

# 2009 Annual Meeting



***CENTRAL STATES CHAPTER***  
OF THE  
***AMERICAN COLLEGE OF SPORTS MEDICINE***

**November 5<sup>th</sup>-6<sup>th</sup>, 2009**  
**Holiday Inn Select Executive Center**  
**Columbia, MO**

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# American College of Sports Medicine

## CENTRAL STATES CHAPTER ANNUAL MEETING



**AMERICAN COLLEGE**  
**of SPORTS MEDICINE**  
[www.acsm.org](http://www.acsm.org)

Holiday Inn Select Executive Center Hotel: Columbia, Missouri

November 5<sup>th</sup> & 6<sup>th</sup>, 2009

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Welcome to the Annual Meeting of the Central States Chapter of the American College of Sports Medicine. The theme for this year's conference is how physical activity and physical inactivity impact health. We have an outstanding lineup of speakers that will address this topic. We are very fortunate to have Steven Blair, PhD with us, and he will be speaking on physical inactivity and its impact on public health in the 21<sup>st</sup> century. Following Dr. Blair will be John Thyfault, PhD, who will discuss the metabolic consequences of physical inactivity. The next two talks will focus on physical activity. Dr. Christine Hoehner, PhD will describe community environments and their impact on physical activity and Amy Eyler, PhD will discuss policy issues to increasing physical activity in our communities. Leading off Friday will be Frank Booth, PhD., who will discuss whether an "exercise pill" could effectively replace actual physical activity. Theme-related talks on physical activity and physical inactivity will continue on Friday with Ian Thomas, PhD and R. Scott Rector, PhD. Dr. Thomas will describe how the Safe Routes to School (SRTS) model can increase community-based physical activity and Dr. Rector will discuss the negative consequences of physical inactivity on liver health and disease development. Following lunch, our Gatorade speaker, Randy Bird, MS, RD will be speaking on sports nutrition for the athlete. Additional breakout sessions will occur during the afternoon including a session featuring some innovative laboratory techniques from three of our outstanding students in the region. In addition to these presentations there are a number of concurrent lectures Friday including a wide diversity of topics such as exercise after menopause, exercise and the use of energy drinks, the athlete personality and addiction, intrinsic motivation for the athlete, and more. The student focus of the meeting will include student oral presentations Thursday afternoon followed by poster presentations and the social. Lastly, students will have the opportunity to learn about an often overlooked but critical part of their future job search, salary negotiation, at the student meeting on Friday.

On Thursday evening we are trying something new and offering the "Tour de Columbia: Nutrition and Hydration Social", a semi-guided tour of the downtown Columbia restaurants and pub scene. No need to drive, a bus will be available to transport conference attendees back and forth to downtown Columbia between the hours of 7 pm – 10:30 pm. A map of the downtown and stops along the "Tour" will be available in the materials you will receive at registration. This will be a great opportunity to socialize and see what downtown Columbia has to offer.

I hope that you enjoy the meeting. Please take special note of our sponsors listed on the following pages. Without their continued support this meeting would not be possible.

*Stephen P. Sayers, Ph.D.*  
Past-President CSC ACSM

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**Central States Chapter  
of the  
American College of Sports Medicine  
FALL 2009 MEETING SCHEDULE**

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*THURSDAY, NOVEMBER 5TH, 2009*

- 10:30-12:00 Registration - Lobby
- 11:45-12:00 Introduction Windsor II  
Stephen Sayers, Ph.D., Past-President CSC ACSM
- 12:00-1:00 Steven Blair, Ph.D., FACSM Windsor II  
University of South Carolina  
**Physical Inactivity: The Biggest Public Health Problem of the 21<sup>st</sup> Century.**  
Sponsor: University of Missouri, School of Health Professions
- 1:00-1:15 Refreshment Break
- 1:15-2:00 John Thyfault, Ph.D. Windsor II  
University of Missouri  
**Insulin Resistance: A Metabolic Consequence of Physical Inactivity**  
Sponsor: Hans Rudolph, Inc.
- 2:00-2:45 Christine Hoehner, Ph.D. Windsor II  
Washington University  
**Building the Case for Activity Friendly Communities: Research and Recommendations**  
Sponsor: RehabCare
- 2:45-3:00 Break
- 3:00-3:45 Amy Eyler, Ph.D. Windsor II  
Washington University  
**Policy Influences on Physical Activity: Challenges and Opportunities**
- 3:45-5:15 Student Oral Research Presentations Windsor II  
4:00 p.m. (pg. 11) – Bruno Roseguini: Doctoral Award Winner  
4:15 p.m. (pg. 12) – Leryn Boyle: Master Award Winner  
4:30 p.m. (pg. 13) – Catherine Mikus  
4:45 p.m. (pg. 14) – Chris Poole  
5:00 p.m. (pg. 15) – Matthew Widzer

5:15-6:15	Poster Session and Chapter Social Presider: Greg Kandt, Ph.D. Poster set-up begins at 4:45 Presenters are to be present from 5:15-6:15	Windsor III
6:15-7:30	Central States Chapter Administrative Council Meeting Phil Gallagher, Ph.D., President	Windsor II
7:00-10:30	Tour de Columbia: Nutrition and Hydration Social	

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***FRIDAY, NOVEMBER 6TH, 2009***

8:45-9:00	Stephen Sayers, Ph.D. Announcements	Windsor II
9:00-10:00	Frank Booth, Ph.D., FACSM University of Missouri <b>Exercise Pill: Feasible or Fantasy</b> Sponsor: University of Missouri, Office of the Provost	Windsor II
10:00-10:15	Refreshment Break	
10:15-11:00	I. Barbara Bushman, Ph.D., FACSM Missouri State University <b>Benefits of Exercise at Menopause</b>	Parliament I
	II. Ian Thomas, Ph.D. PedNet Coalition <b>Safe Routes to School: Generating Policy and Environmental Change          through Community Programming</b>	Windsor II
11:00-11:45	I. Conrad Woolsey, Ph.D. Oklahoma State University Weston Kensinger, M.S. Oklahoma State University <b>Exercise and Energy Drink Use: Juicy Jolts or Risky Sips?</b>	Parliament I
	II. R. Scott Rector, Ph.D. University of Missouri <b>Negative Consequences of Physical Inactivity on Liver Health and Disease          Development</b>	Windsor II

12:00-1:30	Lunch Randy Bird, MS, RD, CSSD, CSCS. <b>Game Breaking Nutrition: Taking Your Athletes to the Next Level</b> University of Kansas Sponsor: Science Advisory Board - Gatorade Sports Science Institute	Expo I
1:30-2:15	I. Professional Business Meeting – Phil Gallagher, Ph.D,  II. Student Meeting Moderator – Kyle Gibson, Ph.D., Jeffrey Krug, M.S. University of Missouri <b>How to Negotiate a Competitive Salary</b>	Parliament I  Windsor II
2:15-3:00	I. Pete Andersen, M.D. US Masters Swimming World Record Holder; Author: <i>Purposeful Intent: Motivating Your Mind from Within</i> ; Syndicated columnist: <i>The Sport Psychology Advisor</i> <b>How Sports Medicine Practitioners Can Inspire Consistent Performance Improvement Skills in Their Subjects</b>	Parliament I
	II. Student Panel Innovative Laboratory Techniques from Around the Region 1. David Keeley, University of Arkansas <b>Injury Prevention in Youth Baseball Pitchers: Current and Future Biomechanical Models</b> 2. Michael Roberts, University of Oklahoma <b>Effects of Different pre-Exercise Feeding Regimens on Intramuscular Markers of Satellite Cell Activation following Conventional Resistance Training</b> 3. Audrey Stone, University of Arkansas <b>Measurement of Purinergic Neurotransmission in Skeletal Muscle Arterioles</b>	Windsor II
3:00-3:45	Conrad Woolsey, Ph.D. Oklahoma State University Matthew Martens, Ph.D. University of Missouri Niels Beck, Ph.D. University of Missouri <b>Understanding Athlete Brain Chemistry and Addiction</b>	Windsor II
3:45-4:00	Closing Remarks – Stephen Sayers, Ph.D.	Windsor II

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## 2007-2008 Administrative Council Members

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Philip M. Gallagher, University of Kansas  
Applied Physiology Laboratory  
University of Kansas  
Lawrence, KS 66045  
Phone: (785) 864-0772  
philku@ku.edu

### **Past-President**

Stephen P. Sayers, University of Missouri  
School of Health Professions  
106 Lewis Hall  
Columbia, MO 65211  
Phone: 573-882-8400  
sayerss@missouri.edu

### **President-Elect**

Greg K. Kandt, Fort Hays State University  
Dept of Health and Human Performance  
600 Park St  
Hays, KS 67601  
Phone: (785) 628-4371  
gkandt@fhsu.edu

### **Secretary/Treasurer**

Mike Leiker, Pittsburg State University  
1701 South Broadway  
Dept. HHPR  
Pittsburg, KS 66762  
Phone: (620) 235-4672  
secretary@centralstatesacsm.org

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Richard J. Sabath, III, Children's Mercy Hospital  
Section of Card.  
2401 Gillham Rd.  
Kansas City, MO 64108

Phone: (816) 234-3259  
rsabath@cmh.edu

**Kansas State Representative**

Mark D. Haub, Kansas State University  
Dept. of Human Nutrition  
127 Justin Hall  
Manhattan, KS 66506  
Phone: (785) 532-0170  
haub@humec.ksu.edu

**Missouri State Representative**

Steve P. Burns, University of Central Missouri  
2440 NE Dale Hunter Pl  
Lees Summit, MO 64086  
Phone: (660) 543-8894  
sburns@ucmo.edu

**Oklahoma State Representative**

Doug B. Smith, Oklahoma State University  
Applied Musculoskeletal and Human Physiology Research Lab  
Health and Human Performance 197 CRC  
Stillwater, OK 74078  
Phone: (405) 744-5500  
doug.smith@okstate.edu

**Arkansas State Representative**

Heidi A. Kluess, University of Arkansas  
308V Hper Bldg  
University of Arkansas  
Fayetteville, AR 72701  
Phone: (479) 575-4111  
hkluess@uark.edu

**Student Representative**

Becky Kudrna, University of Kansas  
Lawrence, KS 66045  
Phone: (785) 864-0773  
kudrna@ku.edu

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## Learning Objectives

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### Intended Audience

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

### Learning Objectives

At the conclusion of the meeting, attendees should be able to:

- Recognize contemporary issues related to sports medicine, exercise science, and health promotion.
- Identify new approaches to, and perspectives on, problems in exercise science and sports medicine through interactions among scientists and clinicians in related fields.
- Identify how physical activity and physical inactivity contribute both positively and negatively to health in different populations.
- Recognize the importance of research in understanding problems related to physical inactivity.

### CEC Credit

The CSC-ACSM meeting is offering 10.5 CEC's. To obtain CEC credit, the attendee will be provided a certificate, which they hold onto until they are audited for their recertification. They don't have to send anything to ACSM after the meeting. Meeting attendees will NO LONGER have to pay the \$15/\$20 CEC processing fee to receive the credits.

### Sponsors

Financial sponsors include Gatorade Sports Science Institute, The University of Missouri School of Health Professions, The University of Missouri Office of the Provost, Hans Rudolph, Inc., RehabCare, Midwest Dairy Council, and New Lifestyles.

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## STUDENT DOCTORAL AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time - 4:15 p.m.

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### ACUTE EFFECTS OF CYCLIC LIMB COMPRESSIONS ON MRNA EXPRESSION OF ANGIOGENIC FACTORS IN SKELETAL MUSCLE

B.T. Roseguini, S.M. Soyulu, J. Whyte, H.T. Yang, S.C. Newcomer, R.L. Terjung, M. H. Laughlin

Department of Biomedical Sciences, University of Missouri, Columbia

e-mail: [brunoroseguini@mizzou.edu](mailto:brunoroseguini@mizzou.edu)

Muscle contraction and therapeutic application of external pneumatic limb compression produces cyclic deformation and changes in shear-stress in vasculatures embedded in skeletal muscle. These mechanical forces are well known stimuli for angiogenic growth factor release in skeletal muscle. **PURPOSE:** We tested the hypothesis that acute application (150 min) of cyclic leg compressions in a rat model up-regulates factors involved in angiogenesis in this tissue. **METHODS:** To explore the impact of different pressures and frequency of compressions, rats were divided into 4 groups: 120mmHg (2s inflation/2s deflation), 200mmHg (2s inflation/2s cuff deflation), 120mmHg (4s inflation/16s deflation) and control (no intervention). Blood flow and leg oxygenation (Study 1) and the mRNA expression of angiogenic mediators in the rat tibialis anterior (TA) muscle (Study 2) were assessed after a single bout of IPC. **RESULTS:** In all three groups exposed to the intervention, a modest hyperemia (~37% above baseline) between compressions and a slight, non-significant increase in leg oxygen consumption (~30%) was observed during IPC. Compared to the control group, vascular endothelial growth factor (VEGF) and monocyte chemotactic protein-1 (MCP-1) mRNA increased significantly ( $p < 0.05$ ) only in the rats exposed to the higher frequency on compressions (2s/2s). **CONCLUSION:** These findings show that application of intermittent leg compressions and the accompanying stretch/deformation of the vasculature as well as changes in leg hemodynamics augment the mRNA content of key angiogenic factors in skeletal muscle. Importantly, the magnitude of changes in mRNA expression appeared to be modulated by the frequency of compressions, such that a higher frequency evoked the most robust changes in VEGF and MCP-1. **Support:** NIH Grants RR-18276 and HL-36088.

## STUDENT MASTERS AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time - 4:30 p.m.

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### THE EFFECTS OF WHOLE BODY VIBRATION AND EXERCISE ON FIBRINOLYSIS IN MEN

L.J. Boyle, P.R. Nagelkirk. Human Performance Laboratory, Ball State University, Muncie, IN; email: [leryn.boyle@gmail.com](mailto:leryn.boyle@gmail.com)

Fibrinolysis, the process by which blood clots are broken down, increases during acute bouts of exercise. The proposed mechanisms for this response include catecholamine release and/or muscle activation, which are both stimulated by whole body vibration (WBV). **PURPOSE.** The purpose of this study was to examine the fibrinolytic response to WBV and exercise in men. **METHODS.** Twenty healthy males ( $23.8 \pm 4.2$  years,  $80.8 \pm 3.3$  kg·m<sup>2</sup>) participated in the study. Each subject performed three trials in randomized order separated by one week. The trials consisted of exercise (X), vibration (V), and vibration + exercise (VX). Exercise sessions consisted of 15 minutes of unloaded squatting at a rate of 20 per minute. Vibration sessions were conducted on a WBV platform vibrating at a frequency of 30 Hz and amplitude of 1.5mm for 15 minutes. Plasma concentrations of active tPA and PAI-1 samples were assessed at baseline and immediately after each session. **RESULTS.** The tPA activity increase from pre to post condition was found to be significantly greater in the VX condition ( $0.87 \pm 0.35$  IU·mL<sup>-1</sup> to  $3.21 \pm 1.06$  IU·mL<sup>-1</sup>) compared to the X ( $0.71 \pm 0.36$  IU·mL<sup>-1</sup> to  $2.37 \pm 1.13$  IU·mL<sup>-1</sup>) or V ( $0.83 \pm 0.25$  IU·mL<sup>-1</sup> to  $1.00 \pm 0.37$  IU·mL<sup>-1</sup>) conditions. The increase in tPA activity was significantly greater in the X condition compared to the V condition. PAI-1 activity significantly decreased in the VX ( $6.54 \pm 5.53$  IU·mL<sup>-1</sup> to  $4.89 \pm 4.13$  IU·mL<sup>-1</sup>) and X conditions ( $9.76 \pm 8.19$  IU·mL<sup>-1</sup> to  $7.48 \pm 7.11$  IU·mL<sup>-1</sup>) compared to the V ( $5.68 \pm 3.53$  IU·mL<sup>-1</sup> to  $5.84 \pm 3.52$  IU·mL<sup>-1</sup>) condition. Heart rate change from pre to post exercise for the V condition ( $75 \pm 8$  bpm to  $90 \pm 7$  bpm) was less than the change in the VX condition ( $77 \pm 13$  bpm to  $148 \pm 19$  bpm) and X condition ( $71 \pm 11$  bpm to  $139 \pm 22$  bpm). The change in heart rate was found to be similar in the X and VX conditions. Peak RPE was not significantly different between X and VX conditions ( $13.7 \pm 0.56$ ,  $13.7 \pm 0.57$ , respectively). **CONCLUSION.** WBV alone does not stimulate increased fibrinolytic activity in young men. However, the significant increase in fibrinolytic potential observed during squatting exercise is enhanced by concurrent WBV.

Supported by ASPIRE Internal Grant Program, Ball State University, Muncie, Indiana.

## ORAL PRESENTATIONS

Presentation Time - 4:45 p.m.

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### MODEST REDUCTIONS IN PHYSICAL ACTIVITY RAPIDLY ALTER GLYCEMIC CONTROL IN YOUNG, LEAN PERSONS

Catherine R. Mikus<sup>1</sup>, John P. Thyfault<sup>1,2,3</sup>. <sup>1</sup>Department of Nutrition and Exercise Physiology, <sup>2</sup>Department of Internal Medicine, University of Missouri, Columbia, MO, and <sup>3</sup>Harry S. Truman Memorial Veterans' Hospital, Columbia, MO.  
email: crm34a@mail.missouri.edu

Postprandial hyperglycemia is a more powerful predictor of cardiovascular disease and all-cause mortality in both healthy individuals and those with type 2 diabetes than either fasting blood glucose or hemoglobin A1c. While physical inactivity is strongly associated with insulin resistance and cardiovascular disease, and the beneficial effects of increasing physical activity on glycemic control have been widely documented, it is unclear whether reductions in physical activity influence glycemic control or whether the effects of inactivity on glycemic control precede alterations in fitness or adiposity. **PURPOSE:** Determine the acute effects of transitioning from high to low levels of physical activity on glycemic control in healthy individuals. **DESIGN:** Young ( $30.0 \pm 0.9$  yr), lean (BMI:  $24.4 \pm 1.0$  kg·m<sup>-2</sup>), healthy (determined by detailed medical questionnaire), physically active ( $>10,000$  steps·d<sup>-1</sup>) individuals (7 men, 3 women) were equipped with pedometers and continuous glucose monitors for 3 days and instructed to follow their normal physical activity patterns and maintain detailed diet and physical activity records (ACTIVE Phase). After  $\geq 1$  wk washout, participants initiated a second monitoring period during which they were instructed to take  $\leq 5,000$  steps·d<sup>-1</sup> whilst replicating their diet from the first monitoring period (INACTIVE Phase). **RESULTS:** Participants reduced physical activity levels from  $15,758 \pm 1103$  steps·d<sup>-1</sup> in the ACTIVE phase to  $4,334 \pm 294$  in the INACTIVE phase. Although fasting blood glucose did not change ( $84.4 \pm 3.0$  and  $86.5 \pm 1.4$  mg·dL<sup>-1</sup> for ACTIVE and INACTIVE phases, respectively), fasting insulin was elevated following the INACTIVE phase ( $6.0 \pm 0.8$  vs.  $3.6 \pm 0.5$   $\mu$ IU·mL<sup>-1</sup> for ACTIVE;  $p < 0.02$ ). When blood glucose responses to all meals across all days were pooled, the mean amplitude of glycemic excursions (post-meal minus pre-meal blood glucose values; an index of glycemic control) was significantly higher during the INACTIVE phase at 30 ( $30.4 \pm 4.3$  vs.  $16.2 \pm 3.8$  mg·dL<sup>-1</sup>;  $p < 0.02$ ) and 60 min post-meal ( $21.8 \pm 5.4$  vs.  $8.2 \pm 2.2$ ;  $p < 0.04$ ) and approached significance at 90 min ( $14.2 \pm 3.9$  vs.  $5.9 \pm 1.5$ ;  $p < 0.061$ ). **CONCLUSIONS:** Modest reductions in physical activity rapidly diminished glycemic control in young, lean, healthy individuals, suggesting 1) physical inactivity may play a key role in the development of insulin resistance by predisposing individuals to impairments in glycemic control, and 2) aberrations in glycemic control precede changes in fitness and adiposity in response to physical inactivity. These findings also suggest physical inactivity may be a useful tool to study the early events in the etiology of insulin resistance.

Supported by MU Research Council Grant and MU Institute for Clinical and Translational Sciences (iCATS).

## ORAL PRESENTATIONS

Presentation Time – 5:00 p.m.

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### HOUSEKEEPING GENE ANALYSIS IN SKELETAL MUSCLE FOLLOWING SEQUENTIAL BOUTS OF RESISTANCE EXERCISE IN ELDERLY MEN

C.N. Poole, K.L. Sunderland, M.D. Roberts, V.J. Dalbo, and C.M. Kerksick.

Applied Biochemistry and Molecular Physiology Laboratory, Department of Health and Exercise Science, University of Oklahoma, Norman, OK.

Email: Chad\_Kerksick@ou.edu

Normalizing the expression of a gene of interest to housekeeping genes (HKGs) is a critical component to successful real-time RT-PCR. Currently, much research is using PCR to examine skeletal muscle gene expression in older men, but no housekeeping analysis to date has been performed on this tissue. **Purpose:** The purpose of this investigation was to determine the effects of three sequential bouts of lower-body resistance exercise on the HKGs  $\beta$ -actin, GAPDH, cyclophilin, 28S, and  $\beta$ 2-microglobulin in skeletal muscle of elderly men. **Methods:** Ten elderly men (60-76 y) participated in the current study. Subjects completed three resistance exercise bouts separated by 48 hrs each consisting of 3 sets of 10 repetitions using 80% 1RM on the leg press, hack squat, and leg extension. Muscle biopsies were taken 1 week prior to the first bout of exercise (T1), 48 hrs following the first (T2) and second bouts (T3), and 24 hrs following the third bout of exercise (T4). **Results:** Real-time RT-PCR was used to analyze the expression of HKGs. Friedman's tests revealed no significant changes ( $p > 0.05$ ) over time in reference to baseline values of any of the HKGs. In addition, no changes in HKGs were found in response to any of the exercise bouts. **Conclusions:** The results of the current investigation suggest that  $\beta$ -actin, GAPDH, cyclophilin, 28S, and  $\beta$ 2-microglobulin are acceptable to use as HKGs when examining gene expression after one or a series of acute resistance training bouts of resistance exercise in elderly men.

## ORAL PRESENTATIONS

Presentation Time – 5:15 p.m.

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### THREE YEAR FOLLOW OF BONE DENSITY IN MALE ATHLETES WITH OSTEOPENIA

M.O. Widzer<sup>1</sup> R.S. Rogers and P.S. Hinton<sup>2</sup>. Department of Biomedical Sciences<sup>1</sup> and Department of Nutrition and Exercise Physiology<sup>2</sup>, University of Missouri-Columbia, Columbia, MO

email: [mwidzer@mizzou.edu](mailto:mwidzer@mizzou.edu)

**Purpose:** The purpose of this study was to determine the change in bone mineral density (BMD) over time in a group of non-weight bearing male athletes, previously identified as having below normal BMD of the lumbar spine or hip. At present, there is a lack of information regarding the rate of change of BMD in healthy, non-elderly males with below normal bone density. **Methods:** Male cyclists (n = 17; 25-58 yr) from a previous cross-sectional study, who had osteopenia (T score =  $\leq -1.0$ ,  $> -2.5$ ) of the lumbar spine (LS) or hip, were re-assessed at  $36.5 \pm 3.0$  months for changes in whole body and regional bone mineral content (BMC) and BMD, by dual-energy X-ray absorptiometry (DXA). Subjects completed a 3-day dietary recall, 7-day exercise history, and the Historical Leisure Activity Questionnaire. Significant changes in anthropometrics, nutrient intakes, BMC and BMD of whole body, and regional skeletal sites were determined by one-way repeated measures ANOVA. Changes were deemed significant at  $P < 0.05$ . Data are means  $\pm$  SEM. **Results:** Initially, 15 subjects had osteopenia and 1 had osteoporosis of the lumbar spine, and 2 had osteopenia of the hip. At follow up, 14 had osteopenia while 1 had osteoporosis of the LS and 4 had osteopenia of the hip. Mean increases in body weight ( $1.6 \pm 0.01\%$ , 1.4 kg), lean mass ( $1.1 \pm 0.01\%$ , 0.6 kg) and fat mass ( $4.9 \pm 0.06\%$ , 0.5 kg), were not significant. No significant changes in BMC or BMD of whole body, legs, or arms were detected with the exception of arm BMD ( $-3.3 \pm 0.01\%$ ,  $P < 0.05$ ). In addition, no changes were detected for LS BMC, LS BMD or hip BMC. In contrast, BMD of the total hip ( $-2.7\%$ ), femoral neck ( $-3.5\%$ ), and Ward's triangle ( $-8.1\%$ ) all displayed significant decrements over the assessment period ( $P < 0.05$ ), which equated to  $-0.8$ ,  $-1.1$ , and  $-2.6$  annualized percent changes, respectively. Total kcals, protein and carbohydrate intakes (kcal/d), calcium and vitamin D, and physical activity levels (hr/wk or total kcals) were not different between assessments. **Conclusion:** We observed a markedly higher annual rate of hip bone loss ( $-0.8\%$ ) over a  $\sim 3$  year period in men previously identified with low bone density compared with previously reported changes in non-elderly, health men ( $0.42\%/yr$ ). These findings suggest an accelerated rate of bone loss and enhanced risk for osteoporosis of the hip in otherwise healthy males, with a high level of participation in non-weight bearing exercise.

Supported by the Department of Nutrition and Exercise Physiology, University of Missouri-Columbia



## POSTER PRESENTATIONS (5:30-6:30)

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1.

### IMPACT OF A BALANCE TRAINING PROGRAM ON FITNESS, BALANCE, AND MENTAL HEALTH IN SENIORS

L.J. Adams and M. Powers. Department of Kinesiology and Health Studies, University of Central Oklahoma, Edmond, OK; email: [lenoch1@uco.edu](mailto:lenoch1@uco.edu)

Several older adults are injured each year from falling, which may result in impaired function and reduced quality of life. **PURPOSE:** The purpose of this study was to assess if a balance training class improved functional fitness, balance, life satisfaction, depression, and mood in older adults over the age of 65. Participants included 16 residents of an independent living community. **METHODS:** The Senior Fitness Test (SFT), Berg Balance Scale (BBS), Positive Affect and Negative Affect Scale (PANAS), Satisfaction with Life Survey (SLS), and the Center for Epidemiologic Studies Depression Scale (CESD) were completed the week prior to class implementation. Subjects participated in the class twice a week for 45 minutes over nine weeks. Exercises consisted of a warm-up, upper body strengthening, lower body strengthening, balancing, and a cool-down. All assessments were completed at the end of the nine weeks. **RESULTS:** Paired samples *t*-tests were conducted to examine changes in all dependent variables over time ( $\alpha = .05$ ). Due to the small sample size, the only significant improvement was observed in the 8-foot-up-and-go test ( $N=9$ ) of the SFT,  $t=2.950$ ,  $p=.018$ . Effect sizes were determined using Cohen's *d* formula. A large effect size was found for the positive affect scale on the PANAS ( $d=-0.86$ ), while a moderate effect size was reported for the 6-minute walk test of the SFT ( $d=-0.54$ ). **CONCLUSION:** Based on the results of this study, it was concluded that the balance training exercise class had a positive impact on functional fitness and mood in seniors. This study was beneficial because falls are a prevalent problem among senior adults. Strengthening and balancing activities may help prevent such issues in this population which could improve quality of life, as well as healthcare costs. This study did have limitations. The sample size was small limiting statistical power and the study lacked a control group. Tester variability from pre- to post-testing may have affected the reliability of the testing. Future research studies may provide beneficial evidence to improve fitness, mental health, and balance by implementing a longer study with a larger sample size.

2.

THE EFFECTS OF ACTIVITY LEVEL AND WEIGHT STATUS ON THE WALKING  
VELOCITY OF COLLEGE-AGE FEMALES

D.K. Applegate, A.P. Glave, and R. Di Brezzo. Human Performance Laboratory,  
University of Arkansas, Fayetteville, AR; dappleg@uark.edu

Obesity is a growing problem in the United States and the biomechanical implications of this disease need to be studied. **PURPOSE:** The purpose of this study was to determine if weight and activity status would affect the walking velocity of college age females. **METHODS:** Fourteen participants were placed in four groups depending on their activity level and body mass index (BMI). The four groups were (1) - normal weight and active (NWA) (n= 6, BMI-  $21.25 \pm 1.50$ ), (2) - normal weight and inactive (NWI) (n= 2, BMI-  $22.98 \pm 1.53$ ), (3) - overweight and active (OWA) (n= 3, BMI-  $27.84 \pm 2.28$ ), and (4) - overweight and inactive (OWI) (n= 3, BMI-  $33.28 \pm 5.09$ ). Upon arrival the participants completed a questionnaire about their physical activity which was used to categorize them. To be classified as active the participant had to partake in aerobic or strength training 2-3 times weekly and participate in both activities at least 1-5 times monthly. The participants wore seven reflective markers on anatomical landmarks of the right side. They then walked down a runway where three full strides were filmed using a Canon ZR50 camcorder and Vicon Peak 9 motion analysis software. After the participant completed the walking portion, their height and weight were taken and used to calculate BMI. Hip displacement and the time taken to walk three strides were used to calculate walking velocity. SAS 9.1 was used to analyze the data. A two-factor ANOVA was used to determine if there was a statistical significant difference in walking velocity between the different groups. **RESULTS:** While there were differences in walking velocity between the groups, the differences were not statistically significant (NWA-  $1.71 \pm 0.240$ , NWI-  $1.57 \pm 0.385$ , OWA-  $1.39 \pm 0.162$ , OWI-  $1.51 \pm 0.062$ ). **CONCLUSION:** The results showed that there were no differences between normal-weight and over-weight college females. The effect of activity level should be studied more to determine the effects it can have on walking velocity and gait.

3.

THE EFFECTS OF A SUPERVISED STRENGTH TRAINING PROGRAM ON UPPER BODY STRENGTH IN COMMUNITY-DWELLING OLDER ADULTS

D. C. Black & T. Leszczak. Human Performance Laboratory, Department of Health Sciences, Kinesiology, Recreation and Dance, University of Arkansas, Fayetteville, AR;  
Email: dcb02@uark.edu

Muscular strength in the upper and lower extremity will decrease as we age, which can lead to a decreased ability to perform activities of daily living. **PURPOSE:** The purpose of this study was to evaluate an 8 week strength training program on a selected measure of the Senior Fitness Test in community-dwelling men and women. **METHODS:** Twelve female (age =  $81.42 \pm 5.55$ ) and six male (age =  $76.58 \pm 7.29$ ) subjects participated in the study. Each participant completed a modified Senior Fitness Test to assess beginning levels of fitness. The modified test included a six minute walk test, chair stand, arm curl, chair sit and reach, chair stand, back scratch, eight foot up and go, and a spine flexibility test. The subjects were then supplied weekly with a "menu" of prescribed exercise options, with a recommendation for how many "entrees" to complete. The options included strength training, water aerobics, personal training, and personalized recommendations for individual training. At the end of each week the progress of each subject was recorded and the next week's "menu" was created to address areas that needed work. After eight weeks, subjects underwent the modified Senior Fitness Test a second time. **RESULTS:** Results were analyzed using a paired samples t-test. This analysis revealed that no significant differences existed between pre- and post-test measures,  $t(16) = -1.46$ ;  $p = .16$ . The means for pre- and post-test show that scores at pre-test were not that different than post-test (pre-test,  $M = 14.58$ ,  $SD = 3.43$ ; for the post-test,  $M = 15.59$ ,  $SD = 4.30$ ). The effect size was computed as  $d = .36$ , revealing a small to medium effect. **CONCLUSION:** These results indicate that the exercise group did not improve on measures of upper body strength after an 8 week exercise program. The main reason why scores on the arm curl test did not improve is the overall attrition rate. Although some individuals participated as prescribed by the exercise coach, the majority did not adhere to the program.

4.

**PHYSICAL EDUCATORS: DO THEY “WALK THE TALK?”**

Jessica Bockelman, Cody Tucker, Delane Paulk, Liz Logsdon, and Dr. Steven Burns. Department of Kinesiology, Central Missouri State University, Warrensburg, MO.  
Email: [jl66810@ucmo.edu](mailto:jl66810@ucmo.edu)

Because of the need to better understand the principals of physical fitness as well as the need to maintain that fitness, we, as physical educators should lead by example by staying physically fit. **PURPOSE:** The purpose of our study is to raise awareness of the importance of physical educators “practicing what they preach” and to determine if our current physical education staff at UCM meet NASPE’s standards of being physically fit. **METHODS:** The participants in this study were UCM professional physical education faculty, both men and women, associated with the department of Kinesiology whose ages ranged between 18-65 years of age and who were not pregnant. We used the President’s Challenge: Adult Fitness Test in order to test each subjects’ aerobic fitness, muscular strength and endurance, flexibility and overall body composition. Tests included in the challenge were a timed mile walk, maximum half-sit up and push up in one minute each, sit and reach test, and calculation of BMI. We also included a small questionnaire asking about how many hours of physical activity per week each participant did. **RESULTS:** Our results demonstrated an average physical fitness ranking in the 60th percentile, an average BMI of 28.1, which is considered overweight according to the President’s Challenge BMI chart, and an average VO2 max of 47. The average amount of scheduled workout time the participants do each week averaged about 8.7 hours. The resulting data collected from the timed push-ups ranged from 27-65, which gave us an average of 39.6 push-ups per minute. The timed half sit ups test results ranged from 30 to 54 which gave us an average of 41.3 sit-ups per minute. We calculated an average of 10.7 inches for sit and reach, which scored in the 10 percentile when looking at the rankings of the President’s Challenge: Adult Fitness Test. **CONCLUSION:** The results of the President’s Challenge: Adult Fitness Test showed little evidence of our physical educators ‘walking the talk.’ Although our educators scored in the 60<sup>th</sup> percentile, above average, we feel our results do not accurately represent our Department of Kinesiology staff as a whole.

Supported by Department of Kinesiology

5.

#### VO<sub>2</sub>MAX OF FEMALE VERSUS MALE SEDENTARY ADULTS

B.R. Boehm, L.D. Holt, K.D. Tungate, S. Burns. Department of Kinesiology, University of Central Missouri, Warrensburg, MO; email: [brb82730@ucmo.edu](mailto:brb82730@ucmo.edu)

The methods in the present study were used to determine whether sedentary (have not participated in vigorous physical activity within the past 6 months) males or sedentary females had a higher VO<sub>2max</sub>. **Purpose** The primary purpose of the study was hypothesized that eight sedentary females have a higher VO<sub>2max</sub> than eight sedentary males, therefore, suggesting that women are more aerobically fit. **Methods** Sixteen sedentary males and females between the ages of 18 and 22 voluntarily participated in a graded treadmill VO<sub>2max</sub> test (Bruce Protocol). The participants walked at a controlled pace until two of the four criteria for maximal oxygen consumption were met. The criteria are: maximum Heart Rate, determined by 220 minus the participant's age, +/- 11 beats per minute; RER >1.15; RPE >17; VO<sub>2</sub> plateau. **Results** The average VO<sub>2max</sub> for the male participants was 33.36 ml/kg/min, with a standard deviation of 19.35 ml/kg/min. The average VO<sub>2max</sub> for the female participants was 28.26 ml/kg/min, with a standard deviation of 5.66 ml/kg/min. **Conclusion** Since the eight male participants had a higher mean VO<sub>2max</sub> than the eight sedentary female participants, the hypothesis was not supported.

6.

### EXERCISE AND OMEGA-3 FATTY ACIDS AS TREATMENTS FOR NONALCOHOLIC FATTY LIVER DISEASE

SJ Borengasser<sup>1</sup>, RS Rector<sup>2</sup>, GM Uptergrove<sup>2</sup>, EM Morris<sup>1</sup>, JL Libla<sup>1</sup>, FW Booth<sup>3,4,5</sup>, KL Fritsche<sup>1,6</sup>, JA Ibdah<sup>2</sup>, and JP Thyfault<sup>1,2,4</sup>. Departments of Nutrition and Exercise Physiology<sup>1</sup>, Internal Medicine<sup>2</sup>, Biomedical Sciences<sup>3</sup>, Medical Pharmacology and Physiology<sup>4</sup>, Dalton Cardiovascular Center<sup>5</sup>, and Animal Sciences<sup>6</sup>, University of Missouri, and Harry S. Truman Memorial VA Hospital<sup>4</sup>, Columbia, MO; e-mail: thyfaultj@missouri.edu

Nonalcoholic fatty liver disease (NAFLD) refers to a spectrum of liver dysfunction, ranging from steatosis to steatohepatitis, fibrosis, and cirrhosis. It is estimated that 20-40% of the general population and 50-90% of obese people have NAFLD. Exercise and omega-3 fatty acids (PUFA) supplementation have been shown to reduce hepatic steatosis by increasing hepatic fatty acid oxidation (FAO) and improving peripheral insulin sensitivity. However, it is unknown which treatment is the most effective. **PURPOSE:** The purpose of this study was to examine the individual and combined effects of exercise and dietary consumption of PUFAs to reverse hepatic steatosis. **METHODS:** Otsuka Long-Evans Tokushima Fatty (OLETF) rats were studied due to their spontaneous development of obesity, insulin resistance, and NAFLD. A novelty of these rats is their intrinsic aptitude for voluntary wheel running despite their obesity. OLETFs were divided into 4 groups (n=8/group): 1) remained sedentary (SED) 2) access to running wheels (EX) 3) diet supplemented with 3% of energy from PUFAs (PUFA) and 4) PUFA+EX. Treatments began at 12 weeks of age, an age when hepatic steatosis is present in OLETF-SED rats, and lasted until all rats were sacrificed at 20 weeks of age. Glucose tolerance tests were performed to assess peripheral insulin sensitivity at 19 weeks of age. Both complete (<sup>14</sup>C palmitate to CO<sub>2</sub>) and incomplete (acid soluble metabolites) FAO and liver TAG content were measured. **RESULTS:** EX and PUFA+EX had reduced body weight and body fat percent as compared to SED and PUFA (p<0.05). Interestingly, despite elevated total hepatic FAO (complete and incomplete) in PUFA and PUFA-EX rats, only the PUFA-EX rats had lower hepatic TAG content (p<0.05) compared with SED. On the other hand, the EX group had significantly higher complete hepatic FAO compared with PUFA, PUFA-EX and SED, and this elevation was associated with the greatest reduction in hepatic TAG content of the groups examined. Glucose and insulin AUCs during the glucose tolerance test did not differ between PUFA and SED groups; whereas, EX animals had significantly lower glucose and insulin AUCs (p<0.01) and PUFA-EX rats only had lower insulin AUCs (P<0.05). **CONCLUSION:** Exercise appears to be the most effective treatment for reducing hepatic steatosis in obese OLETF rats, in part through increasing complete hepatic FAO and improving insulin sensitivity. Surprisingly, a diet high in PUFAs failed to lower hepatic fat content and blunted the beneficial effects of exercise as a treatment strategy for NAFLD and insulin resistance.

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7.

#### CHANGES IN FUNCTIONAL FITNESS FOLLOWING 12-WEEKS OF HIGH-INTENSITY RESISTANCE TRAINING

E. Bounds, M. Tecmire, & P. Funkhouser, & M. Powers, Department of Kinesiology and Health Studies, University of Central Oklahoma, Edmond, OK.  
Email: [ebounds@uco.edu](mailto:ebounds@uco.edu)

**PURPOSE:** The purpose of this study was to examine changes in functional fitness among older women following three months of resistance training. **METHODS:** Participants were females with a mean age of  $81.6 \pm 4.4$  years who were randomly assigned to either the high-intensity resistance training (LIFT;  $n = 12$ ) or active control groups (AC;  $n = 13$ ). Both groups completed three sets of eight repetitions for eight exercises (chest press, bent over row, lateral raise, biceps curl, triceps extension, knee curl, heel raise, and half lunge) twice a week for 12 weeks. The LIFT group completed each exercise with a resistance of 80% of their one repetition maximum (1RM), while the AC group completed the same exercises with no external weight. Functional fitness was measured using the Senior Fitness Test (SFT) in addition to handgrip strength before and after 12 weeks of training. **RESULTS:** Results indicated no differences between the LIFT and AC groups in SFT variables (chair stand, arm curl, 6-minute walk, 8-foot up-and-go, back scratch, and sit-and-reach) or handgrip strength before or after training. Although no between group differences were found, results indicated significant improvements over time for participants in 8-foot up-and-go ( $F = 39.7, p = .00$ ) and handgrip strength ( $F = 8.8, p = .01$ ). While not statistically significant ( $p > .05$ ), participants did experience improvements in other SFT variables, with a 10% increase in number of chair stands, 7% increase in arm curls, 2% improvement in the 6-minute walk, and a 20% increase in back scratch. **CONCLUSION:** Results revealed that there were not differences in improvements in functional fitness when comparing high-intensity resistance training to strengthening exercises performed with no additional weight over three months. Overall improvements were discovered in each variable assessed except for sit-and-reach, indicating that training at any intensity can be beneficial for older adults to improve functional fitness. Researchers found the improvements in SFT variables to be meaningful because such improvements in functional fitness among older adults can translate into an increase overall function, independence, and quality of life. Additional research should be conducted implementing high-intensity resistance training for a longer duration.

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8.

EFFECT OF CAFFEINE: DOES CAFFEINE IMPROVE MUSCULAR ENDURANCE?

E.R. Brennan, A. A. Anderson, T.G. Cesonis and S. Burns.

University of Central Missouri, Warrensburg, MO;

Email: erb14400@ucmo.edu

At some point in a student's athletic career, they have had a coach tell them not to have caffeine before a game or practice. Much conflicting research has been produced regarding caffeine and performance.

**Purpose:** The purpose of this study was to determine the effect caffeine has on upper and lower body muscular endurance. **Methods:** This study included 10 subjects (5 male and 5 female) who regularly participated in sport activity exercise 2-4 times a week. The mean height and weight of the subjects was 177.79cm 72.35kg respectively. The subjects had to abstain from caffeine 24 hours before the testing. The subjects came three times to the weight room each session separated by 48 hours. The first session consisted of determination of subjects' 1 Rep Max for bench press and squat. In the two subsequent sessions subjects ingested either 250 mg placebo or caffeine, and waited 30 minutes, then lifted for maximum number of repetitions 75 percent of their 1 Rep Max for both the bench press and squat. **Results:** All subjects except for one male showed increased muscle endurance after ingesting caffeine in either upper body, lower body or both. The average number of lifts after ingesting the placebo was  $8.75 \pm 2.39$  on bench and  $13.95 \pm 8.26$  on squat. After ingesting caffeine the average on bench was  $9.55 \pm 2.77$  and  $21.4 \pm 10.61$  on squat. **Conclusion:** These results suggest that caffeine increases muscle endurance in both upper body and lower body with an increase of approximately 17% in upper body muscle endurance and approximately 83% increase in lower body muscle endurance.



9.

**WHOLESOME HAWGS: A LOW COST, EIGHT-WEEK WEIGHT-LOSS BASED WORK-SITE EMPLOYEE WELLNESS PROGRAM**

J.L. Brown, B.L. Buss, J.R. Bushong, and R. Di Brezzo. Human Performance Laboratory and Intramural Recreational Sports, University of Arkansas, Fayetteville, AR; e-mail: [jnelson@uark.edu](mailto:jnelson@uark.edu)

Low cost worksite based wellness programs can help improve employee productivity, reduce cost associated with employee absenteeism, and potentially decrease insurance premiums and overall healthcare costs for employers. **PURPOSE:** The purpose of the Wholesome Health and Wellness Group (HAWGs) program is to provide low-cost personal wellness services to University of Arkansas faculty and staff by promoting weight loss and behavioral modification through group interaction and accountability. **METHODS:** Faculty and staff were recruited for the program using campus advertisement and inter-departmental communication. Pre-screening included the following measures: a fasting blood analysis, resting blood pressure, height and weight, sagittal abdominal diameter, girth measurements, and an estimated body composition, including body mass index. Participants also completed the Situation-based Dieting Self-Efficacy Scale and the Attitude towards Physical Activity Questionnaire. All measures were repeated during post-testing. Program features included weekly drop-by weigh-ins, four 30-minute group information sessions on relevant nutrition, activity, and behavioral modification topics, and an interactive participant website. The first eight week session of the program began in the fall of 2009. **RESULTS:** The first eight weeks saw a successful enrollment of 21 individuals who participated in pre-testing. Program adherence decreased as the eight week session progressed. During week three, 14 (67%) participants came for their weekly weigh in, while during week six only ten (47%) showed up to be weighed in. Two-thirds of the participants attended individual nutrition consultations during the first eight week program; the other 1/3 neglected to schedule or attend their meeting. **CONCLUSIONS:** The Wholesome HAWGs program follows previous successful nutrition-based models that involve pre- and post screening, consultations, and individual follow-up, but has been modified for the employees of the University of Arkansas campus. A full program evaluation is planned and will examine the effectiveness of the Wholesome HAWGs program on weight loss, participant analysis of program execution, and will determine if the Wholesome HAWGs program warrants continued support and operation. Future plans include making program modifications necessary to enhance the effectiveness of the Wholesome HAWGs program, as well as potentially developing a student-based wellness program using a modified Wholesome HAWGs model.

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10.

Insulin sensitizers for the management of non-alcoholic fatty liver disease: a meta-analysis of randomized controlled trials

Abhishek Choudhary, Nicholas M. Szary, Matthew L. Bechtold, Srinivas R. Puli,  
R. Scott Rector, John P. Thyfault, Jamal A. Ibdah  
Division of Gastroenterology and Hepatology  
University of Missouri – Columbia

**Background:** In the western world, 25-30% of adults have non-alcoholic fatty liver disease (NAFLD). Of those with NAFLD, 1/3 will develop non-alcoholic steatohepatitis (NASH), which potentially can progress to cryptogenic cirrhosis and advanced liver failure. Insulin resistance (IR) is thought to be a key element of NAFLD progression. Insulin sensitizing medications (IS) are believed to be an affective method for treating NAFLD. Several randomized controlled trials (RCTs) have been performed to evaluate the effects of medications and lifestyle modifications but the results have been inconsistent and controversial. Therefore, we conducted a meta-analysis to evaluate the role of IS in the management of NAFLD.

**Methods:** MEDLINE, Cochrane Central Register of Controlled Trials & Database of Systematic Reviews, PubMed, and recent abstracts from major conference proceedings were searched (10/08). RCTs comparing IS at any dose and duration versus no intervention or placebo were included. Co-interventions were allowed in both groups in all the trials. Standard forms were used to extract data by two independent reviewers. The effects were analyzed by calculating pooled estimates of steatosis, hepatocellular injury, fibrosis, NAFLD activity score (NAS), ALT, IR, C-reactive protein (CRP), and leptin. Separate analyses were performed for each outcome by using odds ratio (OR) or weighted mean difference (WMD) by random or fixed effect models. Publication bias was assessed by funnel plots. Heterogeneity among studies was assessed by calculating  $I^2$  measure of inconsistency.

**Results:** Seven trials met inclusion criteria. IS significantly decreased the odds of steatosis (OR 3.31; 95% CI: 1.63-6.74,  $p<0.01$ ), hepatocellular injury (OR 2.60; 95% CI: 1.24-5.43,  $p=0.01$ ), and NAS (OR 2.88; 95% CI: 1.16-7.13,  $p=0.02$ ). IS also had a trend toward decreased fibrosis but not to a significant level (OR 1.65; 95% CI: 0.75-3.62,  $p=0.21$ ). Also IS significantly increased the odds of normalization (OR 3.72; 95% CI: 1.93-7.16,  $p<0.01$ ) or improvement of ALT (OR 30.85; 95% CI: 19.13-42.56,  $p<0.01$ ) and HOMA-IR (OR -1.15; 95% CI: -1.61- -0.69,  $p<0.01$ ). However, no significant effect was noted on leptin (OR 1.48; 95% CI: -1.46-4.43,  $p=0.32$ ) and CRP serum levels (OR -1.26; 95% CI: -2.77-0.26,  $p=0.1$ ). No significant heterogeneity was present for all the major outcomes. Funnel plot revealed no publication bias.

**Conclusion:** IS significantly improves histology and biochemical markers in NAFLD/NASH in comparison to placebo or no interventions.

11.

#### ATPASE ACTIVITY IN RAT TAIL ARTERY

M.C. Counce, A.J. Stone, K.W. Evanson, and H.A. Kluess. Department of Health, Kinesiology, Recreation, and Dance, University of Arkansas, Fayetteville, AR;  
email: [mcounce@uark.edu](mailto:mcounce@uark.edu) (Sponsor: C. Riggs FACSM)

Previous research supports that ATP and noradrenaline are present in the rat tail artery. **Purpose:** The purpose of this experiment is to determine if ATPase is also detectable in the tail artery and if segment location is a determining factor. **Methods:** The proximal, intermediate, and distal segments (2 mm) of the tail artery were removed from 6 month old F344 male rats. A spectrometric phosphate assay was used to analyze ATPase activity. Vessel segments were incubated at 37 C in PiBlue Phosphate reagent for 50 minutes for detection of free phosphate. Vessels were then analyzed using a spectrometer protein assay for overall protein concentration. **Results:** ATPase activity was detected and normalized by protein concentration in upper (10.37pM Phosphate/ug protein), middle (7.17 pM Phosphate/ug protein), lower segments (12.2 pM phosphate per ug protein). **Conclusion:** In conclusion, ATPase activity can be detected in tail artery and no significant difference was determined between the proximal, intermediate, and distal segments.

12.

#### CAFFEINE'S EFFECT ON WOMEN: SUBSTRATE UTILIZATION DURING STEADY-STATE RUN

Y.E. Creed, H.R. Schmidt, K.L. Fangman and S. Burns\*. Human Performance Lab, and  
\*Department of Kinesiology, University of Central Missouri, Warrensburg, MO;  
Email: [yec63710@ucmo.edu](mailto:yec63710@ucmo.edu)

Due to the excessive number of energy drinks and other supplements college students are now using, caffeine was of interest to us to elucidate the role that it plays in substrate utilization. Hopefully, through our research and data we can generalize information that can be found useful to the active college community.

**Purpose:** The purpose of this study was to compare the physiological effects of caffeine on fat metabolism versus carbohydrate metabolism, during a 2-mile steady-state run in women who are caffeine naive.

**Methods:** Fourteen women who averaged 21 years of age, 60.04kg in weight, and 161.9cm tall ran on a treadmill connected to a metabolic cart (Parvomedics, Salt Lake City, UT), which measured O<sub>2</sub> consumption and CO<sub>2</sub> production, while wearing a Polar heart rate transmitter. Rate of perceived exertion (RPE) was also taken as an oral assessment periodically with Borg RPE chart of 6-20. The subjects completed 2 single-blind trials, one with caffeine and one with a placebo. The caffeine dose was determined according to each participant's weight at a ratio of 5mg/kg. **Results:** The difference in RER averages between placebo and caffeine was less than 0.0030 (placebo 0.9728±0.05, caffeine 0.9700±0.04). Mean HR during the caffeine trial (180.84±10.25 bpm) was increased by 25 bpm, compared to the placebo trial (155.83±10.37bpm).

During caffeine consumption half of the participants experienced a decreased RPE compared to placebo consumption. The mean RPE during the caffeine trial was 13.425±0.59 and the mean for the placebo trial was 13.496±0.43. **Conclusions:** According to this study, caffeine does not appear to affect RER. Thus, caffeine does not change substrate utilization. There is also evidence suggesting that caffeine increases HR during the steady-state exercise and lowers RPE thus making the exercise seem easier.

13.

AN ALTERNANT METHOD TO THE TRADITIONAL NASA HINDLIMB SUSPENSION  
MODEL IN MICE

Jacqueline M. Crissey<sup>1</sup>, J. Andries Ferreira<sup>2</sup>, and Marybeth Brown, FACSM<sup>1,2</sup>

Departments <sup>1</sup>Biomedical Sciences, and <sup>2</sup>Physical Therapy, University of Missouri-Columbia,  
Columbia MO 65211

Many animal models have been used to investigate atrophy and serve as the basis for interventions to reverse muscle loss in humans. The Morey-Holton hindlimb unloading (HU) method in rodents is a widely accepted NASA groundbased model for studying disuse-atrophy. **PURPOSE:** Evaluate an alternative method to the Morey-Holton hindlimb unloading (HU) tail-taping technique in mice. The proposed method allows for ease of tail examination during suspension; decreases the likelihood of cyanotic, inflamed, and/or necrotic tails frequently observed with tail-taping; and reduces the possibility of mice chewing the traction tape and coming out of the suspension apparatus. This tailring method also ensures rapid recovery following HU. **METHODS:** Thirty-three adult (4-8 mo.) female mice were HU for 14 days with (n=17) or without (n=16) 3 days of recovery. Aged matched ambulatory control mice (n=49) were used for comparison to HU animals. A thin stainless steel wire was passed through the inter-vertebral disc spaces between the 5<sup>th</sup> and 7<sup>th</sup> sacral vertebrae and shaped into a ring from which the mice were suspended. The vertebral location for the tail-ring was selected based on its ability to appropriately balance the animal's body weight and did not interfere with defecation. We assessed the success of this novel hindlimb unloading technique by percent body weight lost during suspension, atrophy of the soleus, and adrenal mass in the mice. **RESULTS:** Body mass of the mice prior to HU (24.8  $\pm$  3.8g) was not significantly different immediately after HU (23.8  $\pm$  2.8g), or after 3 days of recovery (24.7  $\pm$  2.5g). Soleus muscle mass significantly declined (-35.6%) in all HU groups (p<0.001). In addition, adrenal gland weights did not significantly differ between ambulatory controls and HU mice. **CONCLUSION:** Our results indicate no significant changes in body mass or adrenal gland weights, and significant soleus atrophy corresponding with expected literature values. This HU method confers several advantages over the traditional HU tail-taping technique, which includes ease of reloading and elimination of mice chewing the traction tape and becoming ambulatory during HU. Our findings suggest that this novel tail-ring hindlimb suspension method is as successful as the traditional Morey-Holton technique in mice.

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14.

#### RESISTANCE AND AERBOIC TRAINING SEQUENCE EFFECTS ON ENERGY CONSUMPTION

R. R. Cutts and S. Burns. Department of Health and Human Performance, University of Central Missouri, Warrensburg, MO; email: [rrc52930@ucmo.edu](mailto:rrc52930@ucmo.edu)

An increasing number of people are looking for the most convenient and time efficient way to lose weight due to busy schedules and time constraints. Perhaps, this is the reason it is becoming increasingly popular to combine strength training and aerobic training in the same workout. **PURPOSE:** The objective of this study was to investigate which sequence of resistance and aerobic training has the most significant effect on energy consumption during and after a workout. It focused on which sequence burned the most calories from fat and carbohydrates during a single 60 minute workout and for 20 minutes following the exercise during the subject's cool down plus excess post oxygen consumption (EPOC). **METHODS:** The subjects were all considered able to lose weight based on body fat % of  $\geq 19\%$  for females and  $\geq 15\%$  for males, were 2 males and 15 females, sedentary or recreationally active individuals between the ages of 20 and 61 years. Subjects did a counterbalanced intervention, circuit training first (intervention RA) or aerobic exercise first (intervention AR) depending on random assignment while their oxygen consumption was continuously monitored using a metabolic cart during and after the workout for 20 minutes. Subjects in the RA intervention performed a warm-up on the treadmill at 40% of their heart rate reserve for 5 minutes then for 30 minutes did continuous walking or jogging on the treadmill at  $\sim 67\%$  in their target heart rate range. Immediately following treadmill exercise, subjects performed 2 sets of 12 reps at 67% of their 1RM of the bench press, triceps extension, bicep curls, bent over row, step ups, squats, lunges, and shoulder press allowing  $\sim 1.5$  minutes for each exercise for a total of 25 minutes. Cool down consisted of five minutes on the treadmill with a gradual decline in speed. Subjects in each intervention reversed the sequence of aerobic and resistance training on their second visit. **RESULTS:** The calories burned during the AR intervention were  $467.39 \pm 136.6$  compared to the RA intervention at  $424.72 \pm 117.4$  calories. There was a mean difference of  $\sim 42.66$  kcal,  $p = 0.003$ ) between the two interventions. **CONCLUSION:** Based on the results of this study, aerobic exercise preceding resistance training has a greater impact on total energy consumption versus a reverse order, when intensity was matched as measured by HR.

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15.

EFFECTS OF DIFFERENT PRE-EXERCISE FEEDING REGIMENS ON INTRAMUSCULAR MARKERS OF MYOSTATIN SIGNALING FOLLOWING RESISTANCE TRAINING

V.J. Dalbo, M.D. Roberts, S.E. Hassell, and C.M. Kerksick. Applied Biochemistry and Molecular Physiology Laboratory, University of Oklahoma, Norman, OK.  
email: chad\_kerksick@ou.edu

**PURPOSE:** The purpose of this investigation was to determine if consuming a non-caloric placebo or isoenergetic (25 g) doses of carbohydrate or protein prior to conventional resistance training affected the myogenic expression of myostatin signaling genes. **METHODS:** Ten untrained men (mean  $\pm$  SD; 22  $\pm$  4 yrs; 77.8  $\pm$  8.3 kg; 17.8  $\pm$  4.0 % fat) participated in 3 cross-over sessions which were preceded by supplement ingestion 30 min prior to 90 repetitions (80% 1RM) of bilateral leg extensor contractions. Pre-supplement/exercise, 2-h and 6-h post-exercise muscle biopsies were obtained during each session and analyzed for fold-changes in *activin IIB*, *follistatin like-3 (FSTL-3)*, *myostatin* and *sMuRF1* mRNA expression using real-time RT-PCR. **RESULTS:** Non-parametric statistics revealed that there were no differences between conditions in the expression of target genes at 2 or 6 hours post-exercise. When examining all conditions over time, Wilcoxin signed rank tests revealed that: 1) *myostatin* expression significantly decreased 2 h post- (-150%,  $p = 0.001$ ) and 6 h post-exercise (-1,930%,  $p < 0.001$ ), 2) *FSTL-3* expression significantly increased 2 h post- (+60%,  $p = 0.001$ ) and 6 h post-exercise (+90%,  $p = 0.003$ ), and 3) and *sMuRF1* expression significantly increased 6 h post-exercise (+150%,  $p = 0.002$ ). **CONCLUSION:** These findings provide rare genetic evidence to suggest that resistance exercise favorably impacts myostatin signaling during acute post-exercise time points; a phenomenon which is seemingly independent of pre-exercise macronutrient ingestion.

BONE LOADING DURING ADOLESCENCE AND YOUNG ADULTHOOD INCREASES  
ADULT BONE MINERAL DENSITY

A.W. Dawson<sup>1</sup>, R.S. Rogers<sup>1</sup>, M.O. Widzer<sup>2</sup>, J.P. Thyfault<sup>1,3,4</sup>, P.S. Hinton<sup>1</sup>

<sup>1</sup> Departments of Nutrition and Exercise Physiology, <sup>2</sup> Biomedical Sciences, and <sup>3</sup> Internal Medicine University of Missouri, <sup>4</sup> Harry S. Truman Memorial VA Hospital, Columbia, Missouri 65211

email: awdqm2@mail.missouri.edu

Exercise that produces high ground reaction forces (GRF) has a positive effect on bone mass, especially during periods of skeletal growth. However, the lasting benefits of physical activity performed during adolescence and young adulthood remain to be determined. **PURPOSE:** The purpose of this study was to evaluate the effects of bone loading during different phases of the life cycle on bone density and risk of osteopenia during adulthood. **METHODS:** Physically active men (N=101), aged 18-63 years participated in this cross-sectional study. Each subject completed a medical history questionnaire and the Historical Leisure Time Physical Activity Questionnaire (HLAQ; Kriska, 1988). Dual energy X-ray absorptiometry (DXA) scans of the whole body, lumbar spine, and total left hip were performed to measure bone mineral density (BMD). Bone loading associated with physical activity during adolescence (age 13-18), young adulthood (age 19-29), and adult-hood (age 30+) was evaluated using bone loading scores. Bone loading scores were calculated using the Effective Load Stimulus (ELS) scoring system (Weeks, 2008), which based scores on the activity type, frequency, and duration of physical activity retrieved from the HLAQ in each phase of the lifecycle. Multiple linear regression was used to examine the relationships between bone loading during adolescence, young adulthood, adulthood, and current total body and regional BMD. The effects of participation in high-GRF activities earlier in life on risk of osteopenia during adulthood were examined using logistic regression. **RESULTS:** Higher bone loading scores throughout the life cycle were associated with increased BMD of the whole body, lumbar spine, and total hip adjusting for body weight. In particular, bone loading during young adulthood was a significant, positive predictor of BMD (Adj. R<sup>2</sup>=43%). Participation in multiple activities with high GRFs during adolescence was associated with decreased risk of osteopenia as an adult. **CONCLUSION:** Participation in activities that produce high GRFs throughout the life cycle are positively associated with increased BMD and decreased risk of osteopenia during adulthood. Adolescents and young adults should be encouraged to participate in activities with high bone loading characteristics to reduce the risk of osteopenia later in life.

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17.

DIPEPTIDYL PEPTIDASE IV ACTIVITY IN SKELETAL MUSCLE CONDUIT AND RESISTANCE VESSELS

Kirk W. Evanson, Audrey J. Stone, Heidi A. Kluess. Department of Health, Kinesiology, Recreation, and Dance, University of Arkansas, Fayetteville, AR  
email: kevanon@uark.edu (Sponsor: C.E. Riggs, FACSM)

Neuropeptide Y is a neurotransmitter that elicits vasoconstriction through stimulation of vascular smooth muscle. The actions of proteases such as Dipeptidyl Peptidase IV (DPPIV) mitigate the vascular response to NPY. **PURPOSE:** To examine DPPIV activity in the vascular smooth muscle of conduit and resistance vessels. **METHODS:** Femoral arteries (FEM) and red, first-order gastrocnemius arterioles (G1A) were removed from male and female (n=8), F344 rats. The vessel segments were homogenized in Krebs-Ringer buffer (pH 7.4), centrifuged, and the resulting supernatant removed for DPPIV analysis. DPPIV activity was assayed using a fluorogenic substrate, glycyl-L-proline-4-methoxy-2-naphthylamide, which produced relative fluorescence units (RFU) proportionate to DPPIV activity. The RFU values were converted to units of DPPIV activity. **RESULTS:** DPPIV activity was greater in the G1A vessels (G1A:  $0.15 \pm 0.11$ ; FEM:  $0.06 \pm 0.11$ ;  $p < 0.05$ ) with nominal activity detected in the femoral artery. There were no differences in G1A DPPIV activity between males and females (M:  $0.11 \pm 0.09$ ; F:  $0.20 \pm 0.10$ ;  $p = 0.09$ ). **CONCLUSION:** These data suggest DPPIV to be more active in G1A vessels as compared to femoral arteries. There were no differences in DPPIV activity between male and female G1A vessels.

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18.

#### THE EFFECT OF ENERGY PATCHES ON PHYSICAL STAMINA IN COLLEGE MALES

K.L. Everett, D.B. Smith, E.D. Ryan, B.J. Thompson, R.E. Fiddler  
Applied Musculoskeletal & Human Physiology Research Laboratory,  
Oklahoma State University, Stillwater;  
Email: [dbsmith@okstate.edu](mailto:dbsmith@okstate.edu) (Sponsor: B.H. Jacobson, FACSM)

There has been a recent interest in the use of Energy patches which have been suggested to improve human performance by utilizing bioelectric stimulation produced by electrical frequencies in the body's magnetic field. These energy patches incorporate organic nanoscale biomolecular antennas into two separate patches that resonate at frequencies in unison with biomolecules in the cells and signal specific metabolic pathways to beta oxidation, using fat as a primary fuel source. **PURPOSE:** The purpose of the study was to examine the acute effects of energy patches on general measures of physical fitness. **METHODS:** Twenty four healthy recreationally active males (age =  $22.9 \pm 2.5$  years; stature =  $179.8 \pm 6.4$  cm; mass =  $84.1 \pm 9.4$  kg) performed a general exercise bout on two separate days. Each exercise bout included a maximum repetition pull-up test, a two minute sit-up test, and a two minute push-up test. Each exercise was separated by two minutes of rest. All participants completed the first exercise bout without the patch, and the second testing period included the same exercise tests in which the participants were randomly assigned to a placebo or active patch group. A two-way mixed factorial ANOVA [time  $\times$  condition;  $2 \times 2$ ] was used to analyze the results from each specific exercise test. An alpha level of 0.05 was set for statistical significance.

**RESULTS:** There was a significant ( $P = 0.025$ ) main effect for time for pull-ups, however there were no significant ( $P > 0.05$ ) differences for both the sit-up and push-up tests. **CONCLUSION:** The results of the current study indicated the number of pull-ups performed improved from test 1 to test 2; however this was not influenced by the energy patch. There were also no other additional benefits of the energy patch on sit-up and push-up performance.

19.

EFFECTS OF DURATION ON EXCESS POST EXERCISE OXYGEN CONSUMPTION ON ACTIVE AND INACTIVE FEMALES

K. Farrell, K. Kurka, and B. Kniffen. Department of Kinesiology, University of Central Missouri, Warrensburg, Missouri  
Email: [kdf00580@ucmo.edu](mailto:kdf00580@ucmo.edu) (Sponsor: S. Burns)

**Introduction** Despite the numerous studies performed, the effects of duration on excess post-exercise oxygen consumption (EPOC) are still being debated. Some studies have found a linear relationship between the two, while others have seen very little difference between different durations. **Purpose:** The primary purpose of this study was to test the effects of duration on EPOC in active and inactive females. **Methods** Participants were 4 active and 4 inactive female college students. The active participants were engaged in a collegiate sport while the inactive participants exercised no more than 60 minutes per week. Oxygen consumption was measured during a 10 and 20 minute treadmill run. The participants trained at a 13, somewhat hard, on the modified Borg RPE chart. Oxygen consumption as well as heart rate, RER, and kcals were measured continuously throughout the workout and during the 30 minute post-exercise resting period. **Results** Data collected indicated that the 20 minute EPOC, 19.77964 was less than the 10 minute, 22.20821. Also, active subjects showed to have a lower EPOC compared to the inactive during the 10 minute run (20.336875, 24.703333), but not during the 20 minute (19.586875, 20.036667). **Conclusion** Our results show that duration does have an effect on EPOC. The EPOC after a 10 minute treadmill was higher than that of a 20 minute. Also, active subjects showed to have lower EPOC than inactive.

THE ACUTE EFFECTS OF A COENZYME Q-10 BASED ERGOGENIC SPRAY ON BENCH PRESS FATIGUE INDEX AMONG COLLEGIATE DIVISION-1 FOOTBALL PLAYERS

R. Fiddler, D. Smith, E. Ryan, B.H. Jacobson, B. Thompson, M. O'Brien, A. Warren, B. Long, R. Hildebrand, M. Andrews

Applied Musculoskeletal & Human Physiology Research Lab  
Oklahoma State University, Stillwater;

Email: [doug.smith@okstate.edu](mailto:doug.smith@okstate.edu) (Sponsor: B.F. Jacobson, FACSM)

Recent interest has grown regarding the potential ergogenic effects of a sublingual spray designed to enhance human performance. **PURPOSE:** The purpose of the present study was to examine the efficacy of a coenzyme Q-10 sublingual ergogenic aid on the fatigue index generated during the bench press in Division-1 collegiate football players. **METHODS:** Twenty five healthy Division-1 college football players (age =  $19.6 \pm 1.4$  years, mass =  $107.3 \pm 20.8$  kg) volunteered to participate in this randomized, double-blinded, placebo-controlled study. All testing included 2 visits that took place over 2 weeks separated by 7 days occurring at the same time of day ( $\pm 1$  hour). During visit 1, each participant completed 15 repetitions of the bench press at 50% of their 1 repetition maximum (1-RM). During each repetition, participants were instructed to move the barbell as fast as possible during upward concentric movement from the chest to full arm extension. During visit 2, the participants were randomly assigned to an active (n=13) or placebo (n=12) group. Approximately 5 min prior to testing each participant received the sublingual spray and then completed the 15 repetition test. Peak power was measured using the Tendo Fitrodyne Weightlifting Analyzer. The Tendo unit was attached to the barbell which measured the velocity of the concentric phase of the lift. By entering the load lifted the Tendo unit calculated peak power per repetition. Percent decline of peak power was determined by subtracting the lowest peak power obtained during the 15-repetitions from the highest peak power obtained during the 15-repetitions and then dividing by the highest peak power. A two-way mixed factorial ANOVA was used for statistical analysis. An alpha of  $P \leq 0.05$  was used to determine statistical significance. **RESULTS:** There were no significant interactions or main effects ( $P \leq 0.05$ ) for all conditions. **CONCLUSIONS:** These findings indicated that the sublingual spray had no ergogenic effects on the fatigue index in Division-1 college football players.

## FREQUENCY OF FUNCTIONAL TRAINING IN INDIVIDUALS OVER THE AGE OF 65

D. Ford, Department of Kinesiology.

University of Central Missouri, Warrensburg, MO;

Email: [dford@ucmo.edu](mailto:dford@ucmo.edu)

Functional exercise programs are designed to mimic everyday activities such as lifting, reaching, power, and balancing. Functional fitness relates to an individual's physical independence in terms of mobility, self-care, exerting adequate control over one's living environment, and preserving specific physical abilities needed for pursuits that enhance quality of life. As age ensues, especially after age fifty, a steep decline in functional strength is underway. **Purpose:** The purpose of this study was to determine if frequency of training had an effect on fitness variables in older adults. It was hypothesized that functional exercise performed three days per week will improve functional fitness variables and strength greater than performing functional exercise once a week. **Methods:** Six individuals were divided into a frequency (three times per week) group (FG) ( $n = 3$ ; age = 76-85) or once per week group (OG) ( $n = 3$ ; age = 72-90). During the exercise sessions (30 min,  $3d\ wk^{-1}$  for 4 weeks) or (30 min,  $1d\ wk^{-1}$  for 4 weeks), participants were led and instructed to perform a series of functional exercises for each body part. Functional training was used as a classification of exercises which involved training the body for the activities performed in daily life. To increase the difficulty of these exercises, Thera-Bands and Stress Balls were used. The Senior Fitness Test was performed before and after the 4-week program, and measured the number of chair stands (CS), arm curls (AC), and duration of the 8-ft. up and go test (UG). **Results:** All six individuals completed all testing and exercise sessions. A difference of the means of each group's pre and post assessments revealed OG increased maximum number of chair stands greater than the FG; OG decreased maximal number of arm curls in both left and right arms and FG increased maximal number of arm curls in both arms; and both OG and FG decreased their walk time in the 8-ft. up and go test with FG improving their times by  $\frac{1}{2}$  of a second faster than OG. **Conclusion:** These results indicate that a significant positive relationship does not exist between frequency of days trained and functional strength.

## RELATIONSHIPS BETWEEN ISOMETRIC KNEE EXTENSION KINETICS AND VERTICAL JUMP PERFORMANCE

A.C. Fry, Human Performance Laboratory, University of Kansas, Lawrence, KS 66045  
([acfry@ku.edu](mailto:acfry@ku.edu))

Many sporting activities are dependent not only on the muscular force produced, but also on the ability to produce force in a minimal amount of time. The vertical jump (VJ) test is a commonly used field test for lower body power. Since the VJ must be performed in a limited period of time, the ability to produce high levels of force quickly is paramount. Previous work by Weiss et al. (2000, 2003) indicates that RFD and ESD during squats may be contributors to VJ performance, but this has not been demonstrated using a simple isometric knee extension activity. **Purpose:** To determine the relationships between kinetic variables during an isometric knee extension and performance during a dynamic counter-movement vertical jump. **Methods:** Twenty exercise science students participated in this study ( $X \pm SD$ ; men,  $n=9$ , age [yrs]= $23.2 \pm 3.8$ , hgt.[cm]= $178.3 \pm 7.1$ , BW[kg]= $81.8 \pm 15.1$ ; women,  $n=11$ , age= $21.6 \pm 1.6$ , hgt.= $164.8 \pm 6.9$ , BW= $67.2 \pm 12.8$ ). Maximum 3 sec isometric knee extension force ( $F_m$ ) and RFD were determined using a modified York leg extension machine and a computer-interfaced load cell (Transducer Techniques, Temecula, CA) sampling at 1000 Hz. VJ height was determined using a Vertec VJ tester (Sports Imports, Columbus, CA), and VJ peak power (W) was estimated using the Harman equation (1995). Pearson product moment correlations were used to determine relationships between knee extension and VJ variables ( $p < .05$ ). For the purpose of this exploratory study, data from all subjects was collectively analyzed. **Results:** Knee extension results were  $F_m = 599.8 \pm 223.5$  N, and RFD= $1487.8 \pm 510.6$  (N/s). VJ results were hgt.= $44.5 \pm 14.5$  cm, and peak power= $3447.7 \pm 1114.0$  W.  $F_m$  was significantly correlated with VJ hgt. ( $r=0.68$ ) and VJ peak power ( $r=0.81$ ). RFD was also significantly correlated with VJ hgt. ( $r=0.64$ ) and VJ peak power ( $r=0.81$ ). **Discussion:** Although knee extension variables were measured using single joint, isometric muscle actions, both  $F_m$  (not time dependent) and RFD (time dependent) were related to the dynamic measures of VJ hgt. and peak power. Conceptually, this makes sense since Schilling et al. (2005) has demonstrated that isometric knee extension RFD is related to muscle fiber characteristics, and Fry et al. (2003) reported that VJ performance is also related to muscle fiber characteristics. It would appear that static, single-joint, small muscle mass knee extension measures such as used in the present study would not be strongly related to dynamic, multi-joint, large muscle mass measures such as a VJ. However, in summary, it is likely the ability to not only produce maximal force, but to be able to do this as rapidly as possible may be one of the key contributors for VJ hgt. and power.

23.

#### DYNAMIC VS STATIC STRETCHING WHEN PERFORMING A MAXIMAL VERTICAL JUMP

M. Gargano, L. Saforek, T. Hackward. \*Department of Kinesiology, University of Central Missouri, Warrensburg Missouri

There are many misconceptions about whether or not stretching prior to performing a maximal vertical jump would improve performance. Some research shows that dynamic type stretching can provide some benefits prior to performing a maximal vertical jump. **PURPOSE:** The primary purpose of this study was to determine the effects of dynamic stretching compared to static stretching before performing a maximal vertical jump. **METHODS:** Participants consisted of 10 UCM female volleyball players and 10 UCM female basketball players. Vertical jump height was determined by recording the subject's reach height using a VERTEK, recording their maximal vertical jump and then subtracting the vertical jump height from the reach height. Each subject was instructed to do no stretching or warm-up prior to performing vertical jumps. Subjects performed reach height, maximal vertical jumps, and then stretched. Half of the female volleyball players performed 5 dynamic stretches and the other half performed 5 static stretches and the same procedure was followed for the female basketball players. Immediately following stretching, each participant performed final maximal vertical jumps. **RESULTS:** There was a significant difference when we analyzed our results with dynamic and static type stretching. The mean jump height for dynamic stretching was increased (vertical jump height) by  $2.28 \pm 2.46$  cm and the mean jump height for static type stretching was decreased by  $0.76 \text{ cm} \pm 2.86$ . **CONCLUSION:** The results of the data suggest that dynamic stretching in female volleyball and basketball players is more beneficial to performing maximal vertical jumps vs. static stretching because dynamic stretching had over a 3 cm mean increase than static stretching.

GENDER DIFFERENCE IN TIME TO EXHAUSTION DURING AN INCREMENTAL  
HIGH INTENSITY INTERVAL PROTOCOL

J. Gildon, G. Kandt and J. Zody. Fort Hays State University, Hays, Ks.

Email: jagildon@scatcat.fhsu.edu

This study is one component of an investigation into high intensity interval exercise and recovery.

**PURPOSE:** The purpose of the study was to compare time to exhaustion during the final stage of a unique interval running protocol between male and female athletes. The protocol was designed to equalize measures of intensity between genders. **METHODS:** Nine track athletes (5 male and 4 female) from a NCAA Division II university whose primary competition distance was  $\leq 800$  meters volunteered to participate. All subjects completed 2 test sessions consisting of six 60 second higher-intensity runs separated by 3 minutes of active (walking at 3.0 mph, 0% grade) or passive (standing stationary) recovery. Active or passive protocols were administered utilizing a randomized crossover design with 3-7 days between tests. The initial running stage was performed on a level treadmill at its' maximum velocity of 10.0 mph. Treadmill speed for each running stage was maintained while elevation was increased by 3.0% (males) and 2.5% (females) during each of 5 subsequent higher intensity stages. This progression resulted in a final stage elevation of 15% (males) or 12.5% (females). The final stage continued to voluntary exhaustion. Pilot testing indicated these gender specific grade changes resulted in similar heart rate (HR), respiratory frequency (RR) and rating of perceived exertion (RPE) between genders. Heart rate and RR were monitored using the Zephyr Bioharness system. **RESULTS:** HR, RR, and RPE were recorded at the end of each running and recovery stage. No significant differences in mean values between males and females were observed for these 3 dependant variables during any stage of the corresponding protocol. Despite the similarity in intensity measures, mean final stage duration across both protocols was twice as long for males (male =  $65.7 \pm 8.97$  vs. female =  $32.1 \pm 3.79$  seconds). **CONCLUSIONS:** Interval training sessions are frequently controlled by heart rate or perceived exertion. Results of this study indicate that the relation of HR, RR and RPE to total interval effort may be gender specific. Coaches and fitness professionals should consider possible gender differences when prescribing intensity targets during interval exercise.

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25.

DIFFERENCES IN FATIGUE, PEAK AND MEAN POWER, AND PEAK LACTATE WHEN COMPARING THREE DIFFERENT ANAEROBIC MAX TESTS.

Z Graham, J Fletcher, R Wooderson, A Fowles, A Fry, AND P Gallagher.  
Applied Physiology Laboratory, University of Kansas, Lawrence, KS 66045;  
e-mail: [philku@ku.edu](mailto:philku@ku.edu)

It has recently been proposed that the WAnT is not an accurate test to determine sprint-running power and that a power squat test (PST) may be a suitable alternative for WAnT for strength trained athletes. **Purpose:** The purpose of this study was to determine if a non-motorized treadmill test (NMT) and a PST had similar power outputs with WAnT and to determine if NMT and PST could be a valid alternative to WAnT.

**Methods:** 16 recreationally trained individuals, aged 20-30 ( $n=8$  males and  $n=8$  females) participated in three different anaerobic max tests. Each subject made five visits. For the first 2 visits, subjects performed familiarizations at a sub-maximal intensity. The following three visits the subject carried out a randomly chosen anaerobic max test. **Results:** Fatigue was higher in NMT ( $175.4 W/s \pm 41.0$ ) compared to WAnT ( $20.5 W/s \pm 1.1$ ) and PST ( $20.4 W/R \pm 5.3$ ). NMT ( $1676.3 W \pm 121.8$ ) had higher mean power compared to WAnT ( $484.7 W \pm 35.3$ ) and PST ( $918.7 W \pm 34.3$ ) while also having higher peak power versus WAnT and PST [ $(NMT=2282.2 W \pm 121.1)$  vs  $(WAnT=931.0 W \pm 48.5)$  and  $(PST=1035.71 W \pm 59.1)$ ]. PST was also higher versus WAnT in regards to mean power. However, WAnT ( $13.4 mmol/L \pm 0.78$ ) had a higher peak lactate compared to NMT and PST ( $8.6 mmol/L \pm 0.7$ ;  $7.3 mmol/L \pm 0.7$ , respectively). **Conclusion:** NMT power outputs are not comparable to WAnT and PST. Lactate production was highest in WAnT. Therefore, NMT and PST may not be an adequate substitution for WAnT to determine anaerobic power in recreationally trained individuals some of whom had modest weight training experience.

**EXERCISE, SEX HORMONES, AND FATTY ACID OXIDATION IN MICE WITH LONG-CHAIN ACYL-COA DEFICIENCY**

G.S. Han, M. Nash, K. Miller, and C.E. Riggs, FACSM. Human Performance Laboratory, Department of Health Sciences, Kinesiology, Recreation and Dance University of Arkansas, Fayetteville, AR; email: [gxb01@uark.edu](mailto:gxb01@uark.edu)

**Purpose:** To observe the effects of ovariectomy and prolonged moderate intensity exercise on mitochondrial fatty acid oxidation in both LCAD deficient and non-deficient mice. This will help broaden the understanding of the disorder and how it relates to exercise and gender. Specifically, the objective was to study the mitochondrial oxidation of fat using mitochondria from the hearts of exercise trained and untrained, ovariectomized and non-ovariectomized LCAD deficient female mice. **Research Methods and Procedures:** Normal female mice (n=20) 129 SvJ/C57BL6 mice (LCAD +/+) and female (n=20) 129 Sv/C57BL6 knockout mice homozygous for LCAD -/- were used for these experiments. The forty mice were divided into eight groups of five, each group encompassing a different aspect of the study: enzyme deficient/non-deficient, exercise trained/non-trained, and ovariectomized/non-ovariectomized. Four groups had the ovaries surgically removed and were allowed time to recover before experimentation. The four exercise trained groups were run on a treadmill five days per week for eight weeks. Before collection of data, the mice underwent a single bout of exhaustive exercise. Twenty-four hours after exercise, the mice were anesthetized using sodium pentobarbital (60 mg/kg body weight) administered intraperitoneally. The hearts were removed from all experimental groups of mice and the subsarcolemmal mitochondria isolated. **Results:** In state 3 the difference was shown to be based on training. Untrained mice showed a significantly ( $p < 0.05$ ) higher level of oxygen consumption in state 3 than the trained mice. There was a no significant difference between groups in state 4. The respiratory control index (RCI) showed a near significant difference for training state ( $p = .0586$ ) with trained mice exhibiting lower RCI than untrained animal. P/O ratios were normal for both trained and untrained groups. **Conclusions:** We hypothesized that LCAD deficient and ovariectomized mice would show to have a decreased RCI. The results indicate that regardless of disorder and presence of ovaries, trained mice showed a decrease in the RCI due to decreased level of oxygen consumption in state 3. The decline in state 3 respiration in the trained mice could be the results of increasing physical stress induced by the disease and accumulation of fatty acids in the heart as a result of diseased state. Further research should be conducted to more fully understand the effects of exercise training and the reason for female advantages in LCAD deficient mice.

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**EFFECT OF RESISTANCE TRAINING DOSE ON METABOLIC RESPONSES AND BEHAVIOR HABITS**

T.D. Heden, E.P. Kirk, & R. Wessling. Department of Kinesiology and Health Education,  
Southern Illinois University, Edwardsville, Illinois.  
Email: tdheden@mail.missouri.edu

The dose of acute resistance training (RT) needed to improve important metabolic parameters related to Obesity and Type 2 Diabetes has not been established. Additionally, the relationship between acute RT dose and behavior habits, such as caloric consumption and free-living physical activity, has not been established. **PURPOSE:** To compare the dose response effects (1-set vs. 3-sets) of a single, whole body circuit resistance training (CRT) session designed using the American College of Sports Medicine guidelines on resting energy expenditure (REE), respiratory quotient (RQ), caloric consumption, muscle soreness (MS), free-living physical activity (FLPA) and fasting venous blood free fatty acid (FFA), glucose, and insulin at baseline and 24, 48, and 72 hours (hrs) after a single CRT session. It was hypothesized that 3-sets would have a more positive impact on all the metabolic parameters, while behavior habits would be unaffected between or within doses. **METHODS:** Nine healthy, previously untrained males (mean  $\pm$  SD; BMI =  $25.8 \pm 1.9$ ) participated in this study. All participants performed both a 1-set and 3-set CRT session (10 exercises, 10RM) in a counterbalanced randomized order, with the previously stated measurements taken at each time point. A two (dose) by four (time) repeated measures ANOVA was used to test for significance, while a Tukey's HSD post hoc test was used to test for specific differences. **RESULTS:** Measured REE, FFA, glucose, and insulin levels were not significantly different at any time point ( $p > 0.05$ ). There were trends for increased REE and decreased fasting insulin levels after both doses. Measured RQ after 3-sets was significantly lower (0.81) 24-hrs after exercise compared to baseline (0.85), and remained lower for up to 72-hrs. There was a trend for increased caloric consumption after 3-sets compared to 1-set. Muscle soreness was significantly ( $p < 0.05$ ) greater at the 24 and 48-hr time points after 3-sets, while no significant ( $p > 0.05$ ) changes were observed after 1-set. The FLPA was significantly ( $p < 0.05$ ) higher during the 3-set protocol the day of exercise and during the 24 to 48-hr post exercise period compared to the 1-set protocol. **CONCLUSION:** The hypothesis was partially supported, since 3-sets did not improve all metabolic parameters better than 1-set. However, 3-sets resulted in more fat kilocalories burned at rest after exercise compared to 1-set. Collectively, these results have important implications for resistance training prescriptions for Obesity and Type 2 Diabetes prevention.

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TRANSMUCOSAL ADMINISTRATION OF AN ERGOGENIC COMPOUND  
AND POWER OUTPUT IN COLLEGE VARSITY FOOTBALL PLAYERS

B.H. Jacobson (FACSM), E. Ryan, A. Warren, M. O'Brien, B. Long, D. Smith, R. Fiddler, B. Thompson and R. Hildebrand. Health and Human Performance, Oklahoma State University, Stillwater OK. 74078. bert.jacobson@okstate.edu.

Transmucosal administration of drugs or nutrients may occur with contact of the buccal mucosa on the underside of the tongue where diffusion through the membrane of dense capillaries provides rapid absorption. **PURPOSE:** To assess the effectiveness of an ergogenic product containing vitamins/minerals, amino acids, and a co-enzyme on muscle performance following transmucosal absorption. **METHODS:** Twenty-five Division I, NCAA football players ( $19.59 \pm 1.45$  yrs;  $120.98 \pm 15.63$  kg;  $188.72 \pm 7.37$  cm) voluntarily participated in the study and signed an approved consent form. On the first day of testing all subjects warmed up, stretched, and were tested on the bench press for 15 repetitions at 50% 1RM. Subjects were given timed cues of "ready", "down", "pause", "lift". The lift phase was executed as quickly as possible while Peak and Average Power (PP & AP) and Peak and Average Velocity (PV & AV) were recorded using a Tendo FitroDyne apparatus. One week later participants were randomly given the placebo (PL) or the experimental sublingual spray (EX) and retested using the same protocol. One-way ANOVAs were used to compare gain score means between the two groups. **RESULTS:** Results yielded no significant group differences for PP ( $F=.749$ ;  $p=0.39$ ), AP ( $F=.505$ ;  $p=0.48$ ), PV ( $F=.385$ ;  $p=0.54$ ), and AV ( $F=.332$ ;  $p=0.57$ ). However, the EX group registered greater gains and positive gains while the PL group registered negative post-test results in all but one variable: PP (1.0 vs. -15.0 W), AP (.002 vs. -.017 W), PV (.002 vs. -.017 m/s) and AV (.018 vs. .003 m/s). **CONCLUSION:** While only small gains were seen in the EX group, mostly negative pre- to post- means were recorded by the PL group suggesting that less detriment in performance existed in the EX group. Since the subjects were engaged in seasonal training, it is possible that the volume of weekly training may have resulted in cumulative effect, thus a reduction in performance from the first to the second week of testing. If cumulative fatigue may be minimized, the use of a sublingually administered ergogenic aid may be beneficial.

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## PREVALENCE OF EXERCISE-INDUCED BRONCHOCONSTRICTION IN COLLEGE

R. Johnson, K. Young, and S. Burns. Department of Kinesiology.  
University of Central Missouri, Warrensburg, Mo;  
Email: [rajohnson1@ucmo.edu](mailto:rajohnson1@ucmo.edu)

Exercise-Induced Bronchoconstriction is activated by vigorous exercise, and commonly occurs after exercise has ceased, and occurs in approximately 10% of the general population (Parson, 2007). **Purpose:** The Purpose of this study is to identify the prevalence of exercise-induced bronchoconstriction in student-athletes. We hypothesis that 10% of student athletes would test positive for EIB. **Methods:** Participants were thirty-two student-athletes (18 male, 14 female). Exclusion criteria included pregnancy, recent upper-respiratory tract infection (within 2 weeks of the study enrollment), A history of > 10 pack-years of tobacco use (calculated by multiplying the number of years the person has smoked), or history of asthma with a current forced expiratory volume (FEV) of less than 70% of the predicted value on baseline spirometry, which would identify airway obstruction. Athletes underwent baseline spirometry following American Thoracic Society (ATS) guidelines, to determine each athlete's individual baseline FEV. Each individual's FEV1 was then used to calculate 50-60% of his or her exercise target ventilation (VE) ( $35 * FEV1 * 0.5$  and  $35 * FEV1 * 0.6$ ). The athlete was instructed to repeat a FEV1 three times; we would choose the best out of the three FEV1 (readings had to be within 150ml of each other). The maneuver must last at least six seconds and there must also be an obvious plateau of at least one second. After the baseline spirometry was obtained the athlete would performed exercise on a treadmill at 80-90% of their maximal heart rate or 40-60% of their maximal ventilation for at least 4 minutes (time on treadmill was between 8-12 minutes). After the exercise the athlete repeated maximal spirometry effort at 2, 5, 10, 15, and 20 minutes post treadmill test. A fall in FEV1 > 10% from baseline was considered positive for EIB. **Results:** Thirty-two athletes from five different sports completed the testing. Three of the thirty-two athletes had positive post FEV1 results indicating EIB. **Conclusion:** Based off the results of this study, we were able to confirm that there is a 10% prevalence of EIB in student-athletes who are unaware they have EIB. The athletes who had a positive EIB did not have a known prior history of EIB or asthma.

THE DIFFERENCES IN RATE OF PERCEIVED EXERTION WHILE RUNNING ON  
DIFFERENT SURFACES

S. Johnson, B. Lyon, J. Gore, S. Brown, and S. Burns. University of Central Missouri,  
Warrensburg

MO; email: [saj10820@ucmo.edu](mailto:saj10820@ucmo.edu)

Running on a treadmill is perceived differently when compared to running on an outdoor track or an indoor track. Whether the runner is actually working harder on one surface or another may impact how difficult they perceived that exercise bout. **Purpose:** The primary purpose of this research project was to determine the most difficult surface to run on when running at the same target heart rate; an outdoor track, an indoor track, or a treadmill. **Methods:** Five collegiate male athletes ranging from 18 to 23 years in age (mean 19 years) performed three running trials on different surfaces. Subjects were 177.8cm  $\pm$  7.6cm, 80.1kg  $\pm$  21.3kg, 16.6%  $\pm$  9.4% body fat, with a mean resting heart rate of 60bpm  $\pm$  5. Each subject completed a 600 meter run on three difference surfaces: treadmill, outdoor track, and indoor track. During the first 400 meters of each test, the subjects were instructed to keep their heart rate at 90 percent of their maximum heart rate via heart rate monitor. The subjects were not told that they would be running at 90 percent of their maximum heart rate. They were just given the beats per minute that equaled the target heart rate and were instructed to maintain that number on the heart rate monitor. The subjects were instructed to yell out their actual heart rate off of their heart rate monitor five yards before the finish line. After each test the subjects were to point at which number best describe their rate of perceived exertion (RPE) on the Borg RPE scale of 6-20. The only difference in the three protocols was that the subjects speed on the treadmill was increased or decreased by the researchers. **Results:** The treadmill was perceived to be the hardest (RPE=15  $\pm$  2) with the fastest speed (4.59 m/s  $\pm$  .57 m/s). The outdoor track was the second hardest (RPE=14  $\pm$  3) with the second fastest speed (4.09 m/s  $\pm$  1.23 m/s), and the indoor track being perceived as the easiest (RPE=13  $\pm$  2) with the lowest speed (3.94 m/s  $\pm$  .56 m/s). **Conclusion:** The results from this study suggest that athletes running on an indoor track perceive it to be the easiest surface.

THREE YEAR CHANGE IN CARDIOVASCULAR RISK OF FIREFIGHTERS IS RELATED TO WEIGHT CHANGE

G. Kandt and J. Schlagek\*. Fort Hays State University, Hays, Ks. And \* Mercy Regional Health Center, Manhattan, KS.

Cardiovascular events account for a disproportionate share of deaths among firefighters on duty. Some studies report no significant change in cardiovascular disease (CVD) risk for firefighters when monitored 2-5 years. **PURPOSE:** The purpose of this study was to track change in CVD risk factors (RF) of firefighters over 3 years with specific emphasis on weight change. **METHODS:** Beginning in 2004, all full-time members of a fire department underwent annual risk factor evaluations. Firefighters not employed the full 3 years and those who began using cardiovascular medication during the study period were excluded, resulting in a final sample of 51. **RESULTS:** Initial analyses compared RF change for the full sample. Only mean changes for HDL cholesterol (2004 =  $44.3 \pm 11.25$  vs. 2007 =  $47.6 \pm 10.16$ ) and Risk Ratio ( $4.45 \pm 1.53$  vs.  $4.78 \pm 1.43$ ) were statistically significant. Subsequent correlation analyses identified significant relationships between weight change and 6 RF variables. Based on this finding, the sample was subdivided into groups by change in BMI. Mean BMI increased 2.04 units (~13 lb for 26 participants) in the weight gain (WG) group and decreased 1.87 units (~11.8 lb for 15 participants) in the weight loss (WL) group. Comparison between the 2 weight change groups identified significance for RF specified in Table 1.

Table 1: Means Comparison for Firefighters Who Increased (WG) or Decreased (WL) BMI

Risk Factor	WG Group Mean Change	WL Group Mean Change	p-value
Systolic BP	+4.89	-1.83	0.049*
Diastolic BP	+1.37	-1.80	0.32
Cholesterol	+13.85	-11.32	0.003*
Triglycerides	+21.74	-10.20	0.036*
LDL	+10.81	-3.53	0.043*
HDL	-5.76	+0.87	0.044*
Risk Ratio	+0.84	-0.15	0.041*

**CONCLUSIONS:** RF status worsened in the WG group. Studies that compare change in RF over time should consider that total group change may mask changes for specific sub-groups. If it is assumed the observed trends might continue in some individuals, the implications for health status are even greater. Considering the elevated risk of sudden cardiovascular death in on-duty firefighters, weight loss or maintenance is potentially an important intervention.

A COMPARISON OF FOREARM BONE MINERAL DENSITY AMONG COLLEGIATE GYMNASTS, DISTANCE RUNNERS, AND NON-ATHLETES

\*M.L. Kearney and C.L. Elder

Southeast Missouri State University, Cape Girardeau, MO

Email: mkkc3@mail.missouri.edu

**PURPOSE:** Low regional bone mineral density (BMD) has been correlated with increased fracture incidence in multiple body regions. High forearm BMD has been observed in athletes of impact loading sports and has been shown to decrease the risk of Colles' fracture. The purpose of this study was to compare BMD of the total forearm, ultradistal radius, and 1/3 distal radius in female collegiate gymnasts to a group of athletic controls (collegiate distance runners) and a group of non-athletic controls (non-athletes).

**METHODS:** Female collegiate artistic gymnasts ( $n = 11$ ), female collegiate distance runners ( $n = 9$ ), and female college-age non-athletes ( $n = 25$ ) underwent a whole-body dual-energy x-ray absorptiometry (DXA) scan to determine total body BMD and body composition and a forearm DXA scan to determine site-specific BMD of the dominant forearm. Weight and height were assessed and used to calculate body mass index. Data for athletes were collected after the midpoints of their competitive seasons.

**RESULTS:** Significant differences were found in BMD of the total forearm, ultradistal radius, and 1/3 distal radius between gymnasts and distance runners ( $p < 0.001$ ) and between gymnasts and non-athletes ( $p < 0.001$ ), with gymnasts exhibiting greater BMD at the three forearm sites. Gymnasts demonstrated higher total body BMD than non-athletes ( $p < 0.01$ ), but total body BMD in gymnasts was not significantly higher than in distance runners. Differences between runners and non-athletes were not significant. **CONCLUSION:** This population of gymnasts exhibited greater site-specific BMD at cortical and trabecular forearm sites when compared to athletic and non-athletic controls. The loading impact and forearm site-specificity of gymnastics exercise likely caused the differences in BMD. Implications of this research suggest the exploration of training avenues to approximate gymnastics loading in the upper-body to improve forearm BMD and prevent forearm fracture in non-gymnast populations.



PREDICTING LOWER EXTREMITY STRENGTH DEFICITS IN COLLEGE STUDENTS USING  
COMMON FIELD POWER TESTS

D.W. Keeley and G.D. Oliver. Department of Kinesiology, University of Arkansas, Fayetteville,  
AR;email: [dwk0611@msn.com](mailto:dwk0611@msn.com)

Strength deficits in the quadriceps and hamstrings have been linked to several lower extremity injuries. The most common protocol used in testing for these deficits is isokinetic strength testing which is both costly and time consuming. **PURPOSE:** The purpose of this study was to employ common vertical and horizontal power field tests to identify those field tests that best predict lower extremity strength deficits. **METHODS:** Data describing 22 healthy collegiate graduate students' vertical and horizontal power were collected using standard field tests (i.e. two feet vertical jump, single leg vertical jump, 40 yd, 50 yd, and 60 yd run). In addition, data describing each subject's lower extremity strength deficits were collected by using the Biodex 840-000 Multi Joint System Isokinetic Dynamometer (Biodex Medical Systems, Shirley, NY) set to report peak torque at  $60^{\circ}\cdot\text{sec}^{-1}$  of knee flexion and extension as well as  $180^{\circ}\cdot\text{sec}^{-1}$  of knee flexion and extension. **RESULTS:** Regression analyses indicated that three of the four strength deficit parameters could be predicted from a linear combination of field test results. Of the strength deficits measured, hamstring deficits at flexion velocities of both  $60^{\circ}\cdot\text{sec}^{-1}$  and  $180^{\circ}\cdot\text{sec}^{-1}$  and quadriceps strength deficits at  $60^{\circ}\cdot\text{sec}^{-1}$  were those that could be predicted using field test results. **CONCLUSION:** The results of this study may increase the diagnostic power of the clinician and ultimately make it easier to develop strength training protocols designed specifically to target weak musculature in the lower extremity. This targeting of specific musculature, in an effort to return symmetrical strength to the lower extremity, may ultimately decrease the likelihood of lower extremity injury in college aged males and females.

No authors received financial support for this study.

**Table 1.** Mean and standard deviation for field tests and isokinetic strength testing. Field test results are broken down by type and are displayed in cm and s. Strength test results are displayed as percentage of net strength deficit.

Variable	Results	
	Mean	Standard Deviation
<i>Vertical Jump Tests (cm)</i>		
Two Feet (n = 22)	51.44	13.30
Right Foot (n = 22)	44.33	11.58
Left Foot (n = 22)	44.51	12.84
<i>Timed Run Tests (sec)</i>		
40 yd (n = 21)	5.82	0.71
50 yd (n = 21)	6.99	0.82
60 yd (n = 21)	8.43	1.10
<i>Extension Deficits (%ft-lb)</i>		
$60^{\circ}\cdot\text{sec}^{-1}$ (n = 21)	-3.60%	7.65
$180^{\circ}\cdot\text{sec}^{-1}$ (n = 21)	0.99%	11.22
<i>Flexion Deficits (%ft-lb)</i>		
$60^{\circ}\cdot\text{sec}^{-1}$ (n = 21)	-6.69%	8.88
$180^{\circ}\cdot\text{sec}^{-1}$ (n = 21)	0.95%	15.32

EFFECTS OF EXERCISE ON THE DEPRESSION LEVELS OF OLDER ADULTS IN A LONG-TERM CARE FACILITY

W.S. Kensinger & T. Tapps, Oklahoma State University  
E-mail: [tyler.tapps@okstate.edu](mailto:tyler.tapps@okstate.edu)

**Purpose:** The purpose of this study was to determine the effects of a resistance exercise band program on perceived depression levels among older adults residing in a LTC facility. The study describes whether or not a change in recreation programming at a LTC facility will potentially lower perceived depression levels among participants over a 12-week period. Regular exercise has been associated with decreased stress levels and increased levels of neurochemicals, such as endorphins, which serve to enhance mood changes and to reduce symptoms of perceived depression among older adults (National Institute on Aging, 2007). Research has suggested that resistance exercise can have a significant impact on physical health as well as the psychological well being, specifically perceived depression among older adults well into their 90's.

**Methods:** A random assignment of older adults from a purposive sample individuals residing in a LTC facility in a southwestern city was performed. The purposive sample of participants were randomly assigned to a study group or a control group. This research study utilized a randomized controlled trial between subjects design. Participants were asked to participate in an exercise program and complete a self report BDI-II instrument consisting of a 12-week resistance band exercise program. The BDI-II was collected prior to initiation of the exercise program then at 4, 8 and 12-weeks. A control group was utilized involving participants who meet the sampling criteria and were then randomly assigned to the control group. **Results:** *Experimental:* Mean scores from the 4-week testing period compared to the 8-week testing period showed the biggest numerical decrease between any of the consecutive testing periods (6.73 to 2.73). *Control:* For the control group the means showed no continuous trend, starting seemingly low at baseline then increasing over the first 4-week period. The data suggests the same results from 4-week to 8-week and then increasing again over the last four weeks of the study. **Conclusions** In conclusion, resistance training utilizing exercise proved to be an effective mode of exercise for older adults residing in a LTC facility participating in this investigation. Subjects in the experimental group improved their overall perceived depression scores from the baseline analysis over time to the 12-week analysis when compared to the control group.

**LACTATE RESPONSES TO GYMANSTICS FLOOR AND UNEVEN BAR ROUTINES**

K.M. Krengiel, J.P. Loenneke, M.L. Kearney, Southeast Missouri State University, Cape Girardeau, MO e-mail: kmkrengiel1s@semo.edu (Sponsor: T.J. Pujol, FACSM)

There has been much research done on the lactate(La) accumulation in aerobic sports. Researchers have shown an average of 7-10 mmol/L peak La accumulation during aerobic sport participation. There has also been some research done on quick, maximal output efforts, in which the average peak La accumulation is 10 mmol/L for efforts under 20 seconds. **PURPOSE:** Little research has been done on the 30 second and 90 second range, so the purpose of this study was to find the average La accumulation in an uneven bar routine and floor exercise routine in NCAA Division 1 female college athletes. **METHODS:** Ten female Division 1 collegiate gymnasts participated: nine performing uneven parallel bar routines and five performing floor exercise routines. Participants warmed up as they would in a competition to get more practical results. Blood samples were taken pre- and post-routine and assayed immediately using a blood La analyzer. A t-test was used to compare post routine La accumulations. Alpha level was set at 0.01. **RESULTS:** The results for a floor routine indicate a peak average pre-La level of 9.84 mmol/L (SD=3.95; Range=7.4-14.3 mmol/L) and an increase in La from pre-routine (and after the warm-up) to post routine (+6.34 mmol/L) in all participants. The results for the uneven bar routine were less consistent. The average peak La following the uneven bars routine was 4.6 mmol/L (SD=2.2; Range=2.9-9.6 mmol/L), which was only slightly higher than the average following the warm-up and pre-routine at 4.5 mmol/L (1.3-11.7 mmol/L). Average change in LA pre to post was 0.1 mmol/L. Post routine La levels differed significantly. **CONCLUSIONS:** The wide range of results may have been more centralized with a larger sample size. Pre-routine blood samples were taken after warm-up so that the results would most closely reflect La responses during a practice or competition. The results indicate that the time required for a floor routine plays a significant role in the greater La accumulation as compared to the shorter uneven bars routine.

#### ASSOCIATIONS BETWEEN BMI AND ANTHROPOMETRIC-FOCUSED FORMULAS FOR CLASSIFYING SARCOPENIA

T. Lake, J. Suttle, S. Tomlinson, and M. Powers. Department of Kinesiology and Health Studies, University of Central Oklahoma, Edmond, OK; email: [tlake@uco.edu](mailto:tlake@uco.edu)

Skeletal muscle mass below a critical threshold (sarcopenia) may be indicative of functional impairment and physical disability. Proposed indicators of sarcopenia include, but are not limited to; appendicular skeletal muscle mass/height<sup>2</sup> (ASI;  $\leq 5.45 \text{ kg/h}^2$ ), the ratio of appendicular lean mass to appendicular fat mass (ALAF), and appendicular skeletal muscle mass/body mass (ASMBM). Research shows that anthropometric measures are limited in classifying sarcopenia. This is primarily due to the broadness of total body weight assessment in body mass index (BMI;  $\text{kg/m}^2$ ), lack of accountability of fat in ASI, and lack of relativity (height) in ALAF and ASMBM. **PURPOSE:** The purpose of this study was to examine the relationships between BMI and indicators of sarcopenia. **METHODS:** Thirty-one senior women ( $M = 80.34 \pm 6.24$  years) completed dual energy x-ray absorptiometry (DXA) scans, and anthropometric measures using a stadiometer and scale, prior to a six-month exercise intervention. Results were analyzed using Pearson's product moment correlation coefficients. **RESULTS:** BMI was positively associated with ASI ( $r = .900, p = .00$ ), but negatively associated with ALAF ( $r = -.712, p = .00$ ) and ASMBM ( $r = -.624, p = .00$ ). Interestingly, as BMI increased so did skeletal muscle mass when accounted for by height (ASI). However, BMI increased as skeletal muscle mass decreased when skeletal muscle mass was accounted for by fat (ALAF) and body mass (ASMBM). **CONCLUSION:** The relationships observed between BMI and the anthropometric-focused formulas further contribute to the call for deriving a consensus definition of sarcopenia. Researchers and practitioners should take precaution in basing assumptions of sarcopenia on single anthropometric measures. The relationship between indicators of sarcopenia and physical functioning is multifactorial and complex, thus, confounding variables (ie. fat, height, body mass, and activity status) should be considered. Future studies should emulate the research in question by incorporating a larger sample size, a more diverse group of adults (males and females over 75 years of age), and functional measures of fitness and power.

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37.

INTERVAL VERSUS STEADY-STATE EXERCISE: WHICH EXPENDS MORE ENERGY?

R.L. Lamont, R.B. Weir, and J.A. Collins

email: [rl188750@ucmo.edu](mailto:rl188750@ucmo.edu)

Exercising at alternating intensities can be physiologically beneficial in many different ways. Whether it is advantageous for total energy expenditure has been the subject of much speculation. **Purpose:** The purpose of this study was to compare energy expenditure between a steady-state and an alternating intensity bout of exercise using approximately equal ratings of perceived exertion (Borg RPE scale). **Methods:** Seven individuals of varied fitness levels, ranging in age from 18 to 54, (body mass index =  $23 \pm 2.71$ ) successfully completed two repeated measure trials. Each trial consisted of a 20-minute treadmill run of self-selected speed. Each subject was instructed to equate their steady-state protocol speed to 13 RPE. The lower and upper limit of the alternating intensity protocol was instructed to equate to 11 RPE and 15 RPE respectively. Both trials included a three minute warm up and cool down, for a total exercise time of 26 minutes. **Results:** The average calorie expenditure for steady-state exercise and alternating intensities was  $252 \pm 58.11$  kcal and  $246 \pm 52.09$  kcal respectively: According to paired t-test calculation of 0.12, the mean difference is of no statistical significance. **Conclusion:** This data suggests

STATINS ALTER METABOLIC ADAPTATIONS TO EXERCISE TRAINING IN PATIENTS WITH THE METABOLIC SYNDROME: PRELIMINARY FINDINGS

JL Libla<sup>1</sup>, CR Mikus<sup>1</sup>, SJ Borengasser<sup>1</sup>, SP Naples<sup>1</sup>, MJ Ruebel<sup>1</sup>, PJ Fadel<sup>2</sup>, NM Szary<sup>2</sup>, TR Thomas<sup>1</sup>, MH Laughlin<sup>3</sup>, JP Thyfault<sup>1,2,4</sup>

<sup>1</sup>Departments of Exercise Physiology, <sup>2</sup>Internal Medicine, <sup>3</sup>Biomedical Sciences, and <sup>4</sup>Harry S. Truman Memorial VA Hospital, University of Missouri, Columbia, MO; email: [thyfaultj@missouri.edu](mailto:thyfaultj@missouri.edu)

Over 47 million Americans possess the metabolic syndrome (MSynd). Many are prescribed statins (St) and encouraged to exercise for cardiovascular disease prevention; however, there is a paucity of data examining the benefits and downfalls of combined therapy. Emerging evidence shows that some classes of St are not well tolerated in active individuals, may impair skeletal muscle mitochondrial function, and are associated with increased risk of developing type 2 diabetes (T2D). Given the widespread use of St, it is clinically relevant to understand the combined effects of St-therapy and exercise training. **PURPOSE:** The purpose of this study was to determine whether St alter metabolic adaptations to aerobic exercise training.

**METHODS:** Fifteen overweight/obese, sedentary individuals with  $\geq 2$  MSynd risk factors were randomized to 1 of 2 groups: 1) St-therapy plus exercise (St+Ex; 40mg/d simvastatin plus treadmill walking 45min/d, 5d/wk at 65% VO<sub>2</sub>max), or 2) Exercise only (Ex) for 12 wks. **RESULTS:** The St+Ex (n=10) and Ex (n=5) groups were well-matched for age and body mass index (BMI). Ex produced significant declines in fasting insulin, whereas combined St and Ex therapy did not affect fasting glucose or insulin levels.

Further, Ex resulted in significantly greater gains in maximal oxygen consumption (VO<sub>2</sub>max).

**CONCLUSIONS:** Preliminary findings suggest St may alter beneficial adaptations to exercise training, such as fitness and fasting insulin. Fitness and fasting insulin are particularly important in MSynd patients because these individuals are at a much greater risk for T2D and cardiovascular disease. The underlying cause for these effects is unclear, but may be linked to the negative effects of St-therapy on mitochondrial function. Further, given that fitness is the single best predictor of mortality, further investigation utilizing a larger study population is warranted to definitively determine the scope of effects that St-therapy may have on cardio respiratory fitness.

Table 1. Participant Characteristics

	St +Ex			Ex		
	PRE	POST	CHANGE	PRE	POST	CHANGE
Age (yrs)	41±2.5			40±4.7		
BMI	33.6±1.6	33.9±1.8	0.3	30.3±1.0	29.7±1.0	-0.6
Weight (kg)	98.2±7.0	99.2±7.7	1.0	84.7±4.0	83.3±4.4	-1.5
VO <sub>2</sub> max (mL/kg/min)	25.7±1.4	26.0±1.3	0.5	33.8±2.6	36.3±3.4	3.1†
Glucose (mg/dL)	94.4±3.2	90.7±3.4	-3.7	83.7±3.6	85.5±3.8	1.7
Insulin (pmol/L)	60.5±6.8	68.8±8.3	8.3	68.1±16.3	51.9±12.7*	-16.2†

Data were reported as means ± SE. \* P < 0.05 within group. † P < 0.05 between groups.

exercising at alternating intensities does not offer an energy expenditure advantage over steady-state exercise.

**Key Words:** Energy expenditure, alternating intensity, steady-state, exercise.

39.

AN INVESTIGATION OF PHYSICAL AND PSYCHOLOGICAL EFFECTS OF MUSIC ON RUNNING

B.W. Lundy, A.D. Dixon, D.R. Wright, K.A. Jackson, & S. Burns. Department of Kinesiology,  
University of Central Missouri, Warrensburg, MO;

Email: [blundy@kc.rr.com](mailto:blundy@kc.rr.com)

Understanding how music benefits exercise is currently a popular topic even though many of the people do not understand what music or how music affects their own exercise individually. If someone knows that music can help motivate them, they may be more inclined to use music to increase the benefits of exercise. **PURPOSE:** By testing classical, rock, and electronic genres of music against each other and no music, we compared the effects of each to possibly find if one is more beneficial, hinders performance, or if there is no difference between them. **METHODS:** The selection criterion to participate was that subjects were active 18 to 30 years old (9 males and 3 females) and enrolled in classes at the University of Central Missouri. Data collected included the distance reached by participants during each ten minute treadmill exercise session and subjects also separately rated on scales of one to ten, their motivation and perceived difficulty after each run. As one being the lowest and ten being the greatest of each respectively. **RESULTS:** When looking at the mean distances, motivation, and perceived difficulty of the different genres, rock was the best motivator  $8.17 \pm 1.53$ , compared to no music  $6.58 \pm 2.02$ , Classical  $7.00 \pm 1.41$ , and electronic  $7.67 \pm 1.92$  (mean  $\pm$  standard deviation). Rock genre elevated the subjects' performances the most  $1.75 \text{ km} \pm .31 \text{ km}$  than no music  $1.67 \text{ km} \pm .37 \text{ km}$ , classical  $1.64 \text{ km} \pm .34 \text{ km}$ , and electronic  $1.66 \text{ km} \pm .34 \text{ km}$ . Also, the subjects' favorite genre (scale of 1-10) had a substantial increase in perceived difficulty  $6.5 \pm 2.28$  when compared to the least favorite genre  $7.75 \pm 1.96$ . **CONCLUSION:** The data supports the hypothesis that rock is the most effective single genre for increasing intensity with the other genres having no significant differences between their mean distances ( $\pm 0.03$  miles). Finally, if a person was looking for a genre of music to motivate them or reduce how difficult they perceived a run, that person should choose their favorite genre from what our results showed.

**ECCENTRIC VERSUS CONCENTRIC MUSCLE CONTRACTIONS AND DOMS IN MALE MILITARY PERSONNEL**

A. L. McNew, C. D. Stephens, K. R. Grayson, S. Burns, Whiteman Air Force Base, and  
Department of Kinesiology, University of Central Missouri, Warrensburg, MO;  
email: [alm17320@ucmo.edu](mailto:alm17320@ucmo.edu)

Eccentric contractions are believed to be the primary cause of DOMS rather than concentric contractions because of increased microscopic tears in the sarcomere and muscle filaments. The tearing is increased due to the amount of stress placed upon the globular heads and the muscle resisting the force of gravity.

**PURPOSE:** The purpose of this study is to compare eccentric (EC) and concentric (CC) contractions and indicate which causes more muscle soreness. **METHODS:** After signing IRB approved informed consent, four male military personnel, ages 18-25, performed a five day contraction sequence. On the first day, to induce DOMS, 3 sets of 8 reps at 70% of 1 RM, 3 sets of 6 reps at 80% of 1RM, and 3 sets of 4 reps at 85% of 1RM of bicep curls were performed. Participants performed eccentric contractions on their right arm and concentric contractions on their left arm by performing a circular rotation from left to right. In each of the subsequent four days participants rated their pain on a scale of 0-100, 0 being no pain, and 100 being the worst pain imagined, at or around the same time of day on the pain scale after performing 5 full ROM contractions at 20% of their 1RM. **RESULTS:** The findings of our research indicated that eccentric contractions caused more soreness than concentric contractions. This was determined by finding the average ( $\bar{x}$ ) and standard deviation ( $\sigma$ ) of the pain level within the four days after the first bout of exercise in the left (CC:  $\bar{x}$ =21.4375,  $\sigma$ =24.84074) and right (EC:  $\bar{x}$ =22.0625,  $\sigma$ =29.6029) arms and comparing the results. **CONCLUSION:** Based on our data, our results supported our hypothesis. We conclude that eccentric contractions produced more muscle soreness in male military personnel.



41.

**FIREFIGHTER'S CORONARY CALCIUM AS DETERMINED BY ELECTRON BEAM  
COMPUTED TOMOGRAPHY**

M.A. Michaelides, K.M. Parpa, L.J. Henry, and B. Thompson. Department of Health Science, Kinesiology, Recreation and Dance, University of Arkansas, Fayetteville, AR; email: mmichae@uark.edu (Sponsor: B.S. Brown, FACSM).

Firefighters have an unusually high risk of suffering a cardiovascular disease (CVD) event, due to the intense physical characteristics of their job. Coronary artery calcium scores (CACs) have been shown to be predictive of future cardiovascular events, both independently of and incrementally to conventional cardiovascular risk factors.

**PURPOSE:** The purpose of this project was to identify coronary atherosclerosis in asymptomatic, incumbent firefighters, as assessed by coronary artery calcium (CAC score. **METHODS:** Seventy three male firefighters participated in the study. Each firefighter lay comfortably in a CT scanner for approximately 10 minutes. The CT scanner, in coordination with the ECG, generated a series of pictures of the moving heart. The CT scanner's application selected the images that were least affected by the movement of the heart, and thus had the least blurring of the pictures. The amount of calcium in the arteries (CAC) was expressed as an Agatston Score which is based on the area and the density of the calcified plaques. **RESULTS:** The results revealed two firefighters with identifiable CAC. The first firefighter had an Agatston score of 4 at his left anterior descending coronary artery, which is considered minimal identifiable plaque, and he was ranked at the 50th percentile for his age and gender. The second firefighter had an Agatston score of 178 on his right coronary artery and an Agatston score of 106 on his circumflex coronary artery. Both scores suggest the presence of atherosclerotic plaque, which is indicative of mild coronary artery disease with significant narrowing. The total Agatston score for the second firefighter was 284, which is equivalent to a calcium volume of 238 mm<sup>3</sup>. This firefighter ranked between the 90-100th percentile for his age and gender, and he was referred to a cardiologist for further evaluation. **CONCLUSION:** The absence of calcification does not guarantee that a firefighter is safe from having a CVD event, as blockage of a coronary artery can occur from soft plaque that cannot be detected with the CT scanner. There is evidence to suggest that absence of CAC, as assessed by cardiac CT scan, is associated with a low adverse event risk; therefore, CAC score could be used as a tool to screen and counsel firefighters about their risk of such events. The heart CT scan is simple, non-invasive, relatively inexpensive, and exposes the patient to small amount of ionizing radiation (0.7 to 3 mSv). Despite the small percentage of firefighters identified with CAC, the results of this study suggest that the procedure shows promise in high risk, asymptomatic populations as a tool for the prevention and management of cardiovascular disease.

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THE EFFECTS OF OVAIRECTOMY ON CARDIAC FUNCTION IN THE FEMALE MICE WITH LCAD ENZYME DEFICIENCY.

K.C. Miller, M.D. Nash, G. S.Han, and C. Riggs, FACSM, Human Performance Laboratory, University of Arkansas, Fayetteville, AR;

LCAD deficiency, long-chain acylCoa dehydrogenase deficiency, is a specific type of fatty acid metabolism disorder. Based on previous research done in the University of Arkansas Human Performance laboratory, there is strong belief that gender plays a major role on the effect beta oxidation disorders have on mice. In previous research, female LCAD deficient mice have similar exercise abilities as mice with no deficiency. **Purpose:** To observe the effects of ovariectomy and prolonged moderate intensity exercise on cardiac dimensions and function in both LCAD deficient and non-deficient mice. This will help broaden the understanding of the disorder and how it relates to exercise and gender. Specifically, the objective was to study the cardiac dimensions and function of exercise trained and untrained ovariectomized and non-ovariectomized LCAD deficient female mice. **Research Methods and Procedures:** Normal female mice (n=20) 129 SvJ/C57BL6 mice (LCAD +/+) and female (n=20) 129 Sv/C57BL6 knockout mice homozygous for LCAD -/- were used for these experiments. The forty mice were divided into eight groups of five, each group encompassing a different aspect of the study: enzyme deficient/non-deficient, exercise trained/non-trained, and ovariectomized/non-ovariectomized. Four groups had the ovaries surgically removed and were allowed time to recover before experimentation. The four exercise trained groups were run on a treadmill five days per week for eight weeks. Before collection of data, these trained groups also underwent a single bout of exhaustive exercise. Twenty-four hours after exercise, the mice were anesthetized using sodium pentobarbital (60 mg/kg body weight, ip). After exhaustion the mice underwent echocardiography to determine the effect of training on cardiac dimensions and function. **Results:** In both the trained and untrained experimental groups mean fractional shortening, ejection fraction, stroke volume, and cardiac output were significantly different ( $p < 0.05$ ) from control mice. The trained mice showed a significant difference ( $p < 0.05$ ) in ejection fraction, heart rate, and stroke volume. LCAD deficient mice show a significant decrease in cardiac function. **Conclusions:** There were no significant differences between the state of the mice (ovariectomy and nonovariectomy). As hypothesized LCAD deficient mice have lower cardiac function, but the role of estradiol should be further researched to determine its exact effect. Further research should be conducted to more fully understand the effects of exercise training and the reason for female advantages in LCAD deficient mice.

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**PHYSIOLOGICAL MEASURES IN RESPONSE TO PAIN RATINGS FROM SENSORY STIMULI**

S.K. Mobley<sup>1</sup>, P.S. Hinton<sup>1</sup>, E.A. Dannecker<sup>2</sup>. <sup>1</sup> Department of Nutrition and Exercise Physiology, University of Missouri, Columbia, MO; <sup>2</sup> Department of Physical Therapy, University of Missouri, Columbia, MO; email: skm8r3@mail.missouri.edu

Cardiovascular disease is one of the main causes of death in the United States. An interaction between the cardiovascular and pain regulatory systems has been recognized. High blood pressure and a family history of hypertension have predicted lower pain responses to laboratory stimuli, but few investigations have examined such associations with exercise-induced muscle pain. **PURPOSE:** The purpose of this study was to examine the relationships between resting blood pressure and heart rate and ratings of pain and unpleasantness induced by muscle contractions. **METHODS:** Thirty-two healthy, untrained individuals (age 18-40 y) participated in this cross-sectional study. Resting blood pressure (BP) and heart rate (HR) were measured twice after the completion of background questionnaires. Then four muscle-contraction trials of the non-dominant elbow flexors, two of which were tonic and two of which were phasic, were performed at 45° of flexion in a random order, during which either pain or unpleasantness was rated. Correlations between BP or HR and pain or unpleasantness ratings were evaluated using Pearson correlations. Also, subjects were categorized into either a normal (systolic BP=90-140, diastolic BP=60-90, HR=60-80) or abnormal cardiovascular group (any value outside the normal range) to conduct one-way ANOVAs with pain and unpleasantness as the dependent variables. **RESULTS:** A statistically significant positive correlation was observed between diastolic BP and tonic pain ( $r=0.046$ ). Mean comparisons showed a significant relationship between HR and phasic pain ( $\eta^2=0.068$ ), demonstrating that phasic pain was significantly greater in subjects with abnormal HR compared to those in the normal HR group. **CONCLUSION:** This study did not demonstrate a noteworthy relationship between BP and HR and ratings of pain induced by muscle contractions in healthy, untrained adults. However, this may be because the muscle contraction stimulus used was not painful enough to elicit the results seen in previous studies.

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44.

THE EFFECTS OF TART CHERRY JUICE ON EXERCISE INDUCED  
MARKERS OF INFLAMMATION

N. Moodie, P. Vardiman, G. Wallace, R. Bird, and P. Gallagher.  
Applied Physiology Laboratory, University of Kansas.  
email: [pvardim@ku.edu](mailto:pvardim@ku.edu)

There are a number of prescription, over the counter and natural supplements that are used to help resolve inflammation associated with participation in high intensity athletic activity and sport training. **Purpose:** The purpose of this investigation was to evaluate the effects of tart cherry juice on inflammation and the expression of IL-1 $\alpha$ , IL-1  $\beta$ , IL-2, IL-4, IL-6, IL-8, IL-10, INF- $\gamma$ , TNF- $\alpha$ , and TNK-  $\alpha$ . **Methods:** Eight female subjects were randomly selected for the tart cherry juice (TCJ) and 6 for the placebo (CON) using a double blind design. Groups consumed either 8 ounces of TCJ or like packaged CON drink throughout the four weeks of sport training. Each of the subjects received three fasted blood draws (BD) from the antecubital vein at pre-treatment, after 2 weeks and after 4 weeks of sport training. Blood samples were then analyzed for any changes in IL-1 $\alpha$ , IL-1  $\beta$ , IL-2, IL-4, IL-6, IL-8, IL-10, INF- $\gamma$ , TNF- $\alpha$ , and TNK-  $\alpha$  using a multiplex Enzyme Linked Immunosorbant Assay (ELISA). **Results:** A repeated measures ANOVA showed there were no significant differences in the three time points for IL-1 $\alpha$ , IL-1  $\beta$ , IL-2, IL-4, IL-6, IL-8, IL-10, INF- $\gamma$ , TNF- $\alpha$ , and TNK-  $\alpha$  in the TCJ or CON groups. **Conclusion:** These results suggest that tart cherry juice did not have an effect on inflammation with the athletes that were participating in this sport training protocol.

45.

PRIMARY HEPATOCYTES FROM RATS SELECTIVELY BRED FOR LOW AEROBIC CAPACITY DISPLAY REDUCED FATTY ACID OXIDATION

EM Morris<sup>1,2</sup>, GME Uptergrove<sup>1</sup>, LG Koch<sup>4</sup>, SL Britton<sup>4</sup>, JP Thyfault<sup>1,2,3</sup>, JA Ibdah<sup>1,2,3</sup>  
Depts. of Medicine-Div. of Gastroenterology and Hepatology<sup>1</sup>, Nutrition and Ex Physiology<sup>2</sup>, Univ of Missouri-Columbia, ;HSTMVA Hospital<sup>3</sup>; Dept. of Physical Medicine<sup>4</sup>, Univ. of Michigan  
email: [thyfaultj@missouri.edu](mailto:thyfaultj@missouri.edu)

The low capacity runner/high capacity runner (LCR/HCR) rat model was developed to determine if intrinsically high or low aerobic capacities provide protection or susceptibility to chronic metabolic disease(s), such as non-alcoholic fatty liver disease (NAFLD). We have observed that the LCR rats display hepatic steatosis that is associated with reduced hepatic mitochondrial-content and fatty acid oxidation (FAO) compared to HCR (Thyfault (2009) *J Physiol*). Furthermore, the LCR rats have reduced insulin signaling in the liver (Haram (2009) *Cardiovasc Res*), in addition to peripheral insulin resistance and increased visceral adiposity (Noland (2007) *Am J Physiol Endocrinol Metab*), systemic factors linked to NAFLD development. **PURPOSE/METHODS:** In order to isolate and study the influence of aerobic capacity on hepatic metabolism independent of peripheral factors, we examined the metabolic actions of primary hepatocytes from the HCR/LCR rats. **RESULTS:** Primary hepatocytes from LCR rats have 50% lower FAO to CO<sub>2</sub> than HCR, which is further diminished by overnight lipid incubation (250 μM oleate: 250 μM palmitate). Also, the LCR primary hepatocytes display elevated basal triacylglycerol (TAG) synthesis rates and unlike the HCR hepatocytes, they do not increase TAG synthesis rates following overnight lipid exposure. Additionally, LCR hepatocytes demonstrate reduced insulin (100 nM) stimulated serine-<sup>473</sup> phosphorylation compared to HCR, which is further decreased following overnight lipid exposure. Future work will examine if the reduced FAO and impaired response to overnight lipid exposure in the LCR hepatocytes leads to the accumulation of lipid species (ceramides and diacylglycerol) linked to impaired insulin signaling. **CONCLUSION:** Isolated primary hepatocytes from the LCR rats retain a phenotype of reduced FAO, insulin resistance, and metabolic inflexibility in response to lipid exposure demonstrating that selective breeding for low aerobic capacity leads to impaired metabolic function in the liver that is independent of systemic factors. These data demonstrate that the HCR/LCR primary hepatocyte model provides a novel, polygenic *in vitro* model to study the links between aerobic capacity, hepatic mitochondrial dysfunction, insulin sensitivity, and NAFLD.

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THE EFFECTS OF TWO DIFFERENT ARM POSITIONS ON MAXIMUM KNEE FLEXION IN THE BODYWEIGHT SQUAT

J.M. Olson, A.P. Glave, J.A. Stafford and R. Di Brezzo. Human Performance Lab, University of Arkansas, Fayetteville, AR; email: [jmolson@uark.edu](mailto:jmolson@uark.edu).

The squat is a common part of many exercise programs and is generally accepted as being relatively safe and easy to perform. The squat may be performed with or without external loads and may be performed anywhere. Despite the popularity of the exercise, there are many aspects of the movement that have not yet been explored. **PURPOSE:** The purpose of this study was to examine the effects of two different arm positions on maximal knee flexion in the bodyweight squat. **METHODS:** Subjects were 28 college-aged females, 17 normal weight (BMI < 25, age  $20.94 \pm 1.39$ ) 11 overweight (BMI >25, age  $20.73 \pm 1.27$ ). Mean height for subjects was  $1.67 \pm .06$  m. The subjects were familiarized with proper squat technique before testing. Reflective markers were placed at the approximate center of rotation at the shoulder, hip, knee, base of fifth toe, and heel joints. All data were collected on the right side of the subjects. Two squat techniques were tested: arms held at sides with elbows flexed to  $90^\circ$  and arms held with shoulders flexed to  $90^\circ$  and elbows fully extended. One trial in each arm position was conducted, starting with the elbows flexed. Data were captured using a camcorder and motion analysis software. Data were analyzed using a repeated measures analysis of variances, one within-subject factor and one between-subject factor. **RESULTS:** Mean knee flexion was found to be significantly different depending on the arm position (elbows at  $90^\circ$ ;  $80.81 \pm 15.17$  degrees; shoulders at  $90^\circ$ ;  $86.31 \pm 15.21$  degrees). The within-subjects effects for this relationship was ( $F_{1,26} = 9.56, p < .01$ ). There was also a significant between-subjects effect for weight status ( $F_{1,26} = 5.78, p = .02$ ). Mean knee flexion was found to be significantly different depending on weight status (NW,  $88.47^\circ \pm 13.04$ ; OW,  $75.97^\circ \pm 15.71, p = .02$ ). **CONCLUSION:** Varying arm position and current weight status significantly affected range of motion during the bodyweight squat. These results support previous research indicating variations in squat technique significantly affect squat mechanics.

Supported by the University of Arkansas Human Performance Lab.

47.

THE INFLUENCE OF PHYSICAL EXERTION ON RAPID DECISION MAKING IN  
ATHLETES VERSUS NON ATHLETES

R.S Orf, K.W. Wickenhauser, J.C. Warncke. Department of Biology, Westminster College,  
Fulton, Missouri;  
Email: [orfirs@westminster-mo.edu](mailto:orfirs@westminster-mo.edu)

This experiment was performed in order to test the effects of physical exertion on rapid decision making in athletes and non-athletes. **PURPOSE:** The purpose of this study was to determine if athletes produced better reaction times under conditions involving physical exertion, than non-athletes. **METHODS:** Twenty subjects were involved in this experiment (ten athletes and ten non-athletes, with each gender equally represented). Subjects strapped on a wireless heart rate belt and watch were asked to mount the *Ergomedic 828E* in order to administer the test and monitor specific heart rate intervals. A keyboard was attached to the *Ergomedic 828E* and a computer screen was set up directly in front of it. Using *My Brain Trainer* subjects took choice reaction time tests involving choosing either a red or green light on a stop light. If there was a red light the subject pressed the left arrow key on the keyboard and if there was a green light the subject pressed the right arrow key, thus a choice. The test was administered six times to each subject at heart rate intervals of rest, 90 bpm, 110 bpm, 130 bpm, 150 bpm, and 170 bpm. Varying pedaling frequency and/or resistance was used in order to increase heart rates to desired levels. The experiment was twofold: 1) to keep the participant at the desired heart rate for an extended period of time so their body could fully become accustomed to its current state and 2) to familiarize the participant with the desired pace so he or she could easily continue it during a reaction time test subconsciously. **RESULTS:** Statistical data show that as physical exertion increased (heart rate intervals) athletes reaction times became faster as non-athletes reaction times became slower. A trend line was added to each set of data. The trend line for athletes' data more than doubled the slope than that of non-athletes (-2.0171 and -4.4229, respectively). **CONCLUSION:** These results indicate that athletes perform much better at high exertion levels than non-athletes.

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48.

LONG DISTANCERUNNERS VS TRACK SPRINTERS ON REACHING MAXIMUM HEART RATE

J. Palmer, A. Wiesner, C. Cumberland, L. Bainbridge and S. Burns. University of Central Missouri, Warrensburg, MO; email: [jap77790@ucmo.edu](mailto:jap77790@ucmo.edu)

Reaching your maximum heart rate for athletes who participate in track and field is a key factor in training. The time it takes to reach your maximum heart rate can influence the way these athletes train. **PURPOSE:** The primary purpose of this study was to determine time to maximum heart rate in sprinters and distance runners. **METHODS:** Participants included 5 distance runners and 5 sprinters between the ages of 18-25, who were all members of the University of Central Missouri Track and Field team. Maximum heart rate was determined by watching for a plateau in the athlete's heart rate while performing a maximum running test on a treadmill. All athletes wore a Polar Heart Rate monitor and used the same treadmills. The treadmill speed was increased after a 3 minute warm-up at 5.0 mph to 7.0 mph. Subsequently every 2 minutes speed was increased 1.0 mph until they reached the maximum heart rate. **RESULTS:** Sprinters reached maximum heart rate in  $9.38 \pm 2.19$  minutes and distance runners  $13.20 \pm 0.73$  minutes. In the speed of the treadmill the sprinters had the lower speed of  $9.4 \pm 1.14$  mph and the distance runners' speed of  $11.6 \pm 0.55$  mph. This indicates the sprinters reached their maximum heart rate by a margin of 3.82 minutes with a difference of 2.2 mph. **CONCLUSION:** These results suggest that sprinters can reach their maximum heart rate in a shorter amount of time than distance runners along with being at a lower speed.



49.

#### CURRENT CARDIO RESPIRATORY FITNESS LEVELS IN COLLEGE MALES

C. M. Pollner, K.L. Everett, D.B. Smith, E.D. Ryan, B.J. Thompson, R.E. Fiddler  
Applied Musculoskeletal & Human Physiology Research Laboratory,  
Oklahoma State University, Stillwater;  
Email: [christie.pollner@okstate.edu](mailto:christie.pollner@okstate.edu) (Sponsor: B.H. Jacobson, FACSM)

Submaximal exercise tests are commonly employed to provide a reasonable estimate of cardiovascular endurance. A common cardiovascular endurance test is the timed 2 mile run which is included in the Army Physical Fitness Test (APFT) **PURPOSE:** The purpose of the present study was to provide a current description of cardiovascular endurance values in a sample of recreationally active college-aged males. **METHODS:** Twenty four males (age =  $22.9 \pm 2.5$  years; stature =  $179.8 \pm 6.4$  cm; mass =  $84.1 \pm 20.8$  kg) participated in this study. Each participant completed a 2 mile time run in which they were encouraged to finish the 2 mile run as fast as possible. During the 2 mile run subjects wore a TIMEX heart rate monitor that was used to estimate heart rate (HR) before, during, and after the 2 mile run in beats per minute (BPM). Time of the 2 mile run was recorded at mile 1 and again at the end of the 2 miles. **RESULTS:** The results of the current study for resting HR, 1 mile HR, and post-exercise HR are  $80.4 \pm 13.1$ ,  $180.6 \pm 10.3$ , and  $142.8 \pm 12.0$  BPM, respectively. The times for mile 1 and mile 2 are  $8:56 \pm 1:47$  minutes and  $17:49 \pm 3:39$  minutes, respectively. **CONCLUSION:** The results from the current study suggest this sample of recreationally active college-aged males would score on average 32-34 out of 100. Thus, this group of males may be considered to have below average cardiovascular fitness when compared to the standards listed by United States Army for the 2 mile run time.

ACUTE EFFECTS OF A SINGLE-BOUT OF RESISTANCE-TRAINING OR PLYOMETRICS ON MARKERS OF BONE TURNOVER

R.S. Rogers<sup>1</sup>, M.O. Widzer<sup>2</sup>, A. Dawson<sup>1</sup>, Z. Wang<sup>4</sup>, J.P. Thyfault<sup>1,3,5</sup>, P.S. Hinton<sup>1</sup>

<sup>1</sup>Departments of Nutrition and Exercise Physiology, <sup>2</sup>Biomedical Sciences, <sup>3</sup>Internal Medicine, <sup>4</sup>Educational, School, and Counseling Psychology, University of Missouri, Columbia, Missouri 65211

<sup>5</sup>Harry S Truman Memorial Veteran's Hospital, Columbia, Missouri 65211  
email: [rsr9b0@mail.missouri.edu](mailto:rsr9b0@mail.missouri.edu)

Weight-bearing exercise positively affects bone mineral density (BMD) and bone strength, presumably by altering the balance between bone formation and resorption. **PURPOSE:** The objective of the study was two-fold: 1) to determine the acute response of serum markers of bone turnover and hormones to a single bout of resistance-training (RT) or plyometrics (PLY); and, 2) to compare the effects of fasting versus feeding on the hormonal and bone turnover responses to RT or PLY. **METHODS:** Eleven recreationally active males, aged 24-63 years, participated in this randomized cross-over study, which included four trials: PLY (fed/fasted) and RT (fed/fasted). Subjects completed exercise trials between 06:00 and 11:00 am. Subjects underwent a 10-hr overnight fast or were fed a liquid meal replacement containing 500 kcal, 12 g fat, 80 g carbohydrate, 9 g protein, 500 mg calcium, and 240 IU vitamin D was ingested two hours prior to exercise. RT consisted of three sets of ten repetitions of eight exercises performed at 60% (first set) and 80% (second and third sets) of one-repetition (1-RM) or ten-repetition maximum (10-RM). PLY consisted of 10 repetitions of 12 different jumps. Blood was drawn immediately prior to exercise (PRE), immediately following exercise, and 15, 30, 60, and 120 min, and 24 hr following exercise. Total testosterone (T), intact parathyroid hormone (iPTH), and cortisol (COR) concentrations in serum were determined using chemiluminescent immunoassay. Serum bone-specific alkaline phosphatase (BAP) (bone formation marker) and tartrate resistant alkaline phosphatase, isoform 5b (TRAP5b) (bone resorption marker) were measured using ELISA. One-factor (time), repeated measures ANOVA was used to detect changes in dependent variables over time; post hoc pairwise comparisons (LSD) were performed when appropriate. **RESULTS:** Following RT, a decrease in TRAP5b, COR, and iPTH concentration was observed during the 2 h post-ex compared with PRE (main effect for time  $p < 0.05$ ), while after PLY, TRAP5b, COR, iPTH, and T declined (main effect for time  $p < 0.05$ ); bone turnover markers and hormones returned to pre-ex values 24 h post-ex. There was no effect of fasting versus feeding on the acute response of serum bone markers or hormones to either RT or PLY. **CONCLUSION:** A single-bout of resistance-training or plyometrics causes a transient decrease in both a bone resorption marker (TRAP5b) and hormones associated with increased resorption (cortisol and iPTH) in the twenty-four hours post-exercise. More research is needed to determine if acute changes in bone turnover markers and hormones following resistance-training or plyometrics predict long-term changes in BMD.

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MAXIMAL OXYGEN CONSUMPTION OF CHILDREN BORN AT EXTREMELY  
PREMATURITY: PRE VERSUS POST SURFACTANT ERA

R. Sabath, FACS<sup>M</sup>\*, K. Teson, M. Gelatt\*, C. Castor, and H. Kilbride\*. Children's Mercy  
Hospitals and Clinics and \*University of Missouri-Kansas City School of Medicine,  
Kansas City, Missouri  
email: [rsabath@cmh.edu](mailto:rsabath@cmh.edu)

**Purpose of Study:** To assess the aerobic exercise capacity of children who were born at extremely low birth weights (ELBW) and treated with surfactant compared to a cohort cared for in an earlier era without surfactant. **Methods:** Maximal treadmill testing was performed on 13 children, 12 to 15 years old, who had been born during 1993 -1995 with birth weight < 801 grams and treated with surfactant (S). Maximal oxygen consumption was measured using a ParvoMedics TrueOne 2400 Metabolic Cart. Findings were compared with those previously obtained on children of the same birth weight born during 1983-1989, before surfactant treatment (NS) was available (Kilbride et al, *J Pediatr* 2003;143:488). Group differences were determined by two-tailed *t* tests.

**Results:** There were no group differences in gender or race. The S cohort were tested at an older age (12.9 vs 11.3 years,  $P=.001$ ) and tended to be heavier and taller than the NS and a normal birth weight (NB) control group. Peak oxygen consumption was significantly greater for S children, compared to NS children. Peak oxygen consumption for the surfactant ELBW subjects was not statistically different from the (NB) comparison group from our prior study.

• Oxygen Consumption Data		
•	• Vo <sub>2</sub> (L/min)	• Vo <sub>2</sub> ml/kg/min
• Presurfactant(NS)	• 1.32+.43	• 31.2+6.3
• Postsurfactant (S)	• 1.81+.48	• 36.9+9.8
• Normal controls (NB)	• 1.65+.44	• 38.5+5.2
•	•	•
• <i>P</i> value (S vs NS)	• .0008	• .014
•	•	•
• <i>P</i> value (S vs NB)	• 0.31	• 0.51

**Conclusions:** These preliminary data suggest a significant improvement in aerobic capacity for more recently born ELBW subjects compared to those from the presurfactant era. ELBW subjects treated with surfactant appear to have improved aerobic capacities, comparable to normal controls.

Effects of Hand Position on Stationary Cycling Motor Performance during Graded Exercise Testing  
 S.R. Schreiner, W. K. Yuen, D. Hoover\*, S.A. Billinger, J.K. Loudon. Department of Physical  
 Therapy and Rehabilitation Science, University of Kansas Medical Center, Kansas City, KS;  
 \*Department of Physical Therapy Education, Rockhurst University, Kansas City, MO  
 Email: sschreiner@kumc.edu

In order to achieve peak performance cyclists must weigh the cost: benefit ratio of cycle positioning to achieve peak power and aerodynamic advantage. One way to achieve aerodynamic efficiency is through the use of aero bars, putting the cyclist in a more horizontal position and thus reducing his/her frontal drag area. However, these aerodynamic gains may result in reduced power and pedaling efficiency, as the aero position increases one's hip angle. These changes in muscle length may influence measures of cycling motor performance (CMP) through varying points in the pedal stroke. **Purpose:** This study assessed whether measures of CMP differs between two different riding positions. **Methods:** 14 male cyclists ( $30.4 \pm 7.41$  years;  $79.3 \pm 9.1$  kg;  $151.8 \pm 60.4$  miles/wk) participated in two peak exercise tests in random order. One graded max exercise test was completed in an upright position (hoods) with the other in the aerodynamic position (aero). Each subject rode his own bicycle, mounted to an electronically braked load generator. Conditions were standardized and controlled by computer, and 11 measures of CMP (Watts, SpinScan™, average torque angle (ATA) for 360° of pedal travel) were assessed by application software. For the aero test, a set of adjustable aerobars were placed on rider's bike using a standardized method. Paired t-tests were computed for all variables. **Results:** Non-significant differences were found between all 11 dependent variables for the hoods and aero positions, such as power ( $341.55 \pm 8.79$  vs.  $310.4 \pm 25.87$  Watts  $p=.346$ ), SpinScan™ ( $72.57 \pm 1.01$  vs.  $67.14 \pm 5.25$ ,  $p=.066$ ) or ATA ( $100.87 \pm 1.18$  vs.  $94.91 \pm 7.34$  deg,  $p=.451$ ). Post-hoc analysis showed that the variance was greater (3 to 11 fold) in the aero condition, and this difference in variance was itself statistically significant ( $t=3.93$ ,  $p=.003$ ). The effect size for this difference in variance is  $r=.78$ . **Discussion:** While there were no significant differences in mean values for all variables, there was a clear difference in the variance for all variables demonstrated between the two conditions. Our findings suggest that subjects may be less efficient in the aero position, potentially leading to early fatigue and an increase risk of cycling-related musculoskeletal injuries.

CHARACTERISTICS OF STEP-DEFINED PHYSICAL ACTIVITY CATEGORIES IN U.S. ADULTS

S.B. Sisson<sup>1,2</sup>, S.M. Camhi<sup>2</sup>, C. Tudor-Locke<sup>2</sup>, FACSM, W.D. Johnson<sup>2</sup>, P.T. Katzmarzyk<sup>2</sup>,  
<sup>1</sup> Department of Nutritional Sciences, University of Oklahoma Health Sciences Center, OKC,  
 OK 73126  
<sup>2</sup> Pennington Biomedical Research Center, Baton Rouge, LA 70808  
 Email: [susan-sisson@ouhsc.edu](mailto:susan-sisson@ouhsc.edu)

Understanding the correlates of step-defined physical activity (in pedometer equivalents) would be useful for public health initiatives, behavioral interventions and continued research targeting physical inactivity and sedentary behavior, which have been associated with a plethora of chronic disease risk factors. **PURPOSE:** The dual purposes are to 1) describe the BMI, demographic, household and behavioral characteristics of the U.S. adult population by pedometer-equivalent step-defined physical activity categories and 2) determine which characteristics predict the step-defined sedentary classification (<5000 steps/day). **METHODS:** 3744 adults (46.8% male; mean age  $\pm$  SE 47.1  $\pm$  0.7 years) wore accelerometers in the 2005-06 NHANES and met inclusion criteria. Accelerometer-determined steps/day were converted to pedometer equivalents by censoring those steps taken at <500 activity counts/minute. Means and frequencies (SE, 95%CI) were calculated for descriptive characteristics. Odds ratios (95%CI) from logistic regression were used to predict sedentary classification with continuous variables standardized to unit standard deviation. **RESULTS:** Percent of adults in step-defined categories were: 36.1% sedentary (<5000 steps/day); 47.6% low to somewhat active (5000-9999 steps/day); 16.3% active to highly active ( $\geq$ 10000 steps/day). Higher odds of sedentary classification were observed for advancing age (OR:1.94, CI:1.78, 2.13), higher BMI (OR:1.40, CI:1.23, 1.59), female sex (OR:1.78, CI:1.38, 2.28), African American vs. European American ethnicity (OR:1.31, CI:1.10, 1.57), household income vs.  $\geq$ \$45K (<\$25K OR:1.92, CI:1.36, 2.69; \$25-44K OR:1.44 CI:1.16, 1.79), and current vs. never smoker (OR:1.55, CI:1.24, 1.93). Lower odds of sedentary classification were found for usual daily occupational/domestic physical activity vs. mostly sitting (standing/walking OR:0.52, CI:0.38, 0.70; lifting/climbing 0.26, CI:0.17, 0.38; and heavy loads/labor OR:0.17, CI:0.10, 0.28). **CONCLUSION:** Over one-third of the U.S. was adults were classified as sedentary by pedometer-equivalent steps/day. Targeted intervention programs to decrease sedentary behavior should focus on at-risk populations (i.e., older, higher BMI, female, African American, low income, smokers, and those with primarily sitting occupations).

**THE IMPACT OF SOY DIETS ON ECTO-ATPASE ACTIVITY IN OBESE ZUCKER RATS**

A.J. Stone, K.W. Evanson, W.C. Gilbert, L. Devareddy, and H.A. Kluess. Department of Health Science, Kinesiology, Recreation, and Dance, and Department of Food Science, University of Arkansas, Fayetteville, AR.

email: ajstone@uark.edu (Sponsor: C. Riggs, FACSM)

**PURPOSE:** The purpose of this study was (1) to determine if vascular ecto-ATPase activity was affected by obesity and (2) to see if feeding soy diets with varying levels of isoflavones would have an effect on ATPase activity in obese rats. Since obesity is associated with high vascular resistance, we hypothesized that obese rats would have less ecto-ATPase activity (i.e. more ATP to cause vasoconstriction) compared to their lean controls. We also hypothesized that soy supplementation would increase the amount of ecto-ATPase activity, and that high levels of insulin would amplify the need for higher ATPase activity.

**METHODS:** Red gastrocnemius 1A arterioles from the hind limb of three month old, female Zucker rats were analyzed using a spectrophotometric phosphate assay to detect synaptic ecto-ATPase activity. Obese ( $538 \pm 7$ g) and lean ( $300 \pm 6$ g) control groups were used in the study. Three treatment groups of obese rats were fed either low (45mg), moderate (450mg), or high (900mg) levels of soy isoflavones per kg of total diet for 100 days. **RESULTS:** The results showed that the obese control had significantly higher ATPase activity than lean control ( $115 \pm 11$ pM of phosphate,  $n=8$ ;  $62 \pm 14$ pM,  $n=8$ ,  $p<0.05$ ). The low soy diet treatment group had significantly lower ATPase activity than the obese control ( $28 \pm 9$ pM of phosphate,  $n=7$ ,  $p<0.05$ ). The data showed that insulin levels with the low soy diet were significantly lower than obese controls ( $0.38 \pm 0.06$ μg/mL vs.  $1.37 \pm 0.19$ μg/mL,  $p<0.05$ ). Moderate and high soy diets did not have a significant effect on ecto-ATPase activity. However, insulin levels were significantly reduced by all three soy diets (low:  $0.38 \pm 0.01$ μg/mL; moderate:  $0.78 \pm 0.12$ μg/mL; high:  $0.82 \pm 0.18$ μg/mL,  $p<0.05$ ).

**CONCLUSIONS:** Although the results of the study are somewhat contrary to our hypotheses, it appears that there is some connection between ecto-ATPase activity and high sympathetic activity. A low soy diet appears to be more beneficial in reducing both insulin levels and ATPase activity in obese rats. Previous literature links purinergic receptors with insulin levels and the results from the current study support the idea that there is an interaction between insulin and ATP.

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#### HOUSEKEEPING GENE ANALYSIS IN SKELETAL MUSCLE FOLLOWING SEQUENTIAL BOUTS OF RESISTANCE EXERCISE IN YOUNG MEN

K.L. Sunderland, C.N. Poole, M.D. Roberts, V.J. Dalbo, and C.M. Kerksick.

Applied Biochemistry and Molecular Physiology Laboratory, Department of Health and Exercise Science, University of Oklahoma, Norman, OK.

Email: [Chad\\_Kerksick@ou.edu](mailto:Chad_Kerksick@ou.edu)

Studies examining gene expression in skeletal muscle typically use constitutively expressed housekeeping genes (HKGs) to normalize their mRNA data. **Purpose:** The purpose of the current study was to investigate the effect of three sequential bouts of resistance training on the HKGs  $\beta$ -actin, glyceraldehyde 3-phosphate dehydrogenase (GAPDH), cyclophilin (CYC), 28S, and  $\beta$ 2-microglobulin (B2M) in skeletal muscle of young males. **Methods:** Ten college-aged males (18-25y) volunteered for the current study. Subjects completed three resistance exercise bouts separated by 48 hrs consisting of 3 sets of 10 repetitions using the leg press, leg extension, and hack squat at 80% of 1RM. Muscle biopsies were taken 1 week prior to the first bout of exercise (T1), 48 hrs following the first (T2) and second bouts (T3), and 24 hrs following the third bout of exercise (T4). **Results:** Real-time RT-PCR was utilized to examine gene expression of the HKGs. A Wilcoxon signed ranks test revealed a significant increase in  $\beta$ -actin from baseline (1.75-fold;  $p < 0.05$ ) at T2 which returned to baseline at the T3 and T4 timepoints. GAPDH values increased at T3 (1.15-fold;  $p < 0.05$ ), but were not different at T2 or T4. No significant changes ( $p > 0.05$ ) from baseline were seen in 28S, B2M, or CYC for any time points. **Conclusions:** When acutely examining repeated bouts of resistance exercise in young men, CYC, B2M and 28S appeared to exhibit favorable housekeeping qualities.  $\beta$ -actin exhibited an early increase but returned to baseline values while GAPDH does not appear to be an appropriate HKG in these testing scenarios.

Comparison of Absolute and Relative Upper Body Peak Power in Division I College Football Players  
B.J. Thompson, D.B. Smith, E.D. Ryan, R.E. Fiddler, B.H. Jacobson, B. Long, A.J. Warren, M.S.  
O'Brien, R. Hildebrand, and M. Andrews. Applied Musculoskeletal & Human Physiology Research  
Laboratory,  
Oklahoma State University, Stillwater;  
Email: [dbsmith@okstate.edu](mailto:dbsmith@okstate.edu) (Sponsor: B.H. Jacobson, FACSM)

Peak power levels may be indicative of successful performance in collegiate football players. Given the different demands of each position in football, absolute and relative peak power may vary among these positions. **PURPOSE:** The purpose of the present study was to examine the relationship between bench press absolute and relative peak power among different positions in Division I collegiate football players. **METHODS:** Fourteen lineman (mean age =  $19.57 \pm 1.45$  yrs; mass =  $266.71 \pm 34.46$  kg) and 11 skill position (age =  $19.64 \pm 1.43$  yrs; mass =  $197.16 \pm 22.66$ ) players performed a multiple repetition bench press at 50% of their 1 repetition-maximum (1-RM). During each repetition, each participant was instructed to move the barbell as fast as possible during the concentric action of raising the bar from the chest to full arm extension. Peak power was measured using the Tendo Fitrodyne Weightlifting Analyzer (Tendo Sports Machines, Slovak Republic). The Tendo unit has a tether that attaches to the barbell which measured barbell velocity during the concentric phase of the lift. The load of the lift was entered into the Tendo unit which calculated peak power per repetition. Peak power was derived from the repetition that produced the highest power value. An independent samples t-test was used for the statistical analyses. An alpha of  $P \leq 0.05$  was used to determine statistical significance. **RESULTS:** Absolute peak power values were significantly greater ( $P = .02$ ) for lineman ( $889 \pm 160.9$  W) when compared to the skill ( $736.5 \pm 130.96$  W) position group. However, there were no differences between groups in relative peak power. In addition, the lineman were significantly heavier ( $P \leq .001$ ) when compared to the skill position players. **CONCLUSION:** These findings suggest that absolute bench press peak power values are greater in lineman when compared to skill position Division I collegiate football players. However, these differences no longer exist when normalized to body mass.



### SKELETAL MUSCLE MITOCHONDRIAL CONTENT AND FATTY ACID OXIDATION IN HYPERPHAGIC OLETF RATS

Grace M. Uptergrove, R. Scott Rector, Sarah J. Borengasser, Catherine R. Mikus, E. Matthew Morris, Scott P. Naples, Matthew J. Laye, M. Harold Laughlin, Frank W. Booth, Jamal A. Ibdah, and John P. Thyfault. Departments of Internal Medicine, Biomedical Sciences, and Nutrition and Exercise Physiology and Harry S. Truman Memorial Veterans Medical Center. University of Missouri, Columbia, MO  
email:thyfaultj@missouri.edu

**PURPOSE:** Here we examined changes in skeletal muscle mitochondrial content and fatty acid oxidative capacity through the transition from insulin resistance to type 2 diabetes in the obese, hyperphagic, sedentary Otsuka Long-Evans Tokushima Fatty (OLETF-SED) rat. These changes were compared to those in insulin sensitive lean, non-hyperphagic, sedentary Long-Evans Tokushima Otsuka (LETO-SED) rats and lean, hyperphagic, OLETF rats given access to voluntary running wheels (OLETF-EX). **METHODS:** Rats from each group (n=6-8) were sacrificed at 20 and 40 weeks of age, periods of time when the OLETF-SED rats transition from insulin resistance to frank type 2 diabetes. **RESULTS:** Body weight, adiposity and serum triglycerides and FFAs were significantly ( $p<0.01$ ) higher in the OLETF-SED rats compared with other groups. Glucose and insulin responses during a glucose tolerance test indicated insulin resistance at 20 weeks and overt diabetes at 40 weeks in the OLETF-SED rats. Glucose transport in the extensor digitorum longus muscle did not differ, but decreased significantly ( $p<0.05$ ) from 20 to 40 weeks in both sedentary groups; however, this reduction was prevented in the OLETF-EX rats. Complete (to  $\text{CO}_2$ ) and total ( $\text{CO}_2$  and acid soluble metabolites) mitochondrial fatty acid oxidation in the red gastrocnemius (RG) muscle were significantly higher in OLETF-SED compared with LETO-SED animals at 20 weeks; however, this elevated response to the hypercaloric environment was no longer present at 40 weeks of age. In addition, markers of mitochondrial gene expression and protein content in the RG, including PGC1 $\alpha$ , PPAR $\alpha$ , mtTFA, SIRT1, and cytochrome c, did not differ between OLETF-SED and LETO-SED groups. On the other hand, RG citrate synthase activity and complete fatty acid oxidation and the gene expression of several mitochondrial markers, including PGC1 $\alpha$ , PPAR $\alpha$ , mtTFA, and cytochrome c, were higher in the OLETF-EX rats. **CONCLUSIONS:** The observation that skeletal muscle of OLETF rats did not respond to the hyperphagic environment by increasing mitochondrial function and fatty acid oxidative capacity suggest that skeletal muscle mitochondrial dysfunction may contribute to disease progression in this model. However, voluntary wheel running enhanced skeletal muscle mitochondrial content and increased complete fatty acid oxidation in OLETF rats. These results suggest that in an environment of overnutrition, physical activity can prevent insulin resistance and type 2 diabetes perhaps through effects on skeletal muscle mitochondria.

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PULSED SHORT-WAVE DIATHERMY DOES NOT INFLUENCE SOLEUS MOTOR  
FUNCTION

B.P. Varilek\*, L.M. Girod\*, K.D. Moles\*, B.C. Long\*, D.O. Draper†. \*Department of Health and Human Performance, Oklahoma State University-Stillwater, OK; email: [blaine.long@okstate.edu](mailto:blaine.long@okstate.edu) (Sponsor: B.H. Jacobson FACSM)

It is suggested that pulsed short-wave diathermy (PSWD) causes a decrease in motoneuron pool recruitment. **PURPOSE:** The purpose of this study was to determine if PSWD influences involuntary motoneuron pool recruitment and voluntary plantarflexion peak torque of the soleus muscle immediately following or 30-minutes following a standard 20-minute treatment. **METHODS:** For this human subjects approved study, 45 healthy subjects (male:  $n = 22$ , age =  $22.45 \pm 2.58$  yrs, ht =  $179.76 \pm 4.89$  cm, mass =  $83.43 \pm 13.47$  kg; female:  $n = 23$ , age =  $20.43 \pm 1.24$  yrs, ht =  $164.77 \pm 7.03$  cm, mass =  $65.85 \pm 14.71$  kg) with no history of lower extremity surgery or injury in the 12 months prior to the study volunteered. Subjects were positioned supine where a series of stimuli were administered to the tibial nerve to attain a  $H_{max}$  and  $M_{max}$  measure. Immediately following each measure, subjects were positioned on an isokinetic dynamometer where plantarflexion peak torque measures were performed. Following the dynamometer measures, subjects returned to the table where a 20-minute PSWD, placebo, or no PSWD was administered to the antero-lateral ankle joint. **RESULTS:** Pulsed short-wave diathermy did not influence the H: $M_{max}$  ratio ( $F_{2,42} = 0.23$ ,  $P = .79$ ) and plantarflexion peak torque ( $F_{2,42} = 0.47$ ,  $P = .63$ ). There was also no difference between the 3 measurement times for H: $M_{max}$  ratio ( $F_{2,84} = 0.23$ ,  $P = .79$ ) and peak plantarflexion torque ( $F_{2,84} = 0.47$ ,  $P = .63$ ). Pulsed short-wave diathermy increased surface temperature immediately following the treatment ( $P < .05$ ). Ambient air temperature fluctuated less than  $1^{\circ}$  C during the data collection. **CONCLUSIONS:** Pulsed short-wave diathermy did not influence involuntary motoneuron pool recruitment or voluntary plantarflexion peak torque of the soleus muscle immediately following or 30-minutes following a standard 20-minute treatment.

THE EFFECTS OF RESISTANCE TRAINING ON METABOLIC HEALTH WITH WEIGHT REGAIN.

S.O. Warner<sup>1</sup>, M.A. Linden<sup>1</sup>, Y. Liu<sup>1</sup>, B.R. Harvey<sup>1</sup>, J. P. Thyfault<sup>1,2,4</sup>, A.T. Whaley-Connell<sup>2,4</sup>, A. Chockalingam<sup>2,4</sup>, P.S. Hinton<sup>1</sup>, K.C. Dellsperger<sup>2,3</sup>, and T.R. Thomas<sup>1</sup>. Departments of Nutrition and Exercise Physiology<sup>1</sup>, Internal Medicine<sup>2</sup>, and Medical Pharmacology and Physiology<sup>3</sup>, University of Missouri, and the Harry S. Truman VA Memorial Hospital<sup>4</sup>, Columbia, MO  
 Email: [swn66@mizzou.edu](mailto:swn66@mizzou.edu)

Metabolic syndrome (MetS) risk factors are reduced with weight loss; however, many individuals regain the weight. Resistance training (RT) can improve muscular strength, body composition, and MetS risk factors.

**PURPOSE:** The purpose of this study was to determine whether RT effectively maintains diet and exercise-induced improvements in MetS risk factors during a period of controlled weight regain.

**METHODS:** Nine sedentary and overweight to class II obese (body mass index =  $33.8 \pm 1.5 \text{ kg}\cdot\text{m}^{-2}$ ) individuals (1 male, and 8 females, age =  $37 \pm 3 \text{ y}$ ) lost 4-6% of their initial body weight during an 8-12 wk diet and aerobic exercise-induced weight loss (WL) phase. After weight loss, all subjects participated in a controlled weight regain (WR) phase, during which they regained ~50% of the lost weight while participating in a supervised RT program. The diet consisted of modest caloric restriction during the WL phase and an increase in caloric consumption during the WR phase. During the WL phase, subjects performed 45 minutes of aerobic exercise  $5 \text{ d}\cdot\text{wk}^{-1}$  at 60% of  $\text{VO}_2\text{max}$ . During the WR phase, subjects performed 3 sets of 6-12 repetitions at 70-80% of 1-repetition maximum (1RM). The RT program trained all major muscles groups on 3 non-consecutive  $\text{d}\cdot\text{wk}^{-1}$ . Outcome measures were assessed at baseline (BL), post weight loss (post WL), and post weight regain (post WR) and included body composition, abdominal adiposity as assessed by computed tomography (CT), muscular strength, maximal oxygen consumption ( $\text{VO}_2\text{max}$ ), blood pressure, and plasma lipids, glucose and insulin. **RESULTS:** Following weight loss ( $6.0 \pm 0.3\%$ ), body mass index (BMI), body fat %, waist circumference (WC), and all abdominal [total ( $\text{TAT}_{\text{abd}}$ ), subcutaneous ( $\text{SAT}_{\text{abd}}$ ), and visceral (VAT)] and thigh [total ( $\text{TAT}_{\text{thigh}}$ ) and subcutaneous ( $\text{SAT}_{\text{thigh}}$ )] adipose tissue (AT) depots were significantly reduced ( $p < 0.05$ ). Total cholesterol (TC), low-density lipoprotein-cholesterol (LDL-C), insulin, and the homeostasis model of insulin resistance (HOMA), also were significantly reduced ( $p < 0.05$ ). The quantitative insulin-sensitivity check index (QUICKI) and  $\text{VO}_2\text{max}$  significantly improved during the WL phase ( $p < 0.05$ ). During weight regain ( $48.3 \pm 3.3\%$  of lost weight), body fat %, WC, and  $\text{VO}_2\text{max}$  were maintained ( $p < 0.05$  baseline vs. post WR), and muscular strength and lean body mass increased significantly ( $p < 0.05$ ). Additionally, abdominal AT depots, and measures of insulin sensitivity did not change significantly from post WL to post WR ( $p > 0.05$ ). **CONCLUSION:** Resistance training was effective in maintaining important diet and aerobic exercise-induced improvements in metabolic health during a period of weight regain.

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### Preventing Endocrine System Decline & Aging

J. White & C. Woolsey

University of Oklahoma, Norman, Ok

The endocrine system is comprised of glands and cells that produce hormones that are secreted into the bloodstream to distant target cells that regulate cellular activity. Those glands and cells include the following: Pineal gland, hypothalamus, pituitary gland, thyroid, parathyroid, thymus, pancreas, adrenal glands, testes and ovaries. With aging comes a decrease in hormones and down regulation of their receptors (Cappola, Xue, Fried 2009; San Frutos, Cacicedo, Vicent, Gonzalez, Sanchez-Franco 2007). The blood's ability to maintain normal glucose and blood sugar levels diminishes with age as well. As a result, there appears to be a decline of insulin sensitivity within cells. Obesity, physical inactivity and alteration of body fat also contribute to the cell's decreased insulin sensitivity.

The decline of hormones presents common pathological conditions in men and women. Menopause (diminished estrogen levels) and Andropause (diminished testosterone levels) often appear around 40 years of age and onward. Diabetes and Thyroid problems are also prevalent for the geriatric population.

Problematic behaviors such as high levels of stress, drug use, a sedentary lifestyle, and malnutrition can cause disruptions in the endocrine system in turn affecting homeostasis of the body. In turn, these conditions can affect behavior causing mood fluxes, lack of energy, libido, and depression.

Prevention and suggestions for reducing the aforementioned side effects include reducing stress, eating a balanced diet, limiting alcohol and drug use, hormone replacement therapy, supplements and exercise. Sleep is also very important. Sleep is a time for the body to rest obviously, but in this time the body repairs itself. The pineal gland, responsible for producing melatonin, helps regulate sleep and with age melatonin decreases. If enough rest is not obtained, the body's immune system becomes compromised and risk for illness increases. In regards to hormone replacement therapy, recent studies are not necessarily showing supporting evidence for this alternative (Emmelot-Vonk, Verhaar, Nakhai-Pour, Grobbee, Van der Schouw 2009; B. Fraysse et al., 2006). Research supports exercise for combating bone mineral density loss and reducing obesity, body weight, BMD, and body fat percentage (Bocalini, Serra, Santos, Murad, Levy 2009).

## VALIDITY OF THE FRIEL ANAEROBIC THRESHOLD TEST IN TRAINED CYCLISTS

W.K. Yuen, S.R. Schreiner, S.A. Billinger, D. Hoover\*, J.K. Loudon. Department of Physical Therapy and Rehabilitation Science, University of Kansas Medical Center, Kansas City, KS; \*Department of Physical Therapy Education, Rockhurst University, Kansas City, MO.  
Email: wyuen@kumc.edu

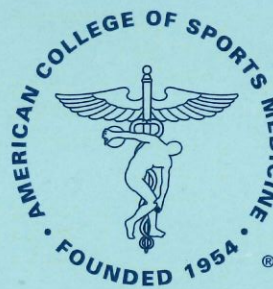
The Computrainer is a popular system commonly used by cyclists in developing training regimens. An important factor in determining exercise efficiency and progression is determining the anaerobic threshold (AT) through testing. The Friel Anaerobic Threshold Test (FATT) – based on Conconi methodology – has been used with the Computrainer system. The Conconi method posits that a heart rate deflection point (HRDP) occurs at AT. In addition, in the FATT, AT is found purportedly at the same heart rate (HR) as ventilatory threshold (VT) and a rate of perceived exertion (RPE) of 16 or 17. To the best of our knowledge the FATT protocol has not been validated. **Purpose:** The purpose of this study was to determine the validity of the FATT compared to the gold standard of ventilatory analysis using a metabolic cart. **Methods:** Fourteen male cyclists ( $30.4 \pm 7.4$  years of age;  $79.3 \pm 9.1$  Kg; an average of  $151.8 \pm 60.4$  miles/week) participated in the study. Two peak exercise tests were performed in random order one week apart at a similar time of day. One exercise test was completed with the cyclist in an upright position (hoods) while the other was completed in the aerodynamic position (aero) to determine effect of positioning on anaerobic threshold. Statistical analysis of the data was conducted using Pearson's correlation and paired t-tests. **Results:** No significant difference was found between the hoods and aero position for HR at VT using the metabolic cart ( $150.1 \pm 12.8$  vs  $153.3 \pm 10.7$ ,  $p = 0.20$ ). Our data suggests that HR values at an RPE of 15 more accurately reflects the HR at VT than the suggested RPE of 17 by the FATT ( $r = 0.60$ ,  $p = 0.02$ ). However, this moderate correlation was found only in the hoods position but not the aeros ( $0.44$ ,  $p = 0.24$ ). A non-significant, low correlation was found for both the hoods and aeros ( $0.41$  and  $0.44$ , respectively;  $p > 0.20$ ) for the HR value at an RPE of 17. **Conclusion:** This data suggests that it may be more appropriate to use an RPE of 15 for estimates of AT when using the Friel Anaerobic Threshold Test and the Computrainer for testing. Our study also suggests variability in the testing position may adversely impact cycling performance during tests to determine AT.

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