36 , 0.60 ± 0.25), RA (1.05 ± 0.37 , 0.66 ± 0.23), and MA (1.23 ± 0.20 , 0.75 ± 0.14). No differences were observed between sedentary and recreationally active adults for any measures. **CONCLUSION:** Results indicate that MA are able to maintain lower body power to a greater extent than RA or SED older adults. The longitudinal ability to maintain power may potentially increase performance of ADLs and help continuation of independent living.

38. BODY COMPOSITION CHANGES DURING 16 WEEKS OF HIGH VELOCITY TRAINING IN OLDER ADULTS

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Body composition plays a key role in physical functioning and health of older adults. As individuals age, lean tissue mass (LTM) decreases and fat mass (FM) increases. It is imperative to find the optimal training intensity to reduce these changes. **PURPOSE:** The purpose of this study was to examine the effects of high velocity resistance training at two different training intensities (30% & 60%1RM) on body composition of older adults. The researchers hypothesized that LTM would increase and FM would decrease more in the 60% group than the 30% group. **METHODS:** Participants over the age of 65 trained two days per week completing three sets of eight repetitions of eight exercises representing a total body workout. The participants were randomly assigned to either the 30% 1RM group ($n = 4$) or the 60%1RM group ($n = 9$). Body composition was measured using a Dual-Energy X-Ray Absorptiometry (iDXA) before and after the 16-week training intervention. **RESULTS:** LTM showed a significant time x group interaction ($F(1,6) = 5.96$, $p = 0.05$). LTM increased by 1.15% in the 30% group while decreasing by 1.31% in the 60% group. No significant interactions or main effects for FM were found. **CONCLUSION:** Overall, the 30% group resulted in more improvements in body composition than the 60% group. The lack of greater

increases in LTM could suggest that participants already had high levels of LTM. Furthermore, it would appear that greater acceleration of the mass might provide a greater stimulus for LTM gains than increasing the training intensity for the population.

39. MUSCLE ACTIVATION DURING PUSHUPS PERFORMED IN A STABLE AND UNSTABLE ENVIRONMENT IN FEMALE COLLEGIATE SOCCER PLAYERS.

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Many strength training programs incorporate pushup exercises, which primarily activate upper body muscles. Past data supports the fact that shoulder girdle muscles (i.e., triceps and anterior deltoid) exhibit greater electromyography activity when a push-up is performed on an unstable vs. stable surface (Park, 2011; Andrade, 2011). While greater muscle activation has been shown for healthy athletes (Freeman, 2006), very little research has been conducted on triceps and anterior deltoid muscle activation in lower body trained athletes (i.e. soccer players). Moreover, the majority of past research using EMG analysis has been performed on male athletes (Beach, 2008; Lehman, 2007; Sandhu, 2008; Andrade, 2011). **PURPOSE:** To determine if differences exist in muscle activation between pushups in a stable vs. unstable environment in female collegiate soccer players. **METHODS:** Twenty-four female collegiate soccer players (Ht: 164.8 ± 7.6 cm; Wt: 61.7 ± 8.4 kg) participated voluntarily. Subjects had their triceps and anterior deltoid activity assessed using electromyography (EMG) while randomly performing three consecutive regular and three consecutive suspended pushups. A repeated measures (2x2) analysis of variance (ANOVA) was conducted using SPSS (v19.0) to analyze the difference between the triceps and anterior deltoid muscle activation in two push up positions. **RESULTS:** The absolute integral (AI), which measured electrical activity based upon a standardized baseline, showed significantly higher muscle activation for the unstable compared to the stable push up for the triceps 181.1 ± 227.9 mV (p < 0.001) and anterior deltoid 219.1 ± 320.5 mV (p = 0.001) muscle. **CONCLUSIONS:** The significant increase in muscle activation was attributed to the lack of hand stability incorporated into the unstable push up position. While the female soccer players in this study are well trained, their training regimen primarily activates lower body muscles. These findings provide further support that well-trained one-sport athletes can exhibit increased muscle activation in muscles that are not part of their primary sport focus. Moreover, performing exercises (i.e., pushups) in an unstable environment can effectively increase muscle activation, even for a well-trained female collegiate soccer player.

40. CONVERGENT VALIDITY OF PHYSICAL ACTIVITY DEVICES IN ADULTS WITH UNILATERAL TRANSTIBIAL AMPUTATION: CASE STUDY

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PURPOSE: To determine convergent validity of physical activity device measurement in adults with unilateral transtibial amputation for step count, time in light physical activity (LPA), time in moderate physical activity (MPA), and classification of physical activity (PA) intensity. **METHODS:** Adults with unilateral transtibial amputation (n=2) voluntarily participated in this single-visit, lab-based assessment. Exclusion criteria included: cardiovascular disease, hypertension, obesity, stroke, and neuromuscular disorders. The Yamax DigiWalker SW-200 (DW) and ActiGraph GT3x (AG) were worn on the right hip. The SenseWear Armband (SWA) was worn on the right tricep, and the *ActivPAL* was worn approximately mid-thigh on the right leg. The Intelligent Device for Energy Expenditure and Activity (ID) had five sensors. One sensor was placed between the clavicles, one mid-thigh on each leg, and two parallel to the ground on the top of participants' shoes. The protocol consisted of four counter-balanced phases each lasting 6 minutes: sitting, standing, LPA, and MPA. A two-minute wash out occurred between phases to allow monitors to record zeros and signify a break in phase. The light and moderate activity phases were at a self-selected pace on an indoor, flat, climate-controlled, carpeted hallway.

RESULTS: Table 1 represents the average of device measurements recorded during phases (n=2). Due to device errors, data for the *ActivPAL* has been excluded.

Device	Sit Phase			Stand Phase			LPA Phase				MPA Phase			
	Steps	SED	LPA	Steps	SED	LPA	Steps	SED	LPA	MPA	Steps	SED	LPA	MPA
DW	0			0			581*				766			
AG	0	5.87	.13	2	5.89	.11	506	1.46	0.04	3.98	596.5	1.00	0.17	3.50
SWA	2	6.00	0.00	0	6.00	0.00	505	1.00	0.50	3.50	637	0.50	0.30	3.00
ID	0	6.00	0.00	0	6.00	0.00	510	0.00	6.00	0.00	609	0.00	0.00	6.00

* Indicates data represented for n=1.

CONCLUSIONS: Thus far, it appears that as intensity increases, intensity misclassification also increases. For step count, as intensity increases variance also seems to increase. Continued research is needed to determine the most valid devices for basic physical activity assessment.

41. CIRCULATING IRISIN LEVELS IN RESPONSE TO ACUTE AND CHRONIC EXERCISE IN OBESE ADULTS

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Irisin is a recently discovered myokine that has been proposed to be secreted into circulation by skeletal muscle in response to exercise. In rodents, irisin activates thermogenic programs in white adipose tissue and improves glucose homeostasis. It is unknown how acute and chronic aerobic exercise alters circulating levels of irisin in obese humans. **PURPOSE:** We sought to determine whether circulating irisin is exercise-responsive in obese humans. **METHODS:** A) Eleven obese females ($37.3 \pm 2.1 \text{ kg/m}^2$) completed, in random order, a single bout of continuous moderate exercise (CME; 55 min, 55% $\text{VO}_{2\text{peak}}$) and high-intensity interval exercise (HIIE; 4 x 4 min intervals at 85% $\text{VO}_{2\text{peak}}$ separated by 4 x 3 min active recovery periods at 50% $\text{VO}_{2\text{peak}}$) at least 7 days apart. Plasma irisin concentrations were measured at 3 time intervals (rest $t=0$ min, during exercise $t=30$ min, and post-exercise $t=100$ min). B) Pre- and post- exercise training irisin concentrations were measured in 13 and 6 obese adults ($34.6 \pm 3.02 \text{ kg/m}^2$ and $34.55 \pm 3.03 \text{ kg/m}^2$) completing 15 d and 12 wk of aerobic exercise training. **RESULTS:** Body weight and resting blood chemistry did not differ between CME and HIIE training days ($p > 0.05$). A two-way repeated measures ANOVA did not reveal a significant interaction or main effect of exercise intensity ($p > 0.05$) on circulating irisin levels. Irisin concentrations were not different across time within CME ($t=0, 30, 100$ min; $2.14 \pm 0.08, 2.02 \pm 0.19, 2.21 \pm 0.13 \text{ } \mu\text{g/ml}$, $p > 0.05$) or HIIE ($t=0, 30, 100$ min; $2.04 \pm 0.16, 2.21 \pm 0.11, 2.08 \pm 0.14 \text{ } \mu\text{g/ml}$, $p > 0.05$), respectively. Chronic exercise training had no effect on plasma irisin ($p > 0.05$). In addition, no significant associations were made between plasma irisin and metabolic parameters. **CONCLUSION:** To our knowledge these are the first data that have directly measured plasma irisin during and after acute exercise of differing intensities in obese humans. Our novel findings suggest that circulating irisin is not responsive to acute or chronic aerobic exercise in obese adults. Future studies are needed to elucidate the mechanisms underlying the physiological effects of irisin levels in humans.

Doctoral Student Poster Presentations

42. EFFECT OF SPACER GARMENT ON PHYSIOLOGICAL STRAIN DURING EXERCISE IN THE HEAT WHEN WEARING PROTECTIVE VESTS

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Numerous cooling technologies have been developed to reduce heat strain when wearing a variety of protective ensembles during military and law enforcement duties. Some cooling vests demonstrate improved sweat evaporation and decreased core temperature when worn along with protective body armor. Spacer garments represent a potentially lighter, cost-efficient method for improved airflow. **PURPOSE:** To determine if a spacer garment reduces physiological strain during exercise in the heat when wearing a military protective vest or a law enforcement concealable vest. **METHODS:** Sixteen men (24.5 ± 3.9 yrs.; 179.5 ± 5.6 cm; 84.6 ± 12.3 kg) performed either 2 or 4 trials of treadmill walking (3.1 mph; 2% grade) over 120 min in a hot, dry environment (37°C , 30% rh, wind speed 3.5 m/s). Participants completed trials with either a military patrol vest or a law enforcement concealable vest, with either a spacer garment (P_s ; C_s) or no spacer garment (P_c ; C_c) in random order. During trials, participants wore Army Combat Uniform pants and physiological measurements that were measured every 5 min included gastrointestinal temperature (T_{GI}), mean skin (T_{sk}) temperature, heart rate (HR), and sweating rate (SR). **RESULTS:** In the patrol trial (P_s vs. P_c), no differences in final T_{GI} (38.2 ± 0.4 vs. $38.3 \pm 0.4^\circ\text{C}$), T_{sk} (35.0 ± 0.9 vs. $35.0 \pm 1.0^\circ\text{C}$), HR (142 ± 19 vs. 143 ± 23 bpm), or SR (1.15 ± 1.13 vs. 1.54 ± 0.46 L/hr) existed ($P > 0.05$). In the concealable trial (C_s vs. C_c), no differences in final T_{GI} (38.0 ± 0.4 vs. $38.1 \pm 0.3^\circ\text{C}$), T_{sk} (35.3 ± 1.1 vs. $35.6 \pm 0.9^\circ\text{C}$), HR (132 ± 20 vs. 135 ± 20 bpm), or SR (1.39 ± 0.52 vs. 1.37 ± 0.18 L/hr) existed ($P > 0.05$). **CONCLUSION:** When participants exercised with either a military protective vest or a law enforcement concealable vest while wearing the spacer garment, there were no thermoregulatory differences when compared to control trials. Thus, the passive spacer garment had no effect on the physiological responses during mild exercise in the heat.

Funded by Cortac.

43. RELATIONSHIPS BETWEEN SALIVARY CORTISOL AND SPEED SQUAT POWER AND VELOCITY IN ELITE COLLEGIATE BASKETBALL PLAYERS

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Studies have found inverse relationships between salivary cortisol and vertical jump, standing broad jump, and peak force and rate of force development (isometric mid-thigh pull) in athletes. However, to our knowledge, no study has determined the relationship between salivary cortisol and power and velocity during barbell speed squats.

PURPOSE: Therefore, the purpose of this study was to determine the relationship between salivary cortisol and power and velocity during barbell speed squats in elite collegiate basketball players. **METHODS:** Ten NCAA Division I male basketball players ($x \pm \text{SD}$; height = 2.00 ± 0.09 m; weight = 95.9 ± 9.5 kg) gave saliva samples immediately prior to 2 regularly-scheduled afternoon workouts, one week apart, at the beginning of the competitive season. Each workout included 1 set of 3 repetitions in the barbell back squat exercise at 50% 1 RM. All repetitions were performed as explosively as possible. A 3-dimensional video motion capture system was used to measure mean velocity and mean power for each repetition. Pearson correlations were used to determine relationships between cortisol and mean velocity and mean power for the repetition with the highest mean velocity and mean power ($\alpha = .05$). **RESULTS:** Mean velocity was 0.85 ± 0.08 m/s and mean power was 565.1 ± 86.2 W. There were no statistically-significant correlations between cortisol and any of the performance measures (see Table 1).

Table 1: Pearson Correlations ($r_{\text{crit}} \pm .63$)		
	Avg Velocity	Avg Power
Cortisol Day 1	-.21	.16
Cortisol Day 2	-.33	-.49

CONCLUSION: In this population, the relationship between salivary cortisol and power and velocity during barbell speed squats was not statistically significant. Other studies have found statistically-significant inverse relationships between salivary cortisol and other measures of anaerobic speed and power in athletes. It is possible that the load was inappropriate for this population or that the other basketball-related daily activities may have affected the relationship. Future studies should attempt a battery of tests with the same population, both in and out of season, to determine what variables are most related to salivary cortisol.

44. THE EFFECT OF OBESITY ON CELL CYCLE REGULATION IN SKELETAL MUSCLE DURING REGENERATION

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Obesity is associated with impairments in muscle function which is an essential for every day physical activity. Optimal skeletal muscle regeneration requires the coordinated regulation of inflammation, extracellular matrix remodeling, and myofiber growth. Furthermore, myofiber growth is dependent on satellite cell proliferation and differentiation to repair damaged skeletal muscle. Yet, it is still unclear how obesity alters cell cycle regulation during skeletal muscle regeneration. **PURPOSE:** Determine how obesity alters cellular signaling related to cell cycle regulation during skeletal muscle regeneration in damaged tibialis anterior (TA) muscle. **METHODS:** Twenty male C57/BL6 mice (12 weeks old) were randomly assigned to either a high fat diet (HFD) (60% fat) or a lean diet (10% fat). Bupivacaine was injected into the TA of the injured group (n = 4-6), and phosphate buffered saline (PBS) was injected into the TA of the uninjured group (n=4-6) for each diet. Three days post-injection the TA was excised. Gene expression and protein levels inflammatory signaling markers, protein synthesis markers, and cell cycle regulators were determined. **RESULTS:** The mice on the HFD had 20% more body fat than the lean mice (lean = 24.0% ± 8.8, HFD = 44.7% ± 10.9, p < .05). There was a significant difference in TA muscle mass to bodyweight ratio in lean (1.8 ± 0.13 mg/g vs. 1.6 ± 0.10 mg/g, p < 0.05) and a trend for a decrease in HFD mice (1.5 ± 0.24 mg/g vs. 1.3 ± 0.13 mg/g, p = 0.07) 3 days post-bupivacaine injection. Three days after bupivacaine injection protein levels of protein synthesis marker, p-AKT, increased 3-fold in both lean and HFD mice (p < .05). Protein levels of p-STAT3, a marker for inflammation, increased 3-fold in the lean mice (p < .05) and 2-fold in HFD mice (p < .05). Injured lean mice had a 20-fold increase in cyclin D1 gene expression (p < .05) 3 days post-bupivacaine injection. However, HFD mice only had a 4.5-fold increase (p < .05) in cyclin D1 gene expression 3 days post-bupivacaine injection. **CONCLUSION:** In conclusion, cell cycle regulation appears to be dysregulated in obese mice.

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45. EFFECTS OF MAXIMAL VERSUS SUBMAXIMAL INTENSITY FATIGUE PROTOCOLS ON THE ELECTROMECHANICAL DELAY OF THE LEG EXTENSORS AND FLEXORS

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Recent studies have revealed that neuromuscular fatigue leads to increased electromechanical delay (EMD), and that differential recovery patterns are exhibited between the leg extensor and flexor muscle groups, which may adversely affect performance and possibly increase lower extremity injury risks. However, it is unknown whether these effects are influenced by the intensity level of the fatigue protocol. **PURPOSE:** The purpose of this study was to investigate the effects of a fatigue-inducing bout of submaximal, and maximal intermittent isometric contractions on the electromechanical delay of the leg extensors and flexors in college-aged females. **METHODS:** Twenty young (age=21.23±1.41years) recreationally active females participated in a familiarization trial followed by four experimental fatigue sessions, separated by seven (±1) days. All sessions began with participants performing maximal voluntary contractions (MVCs) followed by a randomly assigned fatigue-inducing protocol consisting of intermittent isometric contractions of the leg extensors or flexors using a 0.6 duty cycle (6s contraction, 4s relaxation) at either 50% or 100% of MVC until volitional fatigue. MVCs were again performed at 0, 7, 15, and 30 min post fatigue. **RESULTS:** A three-way repeated measures ANOVA (muscle [leg extensors vs. leg flexors] × intensity [submaximal vs. maximal] × time [Pre-vs.Post0vs.Post7vs.Post15vs.Post30]) was used to analyze the EMD data. There was no significant three-way interaction (P=0.134), nor a two-way interaction for muscle × time (P=0.778), intensity × time (P=.072), or muscle × intensity (P=0.842). However, there was a main effect for time (P=0.0001) where the EMD of the leg extensors and flexors was greater at all post fatigue time periods compared to

Pre-, and Post0 was greater compared to all other post time periods ($P=0.001$). Additionally, the EMD of the leg flexors was greater ($P=0.011$) compared to the leg extensors. **CONCLUSIONS:** These findings show similar fatigue-induced EMD effects and recovery patterns between the leg extensors and flexors at both maximal and submaximal intensities. The sustained increased EMD of the extensors and flexors during recovery may have important injury and performance implications in a variety of populations and settings; and these effects may be similarly incurred at both submaximal and maximal contraction intensities.

46. THE EFFECT OF EXERCISE SELF-EFFICACY ON PHYSICAL ACTIVITY, ADIPOSITY, AND BONE MINERAL DENSITY AMONG OLDER ADULTS

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The impact of exercise self-efficacy (ESE) on physical activity (PA) and the ability to maintain healthy levels of body fat (BF) and bone mineral density (BMD) are unclear in older adults. **PURPOSE:** Therefore, the purpose of this study was to investigate the effect of ESE on PA, BF, and BMD among older adults. **METHODS:** Older adults ($n = 76$) were separated into tertiles (T_1, T_2, T_3) based on ESE as scored by the Self-Efficacy for Exercise Scale. BMD and body composition were measured using dual energy x-ray absorptiometry and PA levels were measured using the Rapid Physical Activity Questionnaire. Variables were analyzed via MANOVA and follow-up univariate analyses were completed when significance was observed within the model. **RESULTS:** MANOVA revealed a significant Wilks Lambda ($p < .001$) and follow-up univariate analysis was completed for PA levels, android fat percentage (AFP), gynoid fat percentage (GFP), and spinal BMD. ANOVA revealed that the highest levels of ESE (T_3) were significantly lower for AFP ($p = .002$) compared to T_1 and T_2 (30% and 26% lower, respectively) while GFP was significantly lower ($p = .012$) for T_3 (24%) compared only to T_1 . Compared to T_1 and T_2 , PA levels were significantly higher ($p < .001$) for T_3 . Analysis of spinal BMD was significantly higher ($p = .030$) for T_2 (10%) compared only to T_1 . When investigating the relationship of ESE and PA, a significant correlation ($p < .001, r = .66$) was observed. **CONCLUSION:** It is proposed that both ESE and PA are both involved in older individual's ability to maintain longitudinal health. ESE appears to play a significant role in the conservation of health, but it cannot be considered the only factor. The correlation between ESE and PA suggest their relationship to each other, however the causal relationship cannot be determined. Understanding the cause/effect between ESE and PA could potentially help in not only initiating, but also maintaining PA in older adults.

47. EXAMINATION OF POWER OUTPUT DURING A HIGH-VOLUME POWER-ORIENTED BACK SQUAT PROTOCOL

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The majority of research regarding power-oriented training focuses on a low to moderate range of repetitions (e.g., 2-6), where in some instances a higher range is used (e.g., 6-10). However, some researchers suggest ceasing an exercise, irrespective of repetition number, when peak power output (PPO) drops below 90% of the maximum PPO during that set. **PURPOSE:** The purpose of this study was to investigate peak power output during a high-volume moderate intensity back squat protocol in college-aged males. **METHODS:** Nineteen resistance-trained men (mean \pm SD: age = 22.68 ± 2.98 years, mass = 85.94 ± 10.52 kg, stature = 174.71 ± 8.23 cm, 1 repetition maximum [1-RM] = 149.60 ± 23.35 kg) performed a back squat protocol comprising 5 sets of 16 repetitions at 40% of their 1-RM. The subjects were instructed to follow a 2-sec cadence for the eccentric phase of the back squat, but to perform the concentric phase as explosively as possible while maintaining flat feet. A 2 minute rest interval was allowed between sets. PPO was measured during each repetition with a linear displacement analyzer and the group PPO mean for each repetition was used for analyses. **RESULTS:** When repetitions 1-16 were averaged together, there were no significant between-set differences, for PPO ($P = .581$). The highest-repetition for PPO within each set showed minimal decline across the protocol (up to 1.5%). Within each set, PPO only declined 7-10%. **CONCLUSION:** These findings suggest a high-volume, moderate intensity power-oriented back squat protocol may yield minimal declines in PPO in experienced resistance trained men. Although a non-ballistic stimuli was used in the present study, fitness professionals may consider a protocol of this nature when their objective is maintaining optimal power output levels over longer durations (i.e. 60 seconds, multiple sets).

48. THE EFFECT OF A BOUT OF HIGH-INTENSITY INTERVAL TRAINING ON RESPIRATORY MUSCLE FATIGUE

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PURPOSE: Previous research demonstrates that respiratory muscle fatigue (RMF) occurs during prolonged aerobic exercise at $\geq 85\%$ of an individual's maximal aerobic capacity (VO_{2max}). High intensity interval training (HIT) is a time efficient strategy to stimulate adaptations that are comparable to traditional endurance training. However, it is not known if RMF occurs during HIT. We hypothesized that RMF would occur during and following a session of HIT. **METHODS:** Eight healthy men (21.7 ± 1.7 yrs) with normal pulmonary function initially performed a graded exercise test until exhaustion on a cycle ergometer to determine VO_{2max} . Subjects then, in random order, completed two bouts of HIT (7 x 1 min, 2 min recovery between intervals) and three bouts of continuous exercise (CE) tests until exhaustion (~ 5 min) on a cycle ergometer at the same power output ($\sim 90\%$ peak power; determined from the VO_{2max} test). Maximal inspiratory pressure (P_{IMAX}) and expiratory pressure (P_{EMAX}) were measured pre- and post-exercise for both HIT and CE, and following each interval during HIT. Decreases in maximal inspiratory and expiratory pressures compared to baseline were used to determine RMF. **RESULTS:** There was no differences ($p > 0.05$) in P_{IMAX} or P_{EMAX} pre- or post-exercise for HIT (P_{IMAX} pre: 134 ± 51 post: 135 ± 50 cmH₂O; P_{EMAX} pre: 143 ± 41 post: 148 ± 46 cmH₂O) or CE (P_{IMAX} pre: 135 ± 54 post: 133 ± 52 cmH₂O; P_{EMAX} pre: 146 ± 46 post: 148 ± 46 cm H₂O) indicating no RMF occurred with either type of exercise. Also, there was no difference ($p > 0.05$) in P_{IMAX} or P_{EMAX} following each interval during the bout of HIT compared to baseline values. **CONCLUSION:** These data suggest that respiratory muscle fatigue does not occur during or following a session of HIT. The lack of RMF under these conditions is likely due to the relatively short intervals of exercise in HIT.

49. COMBINATION THERAPY OF METFORMIN AND CALORIC RESTRICTION IN THE TREATMENT OF TYPE 2 DIABETES AND NAFLD IN OLETF RATS

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Weight loss remains a cornerstone therapy in the treatment for nonalcoholic fatty liver disease (NAFLD). In addition, limited literature suggests that metformin can effectively lower liver enzymes in type 2 diabetics. However, the efficacy of metformin therapy when taken in combination with weight loss on NAFLD outcomes remains largely unexamined. **PURPOSE:** Here, we sought to determine the therapeutic effects of metformin, caloric restriction, and the combination on type 2 diabetes and NAFLD outcomes in hyperphagic Otsuka Long-Evans Tokushima Fatty (OLETF) rats. **METHODS:** We randomly assigned OLETF rats (age 20 weeks; $n=6-8$ /group) to ad libitum fed (AL), metformin (300 mg/kg/d; Met), daily caloric restriction (70% of AL fed; CR), or combination CR+Met groups for 12 weeks of treatment. **RESULTS:** Met therapy lowered body weight and body fat compared with AL, but to a lesser extent than CR and CR+Met ($p < 0.05$). All three therapies improved fasting insulin, glucose, and/or HbA1c levels, but only the combination of CR+Met improved post-challenge glucose tolerance. Met, CR, and CR+Met reduced hepatic triglycerides by 40%, 70%, and 60% ($p < 0.05$ between Met and CR/CR+Met groups), respectively compared with AL rats, and although there was no additive effects of CR+Met on lowering hepatic steatosis beyond CR alone, the combination resulted in further attenuation in serum alanine aminotransferase (ALT) levels. Met alone failed to alter hepatic de novo lipogenesis proteins fatty acid synthase (FAS), acetyl-CoA carboxylase (ACC) and stearoyl-CoA desaturase-1 (SCD-1), or hepatic mitochondrial activity assessed with palmitate oxidation and β -hydroxy-acyl-CoA dehydrogenase (β -HAD) activity; whereas, CR alone reduced FAS, ACC and SCD-1 protein content, and increased complete palmitate oxidation and β -HAD activity. Furthermore, the combination therapy resulted in further reductions in ACC and SCD-1 protein content compared with CR alone. **CONCLUSIONS:** Caloric restriction appears to be a more effective therapy than metformin alone in the treatment of NAFLD in the obese, hyperphagic OLETF rat. However, the combination of caloric restriction + metformin offered greater benefits in improving glycemic control, reducing markers of liver injury, and suppressing markers of hepatic de novo lipogenesis than either therapy alone.

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50. EFFECTS OF INCREASING AMBIENT HUMIDITY DURING LOW-INTENSITY EXERCISE IN THE HEAT ON FEMALES

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Females increasingly occupy vocations that require working prolonged periods in hot-humid climates, however, research examining females under these conditions remains unclear. **PURPOSE:** To assess how increasing relative humidity (RH) influences females' thermoregulation and perception during low-intensity exercise in the heat.

METHODS: Ten healthy females (age=23±2 y, VO₂max=46±6 ml·kg⁻¹·min⁻¹) walked 90 min at 35%VO₂max in 35°C at 55% RH (55RH), 70% RH (70RH), and 85% RH (85RH); all trials were completed during follicular phase. Investigators obtained 1) rectal temperature (T_{re}), mean-weighted skin temperature (T_{sk}), heart rate (HR), ambient temperature (T_a), and RH every five min, 2) pre and post nude body masses, and 3) respiratory measures every 30 min; partitioned calorimetric variables were calculated from these measures. **RESULTS:** Significant RH*time interactions existed for all calorimetry variables (n=9; all p<0.0005) except heat production (p=0.139), convective respiratory heat loss (p=0.137), and required rate of evaporative cooling (E_{req}; p=0.197). Each RH increase significantly decreased evaporative heat loss (E); all other calorimetry variables only significantly differed after 70RH. Combined, dry (convective+radiative) and respiratory heat losses only compensated for <30% of decreases in E. T_{re}, T_{sk}, and HR presented significant RH*time interactions (p<0.0005). 85RH T_{re} significantly exceeded 55RH and 70RH after 35 min. 70RH T_{sk} tended to exceed 55RH (p=0.057), and 85RH T_{sk} significantly exceeded 55RH and 70RH after 30 and 40 min, respectively. After 10 min, 85RH HR significantly exceeded 55RH and 70RH; after 50 min, 70RH HR significantly exceeded 55RH. 70RH sweat rate tended to exceed 55RH (p=0.063), and 85RH significantly exceeded both trials (55RH=0.6±0.2; 70RH=0.7±0.2; 85RH=0.9±0.3 L·h⁻¹; p=0.001).

CONCLUSION: The primary findings of this study were that females exercising at low intensities in 35°C only experienced significant thermoregulatory strain after RH exceeded 70%. As heat production and E_{req} remained constant across trials, heat storage increased with each 15% rise in RH because dry and respiratory heat losses minimally offset decreased E. Hotter T_{re}, T_{sk}, and resultantly higher sweat rate, reflected heat storage increases as E decreased in each trial. Overall, at T_a ≤ 35 °C, we found females working/exercising for prolonged periods at low-intensities will remain at safe core temperatures up to 70% RH.

51. THE INFLUENCE OF ANKLE POSITION DURING A STRAIGHT-LEG RAISE ON THE PASSIVE RESISTIVE PROPERTIES OF THE POSTERIOR HIP AND THIGH MUSCLES

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PURPOSE: To examine the influence of ankle position on passive torque (PT), range of motion (ROM), and electromyography (EMG) of the posterior hip and thigh muscles during a passive straight-leg raise (SLR) assessment. **METHODS:** Thirteen healthy participants (mean±SD age=23±2yr; mass=69±15kg; height=169±10cm) performed six randomly ordered passive SLR assessments involving two assessments at each condition, which included the ankle positioned in dorsiflexion (DF), plantar flexion (PF), and a neutral (NTRL) position. All SLRs were performed using an isokinetic dynamometer programmed in passive mode to move the foot toward the head at 5°·s⁻¹. For each SLR, participants laid in a supine position, with the knee braced in full-extension and the ankle immobilized in either 10° of DF, 10° of PF, or a NTRL (0°) position using an adjustable, custom-built stabilizing apparatus. All assessments were conducted on the right leg, while the left thigh and ankle were secured with restraining straps. Bipolar surface EMG amplitude of the biceps femoris was sampled during each SLR and expressed as a percentage of the maximal EMG amplitude that was corrected for initial baseline noise. PT and EMG amplitude were determined at four common joint angles (θ) separated by 5° during the final common 15° ROM for each participant. **RESULTS:** Maximum ROM was lower for the DF than the NTRL (P=0.003) and PF (P<0.001) conditions. PT was greater for the DF than the NTRL and PF conditions at θ₃ (P=0.001) and was greater for the DF than the NTRL condition at θ₄ (P=0.003) but was not different between conditions at θ₁ and θ₂ (P>0.05) (Figure 1).

PT also increased with joint angle for the DF, PF, and NTRL conditions ($P < 0.001$). There were no joint angle or condition-related differences ($P > 0.05$) for EMG. **CONCLUSION:** These findings suggest that the SLRs performed with the ankle positioned in DF elicited greater PT and lower ROM of the posterior hip and thigh muscles than the SLRs with the ankle positioned in PF or a NTRL position.

52. THE EFFECT OF LEUCINE SUPPLEMENTATION ON INFLAMMATION DURING SKELETAL MUSCLE REGENERATION

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Skeletal muscle regeneration requires the coordinated regulation of inflammation, extracellular matrix remodeling, and myofiber growth. Disruptions to any of these processes can alter the skeletal muscle regenerative response. Leucine supplementation has been shown to increase protein translation and muscle protein synthesis by activating the mammalian target of rapamycin signaling pathway. Leucine supplementation appears to modulate inflammatory status and protein turnover of muscle cells by altering protein synthesis and protein degradation pathways. However, it is not known how leucine supplementation modifies the inflammatory response during skeletal muscle regeneration. **PURPOSE:** To examine the effects of leucine supplementation on inflammatory markers during skeletal muscle regeneration. **METHODS:** Twenty female C57/BL6 mice (12 weeks) were randomly assigned to one of four groups: uninjured, uninjured + leucine, injured, injured + leucine. To induce damage, bupivacaine was injected into the tibialis anterior (TA) of the injured group. In the uninjured groups, phosphate buffered saline was injected into TA. Three days post-injection, the TA was extracted and quantitative PCR and western blot analysis was performed to determine gene expression and protein expression, respectively. **RESULTS:** In the no leucine group, there was a 9% decrease in TA mass to tibia length (2.2 ± 0.1 mg/mm vs. 2.0 ± 0.1 mg/mm, $p < 0.05$) whereas, in the leucine group there was a 19% decrease in TA mass to tibia length (2.1 ± 0.1 mg/mm vs. 1.7 ± 0.0 mg/mm, $p < 0.05$) 3 days post-bupivacaine injection. In the no leucine group, TNF- α gene expression was increased 2-fold ($p < 0.05$) 3 days post-bupivacaine injection. However, in the leucine group, TNF- α gene expression was not altered at 3 days post-bupivacaine injection. In the no leucine group, p-STAT protein expression was not affected 3 days post-bupivacaine injection. However, in the leucine group, p-STAT protein expression was decreased 48% ($p < 0.05$) 3 days post-bupivacaine injection. **CONCLUSION:** Leucine supplementation decreased markers of inflammation at the onset of skeletal muscle regeneration and could lead to an improved skeletal muscle regenerative response.

53. ECCENTRIC RESISTANCE TRAINING AND BLOOD FLOW RESTRICTION

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Research into blood flow restriction (BFR) and resistance exercise has indicated the promising potential for use of this novel training modality in both rehabilitative and performance based settings; however, research into the effects of contraction specificity and blood flow restricted exercise have yet to be examined. **PURPOSE:** Therefore, the purpose of this study was to investigate the muscular strength and hypertrophic responses following a four week (two sessions per week) training intervention involving resistance exercise utilizing only eccentric muscle contractions with or without blood flow restriction. **METHODS:** Eighteen young, male, recreational weightlifters were recruited to participate in this study. Prior to the training intervention subjects attended three sessions. The first session was to obtain demographic information (age, height, body mass) and familiarize each of the participants with the testing and training equipment. After the familiarization session, two sessions (separated by 7 days) were performed to obtain each participants' pre-training values for muscular strength assessed via elbow flexion one repetition maximum (1-RM). Additionally, upper-arm muscle cross-sectional area (CSA) was assessed during each of these sessions using an estimation equation derived from the circumference and skinfolds. Subjects were then randomized into three training conditions, eccentric resistance training only (ECC), eccentric resistance training with BFR (OCC), and a control training group (CON). Following each intervention, participants strength and CSA were reassessed and compared to pre-training values. **RESULTS:** Following training, results indicated no significant difference between ($P > 0.05$) or within groups ($P > 0.05$) for 1-RM elbow flexion strength. Regarding upper-arm CSA, there was a significant main effect for time (between pre- and post-training) when collapsed across groups ($P = 0.01$); however, there was no significant group x time interaction ($P > 0.05$). **CONCLUSION:** The findings of the

current study indicate that the addition of BFR to eccentric resistance exercise does not provide superior muscle strength nor size adaptations compared to eccentric resistance training without BFR or regular resistance training. Further research may resolve issues with contraction specificity with regards to blood flow restriction resistance training.

54. COMPARISON OF TWO ENDURANCE PERFORMANCE PROTOCOLS AND EFFECT ON MAXIMAL OXYGEN CONSUMPTION

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Maximal oxygen consumption (VO_2 max) is widely accepted as both a basic measure of aerobic capacity, as well as an indicator of potential cardiovascular performance. The VO_2 max test protocol selected by the researcher has the potential to influence the results, as previous research has shown that graded exercise tests with larger stage-to-stage increases in energy requirements weaken the strength of the relationship between VO_2 max and work rate. Further research has provided evidence suggesting protocols with shorter time durations in each stage can provide results similar to those observed when using protocols with greater energy requirements between stages. **PURPOSE:** The purpose of the study was to compare energy expenditure of a one-minute stage interval VO_2 max protocol with an Astrand Treadmill VO_2 max protocol. **METHODS:** Following IRB approval, a total of 15 subjects volunteered for the study. Subjects reported for testing on two separate occasions with testing separated between 2 and 4 days. Prior to each session a 10-minute warm-up was performed. In randomized order, participants completed either the Astrand Treadmill protocol or the modified graded exercise treadmill test. **RESULTS:** Time to exhaustion for the Astrand protocol and the modified protocol were found to be highly correlated with a Pearson correlation of $r = 0.865$ ($p \leq .001$). A strong correlation was also found between calculated VO_2 max from the Astrand protocol and the modified protocol with a Pearson correlation of $r = 0.865$ ($p \leq .001$). The correlations between the Astrand Treadmill protocol and the modified graded exercise test protocol for both time to exhaustion ($p = .000$) and calculated VO_2 max ($p = .000$) were found to be significant. **CONCLUSION:** These data provide support for the use of a modified graded exercise treadmill test using 1-minute stage intervals for assessing VO_2 max. This research may provide guidance for researchers and exercise physiologists as an additional option for measuring VO_2 max, particularly if laboratory time and resources are limited.

55. NITRIC OXIDE SYNTHASE INHIBITION DOES NOT ALTER HEPATIC MITOCHONDRIAL FUNCTION IN NONALCOHOLIC FATTY LIVER DISEASE

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Nitric oxide (NO) is a complex modulator of mitochondrial content and function. In insulin resistance, constitutive NO production is reduced and it is unknown whether this contributes to hepatic mitochondrial dysfunction in nonalcoholic fatty liver disease (NAFLD). **PURPOSE:** To test the hypothesis that endogenous NO production abatement with a non-selective NO synthase inhibitor (L-NAME) would reduce hepatic mitochondrial content and function in lean Long-Evans Tokushima Otsuka (LETO) rats and obese, insulin resistant Otsuka Long-Evans Tokushima Fatty (OLETF) rats. **METHODS:** OLETF and LETO rats (16 weeks) received either control or L-NAME (65-70 mg/kg/day) containing drinking water ($n=10$ /group) for 4 weeks. Animals were sacrificed following a 12-hour fast and blood and liver were obtained. Hepatic mitochondria were isolated and fatty acid oxidation (FAO) and respiration were assessed. **RESULTS:** L-NAME treatment significantly ($p < 0.05$) reduced serum NO metabolites (NOx) and reduced food intake in both LETO and OLETF rats. Additionally, L-NAME treated OLETF rats, relative to control OLETFs, had significantly reduced percent body fat (24.5% vs. 27.6%) and fasting plasma insulin (22.4 \pm 3.1 vs. 32.0 \pm 3.8 ng/mL). L-NAME did not alter hepatic mitochondrial respiration, FAO, oxidative phosphorylation complex (OXPHOS I-V) protein content, or PGC-1 α protein content. **CONCLUSION:** Under the conditions of this study, while systemic NO synthase inhibition reduced circulating NOx levels, there was no observed effects on hepatic mitochondrial content or function in a lean or obese condition. Further work is needed to elucidate the role of NO in mediating mitochondrial function in NAFLD.

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56. COMPUTERIZED NEUROCOGNITIVE ASSESSMENTS AND DETECTION OF THE MALINGERING ATHLETE

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In the United States it is estimated that 1.6 to 3.6 million concussions occur each year. Computerized neurocognitive assessment tools (NCAT) are commonly used by athletic trainers and physicians to measure cognitive abilities in healthy, non-concussed athletes. The systems are designed to measure post-concussion cognitive ability in order to thoroughly evaluate and monitor the athlete's recovery to ensure proper return to play decisions. However, researchers are concerned that athletes would be capable of intentionally underperforming on baseline tests to expedite their return to the field following a concussion. **PURPOSE:** There were two specific aims of this study: 1. To investigate the test-taker's ability to alter their NCAT baseline test scores, malingering baseline (MB) relative to a non-malingering baseline (NMB), 2. To assess the NCAT's ability to detect MB compared to a physician trained in evaluation of results from this version of NCAT. **METHODS:** 20 male, collegiate rugby players completed this study (23±4yrs). Participants completed 2 NCAT assessments within a 7-day interval. Participants were initially deceived to believe this was a pre-test/post-test assessment. The NMB was measured following the NCAT's normal sequence of instructions where they were asked to perform to the best of their abilities. Immediately prior to the second assessment (MB), each participant was debriefed about the prior deception and instructed to "underperform on the test" without specific direction on techniques to do so. NMB and MB clinical reports were generated by the NCAT system, blinded and sent to the physicians for secondary analysis. **RESULTS:** MB test scores were significantly lower ($p < .05$) than NMB scores for 12 of the 13 variables assessed as part of this study. The NCAT system detected 70% ($n=14$) of the MB tests, whereas the physician detected the same 14 MB tests and 2 additional (80%) from NCAT reports. **CONCLUSIONS:** There is a possibility that athletes would be able to malingering and alter their baseline scores using an NCAT system. This possibility is reduced with oversight by a properly trained physician familiar with the particular NCAT software. In-person clinical assessment coupled with NCAT provides the most reliable method to avoid malingering by athletes.

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57. AIRWAYS AND LUNG GROWTH DURING PUBERTY

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Women have smaller lungs and reduced expiratory flow rates compared to men. Also, women exhibit disproportionately smaller airways in relation to lung size (dysanapsis) compared to men. It is not known, if dysanapsis occurs during puberty. **PURPOSE:** To determine if the airways and lungs grow disproportionately during puberty in boys and girls. We hypothesized that during puberty dysanapsis would occur and boys would exhibit more dysanaptic growth compared to girls. **METHODS:** Nineteen pre-pubescent children (10 boys; 9 girls) performed pulmonary function tests (PFT) from a previous published study (Swain et al. 2010) ~5 years ago. These 19 children were recently recruited to perform follow up PFTs. PFTs included forced vital capacity (FVC) and forced expiratory flow at 50% (FEF₅₀). Static pressure at 50% of FVC (Pst(l)_{50%}) was estimated based on age (DeTroyer et al. 1978). Dysanapsis ratio was calculated (FEF₅₀ × FVC⁻¹ × Pst(l)_{50%}⁻¹). Maturation was determined via Tanner stages. **RESULTS:** During puberty, boys were significantly more mature (4.1 ± 0.6 stage vs. 3.6 ± 0.5 stage, respectively) compared to girls. FVC and FEF₅₀ increased ($p < 0.05$) and FEF₅₀/FVC and DR significantly decreased during puberty. FEF₅₀ and FVC significantly increased and DR decreased ($p < 0.05$) during puberty for both boys and girls. During puberty, boys had a significantly decreased FEF₅₀/FVC compared to pre-puberty, while during puberty the FEF₅₀/FVC of girls was not different ($p > 0.05$) compared to pre-puberty. During puberty, boys had significantly larger FVC, but FEF₅₀, DR, and FEF₅₀/FVC were not different ($p > 0.05$) compared to girls. Lastly, airway conductance (FEF₅₀/Pst(l)_{50%}) during puberty was not different ($p > 0.05$) between boys and girls during puberty. **CONCLUSION:** These data suggests that dysanaptic growth occurs during puberty. In addition, the growth of the airways for boys lags behind the growth of the lungs during puberty compared to girls suggesting a sex difference in dysanaptic growth during puberty.

58. THE EFFECTS OF A HIGH INTENSITY FREE-WEIGHT BACK SQUAT ON POSTURAL STABILITY IN RESISTANCE-TRAINED MALES

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Previous studies have revealed that high intensity aerobic and anaerobic exercise may have adverse effects on postural stability, which could lead to lower performances and an increased risk of injury. **PURPOSE:** The purpose of this study was to investigate the effects of a high-intensity free-weight back squat on static balance in resistance-trained males. **METHODS:** Eighteen young (mean \pm SD: age = 22.9 ± 2.9 years; height = 175.8 ± 6.4 cm; mass = 86.3 ± 9.3 kg), resistance-trained males performed balance testing before and after completing 5 sets of 8 repetitions of the back squat exercise at 80% 1-repetition maximum. A commercially designed balance test unit was used to assess sway index (SI) at pre (Pre) and at 0 (Post 0), 5 (Post 5), 10 (Post 10), 15 (Post 15), and 20 (Post 20) minutes post-intervention following the back squat. Each balance assessment consisted of 4, 20-second static stance conditions: eyes-open firm surface (EOFS), eyes-closed firm surface (ECFS), eyes-open soft surface (EOSS) and eyes-closed soft surface (ECSS). **RESULTS:** SI was greater ($P=0.001-0.020$) at Post 0 than at Pre-, Post 5, Post 10, Post 15, and Post 20. No differences ($P>0.05$) were observed for SI between any other time phases. SI was greater ($P<0.001$) for ECSS than for EOFS, ECFS, and EOSS; and was greater ($P<0.001$) for ECFS and EOSS than for EOFS. **CONCLUSIONS:** These findings revealed that SI for all four conditions significantly increased following completion of the back squat; however, SI returned to baseline within 5 minutes of the exercise. The presence of higher SI values immediately after the back squat exercise demonstrated the adverse effects on postural sway and balance performance that may be induced as a consequence of neuromuscular fatigue. If reductions in balance decrease performance and increase the risk of injury, then the present findings suggest that for athletes who are performing a multiple-exercise workout, a recovery period ranging from 0 – 5 minutes of rest after completing a high intensity back squat may be necessary prior to beginning additional exercises.

59. HYDRATION STATUS WHEN INCREASING DAILY FLUID INTAKE WITH VARIOUS BEVERAGES

Matthew A. Tucker¹, Matthew S. Ganio¹, John D. Adams¹, Lemuel A. Brown¹, Christian Ridings¹, Jenna Burchfield¹, Blake Robinson¹, Jamie McDermott², Nicole E. Moyer¹, Brett Schreiber¹, Tyrone Washington¹, Andrea Bermudez¹, Meredith Bennett¹, and Maxime Buyckx³; ¹University of Arkansas, Fayetteville, Arkansas; ²McDermott Nutrition, Fayetteville, Arkansas; ³The Coca-Cola Company, Atlanta, Georgia.

Few studies have examined how drinking fluids of varying composition may affect hydration status in healthy, free-living adults. Further, relatively little is known about how hydration status is affected when increasing fluid ingestion with various beverages. **PURPOSE:** To investigate the hydration status of healthy, free-living adult males when given varying volumes of different beverage types. **METHODS:** Thirty-six healthy males (age 24 ± 5 y; height 177.7 ± 8.2 cm; mass 75.1 ± 11.4 kg) volunteered for this study. Subjects were randomly divided into four treatment groups for two weeks of testing: water only, water+cola, water+diet cola, or water+cola+diet cola+orange juice. Volumes of fluid were split evenly between beverages within each treatment. Each week consisted of 24-h of testing in which food was provided. Total fluid consumed (including moisture content of food) was equivalent between treatment groups. Week 1 total fluid ingestion over the 24-h period was 35 ml/kg body mass; week 2 total fluid ingestion was 40 ml/kg body mass. At the beginning of each 24-h testing period, equivalent hydration status was confirmed via serum osmolality (Osm_{serum} ; 292 ± 5 vs. 291 ± 5 mOsm, for weeks 1 and 2, respectively; $p > .05$). Urine was collected over the 24-h period and analyzed for osmolality (Osm_{urine}) and volume (Vol_{urine}). Osm_{serum} and total body water (TBW) via bioelectrical impedance was collected and analyzed after 24-h of beverage intervention. **RESULTS:** Per the protocol, total beverage consumption, independent of treatment increased from week 1 (1721 ± 384 ml) to week 2 (2096 ± 437 ml) by $22 \pm 2\%$ (375 ± 57 ml). There was no effect of beverages on hydration differences between weeks (i.e., no interaction; $p > .05$). Independent of week, there were no hydration differences between beverage groups ($p > .05$). The increase in fluid consumption between week 1 and week 2 did not change TBW (43.7 ± 5.5 vs. 43.5 ± 5.2 kg), Osm_{serum} (292 ± 4 vs. 293 ± 5 mOsm), Osm_{urine} (599 ± 221 vs. 561 ± 217 mOsm) or Vol_{urine} (1526 ± 624 vs. 1621 ± 651 ml) (all $p > .05$). **CONCLUSION:** Regardless of fluid volume consumed, there were no differences between the beverages in providing adequate hydration over a 24-h period in free-living adult males. This suggests that the fluid contained in various beverages is equally effective in hydrating the body.

Funded by The Coca-Cola Company.

Professional Member Poster Presentations

60. THE EFFECT OF MUSIC AND MUSICAL GENRES ON PUTTING ACCURACY IN GOLF

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It is well documented that music can positively impact athletic performance with faster tempo music generally leading to improved outcomes. However, most research has investigated explosive or endurance activities, and the benefit of music in fine motor control situations are relatively unknown. **PURPOSE:** Therefore, this study sought to determine whether golf putting accuracy could be improved by listening to music, and whether certain musical genres elicited better performances than others. **METHODS:** Participants were 22 (8 male, 14 female) university Division 1 golfers of average age 20.3 years and all with a minimum of 8 years of golf experience. Each participant completed a series of 6 trials which comprised of attempting 5 putts at 4 pre-designated locations around a hole. In a randomized order, participants were required to listen to either no music or a musical genre that included classical, country, rock, jazz, and hip hop/rap while putting. **RESULTS:** A one-way ANOVA revealed a significant difference between no music compared to jazz ($F(6,15) = 14.47, p = .001$), hip hop/rap ($F(6,15) = 4.55, p = .008$), classical ($F(6,15) = 4.33, p = .01$), and country ($F(6,15) = 2.82, p = .048$). Rock music was not significant but approached significance ($F(6,15) = 2.67, p = .058$). A second one-way ANOVA compared musical genres to each other, and participants were found to perform significantly better while listening to jazz as opposed to any other musical genre ($F(1,20) = 5.04, p = .036$). Although male participants were more accurate in all trials, there was no statistical significance between the male putters and female putters ($F(5,2) = 6.55, p = .138$). **CONCLUSION:** Regardless of genre, music appears to improve golf putting performance over no music. However, it is apparent that the type of music can also significantly impact outcomes, and jazz appears to be the most effective genre for this group. Future research is needed with a larger sample to determine whether such findings can be replicated. Further, other fine motor skill sports or tasks such as shooting or archery should investigate whether music and specific genres can influence performance.

61. EFFECTS OF BEDTIME SNACKING ON REST METABOLIC RATE

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Athletes competing in sports requiring weight-classes, often decrease caloric intake in attempts to lose weight to compete in a lower weight class. Many times this means very limited nutrient intake prior to bedtime, which in turn causes an 8 hour fast during sleeping to become an even longer period of fasting. Periods of intermittent fasting have been shown to decrease one's resting metabolic rate (RMR) which can slow weight loss. **PURPOSE:** The purpose of this study was to investigate the differences in RMR following a one week change in bedtime snack selection in health individuals. **METHODS:** 12 males (18-24 yrs.) and 6 females (18-27yrs) on an ad libitum diet volunteered for this crossover study. RMR was initially assessed two days prior to starting any intervention. Subjects participated in three different interventions: no snacking within two hours of bedtime, a high carbohydrate, moderate protein snack (8 ounce of chocolate flavored skim milk or strawberry flavored 1% milk) immediately prior to bedtime, and a high protein, moderate carbohydrate snack (8 ounces of chocolate or vanilla flavored whey protein) immediately prior to bedtime. There was a one week washout period between interventions. RMR was assessed after day 1 and day 7 of each intervention period. **RESULTS:** Average RMR decreased from baseline for all interventions. There was a trend for less of a decrease in RMR during the high carbohydrate, moderate protein bedtime snack intervention. RMR decreased by 55.56 ± 250.0 calories and 58.22 ± 105.3 calories on average during the no snacking intervention and high protein, moderate carbohydrate snack intervention. Average RMR only decreased by 30.56 ± 259.0 calories in the high carbohydrate, moderate protein snack intervention. **CONCLUSION:** Bedtime snacking did not appear to have a significant impact on RMR in healthy adults consuming an ad libitum diet, except for two hours prior to bedtime. However, there was a trend for a smaller decrease in RMR following the high carbohydrate, moderate protein bedtime snack of chocolate milk. Further research is need to determine if the macronutrients present in milk could be alter to result in an actual increase in RMR when taken immediately prior to bedtime.

62. VALIDATION OF A 3-DIMENSIONAL VIDEO MOTION CAPTURE SYSTEM FOR DETERMINING BARBELL POWER AND VELOCITY DURING THE BENCH PRESS

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Analyses of barbell kinetics and kinematics have typically required the use of force plates, tether-based position transducers, or digitized video analysis. **PURPOSE:** To determine the validity of a 3-dimensional video markerless motion capture system for determining barbell kinetics and kinematics. **METHODS:** Two 3-D video cameras sampling at 30 Hz and mounted on the top of a power rack were interfaced with a self-contained computer and software system, and operated with a touch screen (EliteForm, Lincoln, NE). For laboratory comparison purposes, a ceiling-mounted linear position transducer (Unimeasure, Corvallis, OR) was attached via a tether to the barbell. Data from the position transducer was sampled at 1000 Hz using a BioPac data acquisition system (Goleta, CA). Velocity ($\text{m}\cdot\text{s}^{-1}$) and power (W) were derived using LabView software (National Instruments, Austin, TX). One weight-trained male subject (age = 25 yrs, hgt = 1.75 m, BW = 82.6 kg, 1 RM = 161.0 kg) performed the barbell bench press exercise for 10 sets x 1 repetition at 30, 40, 50, 60, 70 and 80% 1 RM loads using maximal acceleration during the concentric phase. Dependent variables included peak (PV) and \bar{X} velocity (MV) and peak (PP) and \bar{X} power (MP). Linear regressions between lab-derived and 3-D video-derived data provided correlation coefficients, and regression slopes (b). Bland-Altman plots were used to determine \bar{X} differences, from which effect sizes (Cohen's D) and % error for the 3-D camera system was determined. **RESULTS:** Lab-derived mean values for all loads ranged as follows; MV = 0.36 – 1.00 $\text{m}\cdot\text{s}^{-1}$, PV = 0.47 – 1.60 $\text{m}\cdot\text{s}^{-1}$, MP = 460.9 – 621.6 W, and PP = 619.9 – 1055.6 W.

Dependent Variable	\bar{X} difference	Effect Size (D)	r	Slope (b)	% Error
Mean Velocity	0.01 $\text{m}\cdot\text{s}^{-1}$	0.05	0.99	0.94	2.0 %
Peak Velocity	0.02 $\text{m}\cdot\text{s}^{-1}$	0.06	0.99	1.05	2.8 %
Mean Power	9.0 W	0.10	0.99	0.92	2.3 %
Peak Power	44.6 W	0.34	0.94	1.04	7.6 %

CONCLUSION: The 3-D video markerless motion capture system provided accurate and valid barbell velocity and power data for the bench press exercise.

Supported in part by Nebraska Global LLC

63. COMPARISON OF MODERATE TO VIGOROUS PHYSICAL ACTIVITY MINUTES DURING ORGANIZED INDOOR ACTIVITIES, INDOOR FREE PLAY, AND OUTDOOR FREE PLAY

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Recess and play are an important part of a child's growth and development--physically, cognitively, socially and emotionally. School recess provides an opportunity for elementary students to accumulate 30-45 minutes of physical activity per day. However, during inclement weather, recess is spent indoors, which normally reduces minutes of physical activity due to the options allowed to students (ie, computer or study time). **PURPOSE:** The purpose of this study was to compare minutes of moderate to vigorous physical activity (MVPA) during organized indoor recess activities and indoor free play. Secondly, we examined minutes of MVPA for various indoor and outdoor recess activities. **METHODS:** Ninety-nine elementary students (4th-5th grade; 50 females; 49 males) participated in organized indoor recess activities (geofitness, active dance video game, and small group games) and indoor free play while wearing accelerometers to assess minutes of MVPA. Lunchtime recess consists of a 20 minute time period. The difference in MVPA between organized indoor recess and indoor free play was calculated using a t-test ($p < 0.05$). Differences between all recess activities were calculated using an ANOVA ($p < 0.05$). **RESULTS:** Minutes of MVPA attained from organized indoor recess activities (3.31 ± 3.49 min) was significantly greater ($p < 0.05$) than that of indoor free play (1.58 ± 2.27 min). MVPA minutes for active dance video game (2.31 ± 1.98 min), small group games (2.60 ± 2.82 min), and free play (2.77 ± 3.13 min) significantly differed from geofitness (4.60 ± 4.35 min) and outdoor recess free play (4.61 ± 4.41 min, $p < 0.05$), but did not significantly differ from each other ($p < 0.05$). Both organized indoor recess activities and indoor free play differed significantly ($p < 0.05$) from the more sedentary options of study time (0.82 ± 0.85 min) and computer time (0.80 ± 0.91 min). **CONCLUSIONS:** Organized indoor recess activities are a good way to provide elementary students with physical activity compared to

other traditional indoor recess options. While indoor recess activities are not planned daily, creating an organized indoor recess program that provides physically active alternatives during inclement weather is one way to potentially provide MVPA to students similar to outdoor recess free play.

64. CHARACTERISTICS OF DIVISION 1 ATHLETES RELATING TO BODY COMPOSITION

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Athletes tend differ physically from both non-athletes and each other. In particular, differences between athletes of differing rank and athletic performance ability have been documented in a variety of sports. One of these differences is in body composition. While there is a rich literature on the subject, the relationship between measures of body composition and various performance measures has not been well studied in Division 1 Athletes. **PURPOSE:** The purpose of this study was to investigate the relationship between muscularity (as measured via lean body mass), fat stores (as measured by percent body fat) and several other sport-related fitness characteristics, including strength, power, and vertical jump height. **METHODS:** Eighty Division I collegiate athletes were assessed over the course of two days in various strength, power, speed, and body composition tests. Data from these tests was assessed via correlation to establish basic relationships. Additionally, athletes were separated into the "highest" and "lowest" groups (according to their lean body mass to percent fat ratio), and several statistical tests were applied to the groups in order to attempt to ascertain the magnitude of the relationships between body composition and other fitness characteristics measured. **RESULTS:** Results indicated that athletes with more lean body mass and less body fat tend to be relatively stronger (force scaled to body mass of 54.2 N·kg⁻¹ vs. 49.4 N·kg⁻¹, p<0.05), more powerful (CMJ peak power per body mass 68.3 W·kg⁻¹ vs. 58.0 W·kg⁻¹, p<0.05) and jump higher than their counterparts (CMJ height 35.1cm vs. 29.7cm, p<0.05). **CONCLUSION:** These findings reinforce the importance of body composition in athletic performance. From a practical standpoint, the results of this study suggest that body composition advantages (more muscle, less fat) may be associated with higher relative strength, power, and vertical jumping abilities. Strength and conditioning programs at the Division 1 level may benefit from monitoring and attempting to improve the body composition of their athletes.

65. CORRELATES OF POWER AND VELOCITY IN THE DRIVE-BLOCK RELATIVE TO BODY MASS, FAT, AND THE 1-RM SQUAT IN DIVISION I COLLEGIATE FOOTBALL LINEMEN

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Strength and power are vital to American football players and training of these variables is constant in sophisticated, year-round preparation supervised by strength and conditioning specialists. The drive block is a principal technique in offensive line play and the squat exercise, a major staple for lower body training, is thought to relate to leg power in the task of "firing-off the line". **PURPOSE:** The purpose of this study was to investigate the relationship of power (AP) and velocity (AV) to body mass (BM), fat and the 1-RM squat. **METHODS:** Following IRB approval 18 offensive linemen performed 10 fire-outs from a three-point stance into a stationary blocking dummy while assessments of power and velocity were made. Power (Watts) and velocity (m/sec) was recorded using a Tendo® Power and Speed Analyzer and these data were correlated with each players' body mass, fat, and 1-RM squat. **RESULTS:** Means for each variable were: BM 193.82 ±33.41kg, 1-RM squat 208.97 ±35.93kg, fat 25.45 ±6.1%, AP 1442.53 ±137.46 Watts, AV 1.079 ±0.09 m/sec. Correlations of the variables yielded significant (p<0.05) positive associations between power and velocity, and 1-RM squat, between velocity and vertical jump and between power and BM. A significant inverse relationship was found between velocity and body fat. **CONCLUSION:** Based on these results training protocols inclusive of squats positively relates and body fat negatively contributes to offensive line play. It is suggested that players include the squat in year-long training and attempt to replace fat by lean mass in order to maximize playing efficiency.

66. PREVELANCE OF GASTROINTESTINAL BLEEDING FOLLOWING 160 KM CYCLING IN THE HEAT

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Previous studies have suggested that both long-distance running and heat exposure are associated with high incidence of occult gastrointestinal (GI) bleeding. However, it is not clear whether prolonged non-impact exercise in the heat is associated with GI problems, which has been proposed as a predisposing factor for heat stroke.

PURPOSE: The purpose of this research was to determine if competing in a 160-km cycling event in the heat has any effect on gastrointestinal bleeding. **METHODS:** Twenty-five experienced cyclists (21 men and 4 women; 49±9 y; 1.77±0.07 m; 83.7±14.8 kg) were recruited during a summer 160-km cycling event (Hotter 'n Hell Hundred). Immediately following the race, participants were given a fecal occult blood test and were instructed to retrieve their first bowel movement. One week following the race, participants were asked a series of questions regarding their GI discomforts. **RESULTS:** Environmental conditions for race day were 35.3±5.0 °C and 47.2±14.5% RH. Average finishing time for the participants was 6.58±1.22 h. Of the 25 cyclists participating in the study, two of them had positive results for fecal occult blood and GI distress, while two more experienced either constipation, hard stools, diarrhea or vomiting. **CONCLUSION:** These data showed a low incidence of gastrointestinal complaints and occult bleeding during a prolonged cycling event in the heat, indicating the low-impact exercise like cycling may attenuate some of the occult gastrointestinal bleeding previously reported in distance running in the heat.

67. THE RELATIONSHIP BETWEEN VELOCITY OF DRIVE BLOCK AND SELECTED EXERCISES IN DIVISION I COLLEGIATE FOOTBALL LINEMEN

J. Bryan Mann¹, Bert H. Jacobson² FACSM. ¹University of Missouri, Physical Therapy and Athletic Training, ²Oklahoma State University, Health & Human Performance,

The drive block is the basic of a running play and is typically executed by offensive linemen a three-point stance. The technique begins with a quick explosion into the defensive lineman followed by driving the legs in an attempt to displace the defender. Strength and power are vital to this skill and training of these variables is conducted during the offseason as well as during the season. **PURPOSE:** The purpose of this study was to investigate the relationship between velocity of the drive block and selected strength and power variables. **METHODS:** Following IRB approval 10 offensive linemen performed 10 fire-outs from a three-point stance into a stationary blocking dummy while assessments of power and velocity were made. Velocity (m/sec) was recorded using a Tendo® Power and Speed Analyzer and these data were correlated with each players' 225lb Bench Press repetitions: 1-RM Bench Press, Squat, Hang Clean, and Vertical Jump. **RESULTS:** Means for each variable were: 225lb bench press 1-RM bench press 357.0 ±38.02kg, 1 R-M Squat 520.25±111.56; 1 R-M Hang Clean 307.67 ±50.03; Vertical Jump 66.74 ±5.80 ; Average Velocity 1.76 ±0.044 m/sec. Correlations of the variables yielded significant (p<0.05) positive associations between Average Velocity and 225lb Bench Press (r=0.92), Bench Press (r=0.89) and Hang Clean (r=0.81) but not for the Squat (r=0.60) or the Vertical Jump (r=0.10). **CONCLUSION:** Based on these results training protocols inclusive of the bench press and hang clean positively offensive line play. It may be that in current line block technique much of the initial hit is by the heel of the hands to the body of the defender. It is suggested that training continue to include the both the bench press and hang clean in year-long training in order to maximize playing efficiency.

68. NO EFFECT OF CARBOHYDRATE MOUTH RINSING ON CYCLING TIME-TRIAL PERFORMANCE IN THE FED OR FASTED STATE

Brian S. Snyder¹ & Mark D. Haub² ¹Truman State University, Kirksville, MO ²Kansas State University, Manhattan, KS

It has been reported that carbohydrate mouth rinsing during short (~1-hr) high intensity cycling events can have an ergogenic effect. However, the nutritional status of the participant prior to the exercise bout may influence the capacity of carbohydrate mouth rinse to produce an ergogenic effect. **PURPOSE:** The purpose of this study was to investigate the effects of carbohydrate mouth rinsing on cycling performance during a 1-hr time trial in the fasted or fed state. **METHODS:** Twelve endurance-trained athletes (male n=10, female n=2) participated in 4 performance trials using a double-blinded Latin square design. After a $watt_{max}$ test and familiarization protocol two of the trials were conducted after a 10-hr fast and two of the trials were conducted 2-hrs after a standard breakfast. Participants rinsed their mouth immediately before and every 7.5 minutes of the performance test with either a 6.4% maltodextrin-lemon juice solution (C) or 0% maltodextrin-lemon juice solution (P) and then expectorated. **RESULTS:** There was no significant difference ($p > 0.5$) between treatments in distance covered (27.5 ± 3.1 km [FastC], 27.8 ± 3.0 km [FedC], 28.1 ± 2.5 km [FedP], and 27.4 ± 3.2 km [FastP]), average watts, heart rate, or rating of perceived exertion. **CONCLUSION:** We conclude that carbohydrate mouth rinsing was not ergogenic in the fasted or fed state in endurance-trained cyclists.

69. LEG LENGTH DISCREPANCY IN RUNNERS

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Leg length discrepancy is a condition of uneven length between the lower extremities. Leg length discrepancy has been identified as a predisposing factor in affecting the biomechanics of running. However, evidence is unclear as to what extent of discrepancy is significant enough to cause problems when running. **PURPOSE:** The purpose of this project was two-fold: (1) to allow students the opportunity to develop clinical skills for assessing leg length and (2) investigate if a certain amount of leg length discrepancy was associated with problems in runners. **METHODS:** Through a service learning project, students examined 25 college track runners for leg length discrepancy. Students used a tape measure for direct measurement of anatomical leg length. Measurements were taken on bilateral lower extremities from the anterior superior iliac spine (ASIS) to the medial malleolus. **RESULTS:** Forty-seven percent (47%) of the participants presented with a leg length discrepancy. The average difference between their lower extremities was .5 cm. One hundred percent (100%) of the participants who had a leg length discrepancy were unaware of it and did not report problems with running. **CONCLUSION:** Students realized that the tape measure technique is a quick, noninvasive method of screening leg length but factors such as thigh girth, clothing, positioning, etc. can affect the accuracy of the test. Anatomical leg length difference of approximately .5 cm did not appear to be significant in college track runners. More studies are needed to determine the extent of leg length discrepancy required to facilitate complications in running.

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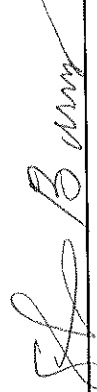
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