

# 2010 Annual Meeting



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

**October 21<sup>st</sup> – 22<sup>nd</sup>, 2010**  
**Holiday Inn Convention Center**  
**Lawrence, KS**

## **SPONSORS**

**Gold: Gatorade Sports Science Institute**

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# American College of Sports Medicine

## CENTRAL STATES CHAPTER ANNUAL MEETING



Holiday Inn Convention Center Hotel: Lawrence, Kansas

October 21<sup>st</sup> & 22<sup>nd</sup>, 2010

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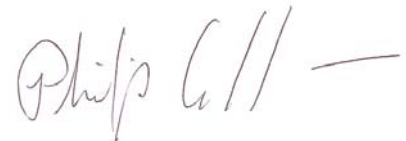
Welcome to the 2010 Annual Meeting of the Central States Chapter of the American College of Sports Medicine. I am excited about this year's line-up of speakers. On Thursday, the first session will focus on the relationship of aging and exercise. Dr. Steve Sayers (former CSC ACSM President) will lead off the session discussing the role that exercise has on muscle physiology and function. The second talk, by Dr. Jeff Burns, will focus on the role that exercise has in preventing dementia. Finally, Dr. Heidi Kluess will be finishing this session with a presentation on how aging affects the cardiovascular system. The spotlight for the second half of the afternoon will be on student presentations and posters.

On Friday morning, there will be two concurrent sessions. Session A will center on clinical applications related to sports medicine and Session B will center on fat and glucose metabolism. Leading off Session A is Dr. Gretchen Oliver, ATC who will be talking about the mechanics and injury prevention of the baseball and softball pitch. The second talk in this session will be on functional rehabilitation to get athletes back on the field by Murphy Grant, M.S., ATC followed by Dr. Lisa Bartels, who will be talking about the integration of postural restoration. This session will wrap up with a talk by Dr. Phill Vardiman, ATC, who will discuss soft tissue mobilization. The first speaker in Session B is Dr. Mark Haub, who will be talking about carbohydrate intake and metabolic health. Dr. Scott Richmond will be the second presenter in the session and will discuss the interaction of diabetes and inflammation. Dr. Paige Geiger will then present her research on the role that heat shock proteins play in diabetes and the session will wrap up with Dr. Kevin Short talking about the effects of exercise on cardiometabolic health.

Following lunch, we are fortunate to have Dr. Scott Trappe, Director of the Human Performance Laboratory at Ball State University presenting his research on the effects of spaceflight and unloading on the skeletal muscle. Dr. Trappe is one of the leading experts on the effects of unloading on skeletal muscle tissue and has been published over a dozen articles on this topic.

In the afternoon, there will be two presentations. Dr. Bryan Smith will be giving an interesting presentation on a somewhat of a controversial topic: the relationship between energy expenditure and intake following weight loss. The conference wraps-up with a talk by Dr. Young Sub Kwon on the effects of pre-cooling on performance.

I hope that you enjoy the meeting. I would like to thank Dr. Mike Leiker for his help with the meeting. Also, please take special note of our sponsors listed on the following pages. **Without their continued support this meeting would not be possible.**



*Philip Gallagher, Ph.D.*  
Past-President CSC ACSM

# SPONSORS

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**HEALTH, SPORT AND EXERCISE SCIENCE DEPARTMENT  
UNIVERSITY OF KANSAS**



**NEW LIFESTYLES**

**Central States Chapter  
American College of Sports Medicine  
FALL 2010 MEETING SCHEDULE**

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**THURSDAY, OCTOBER 21<sup>ST</sup>, 2010**

**10:30 – 12:45 REGISTRATION**  
*Room: Lobby of Convention Center*

**12:30 – 12:45 INTRODUCTION**  
*Room: Regency C*  
  
Philip Gallagher, PhD, Past-President CSC ACSM  
University of Kansas

**12:45 – 3:00 AGING PHYSIOLOGY AND EXERCISE**  
*Room: Regency C*  
*Chair: Philip Gallagher*

12:45-1:30 Steve Sayers, PhD  
University of Missouri  
**High speed power training: A better way to improve muscle performance and function in older adults**

1:30-2:15 Jeff Burns, MD  
University of Kansas Medical Center  
**Exercise and Fitness in Alzheimer's Disease**

2:15-3:00 Heidi Kluess, PhD  
University of Arkansas  
**Age-related Changes in the Skeletal Muscle Vasculature**

**3:00 – 3:15 BREAK AND POSTER SET-UP**

**3:15 – 4:00 STUDENT ORAL RESEARCH PRESENTATIONS**  
*Room: Regency C*

3:15 – 3:30 Monica Kearney, University of Missouri  
**Outcomes of a Weight Loss, Weight Regain Intervention at One Year Follow-up**

3:30 – 3:45 Matt Andre, University of Kansas  
**A Reliable Method for Assessing Rotational Power**

3:45 – 4:00 Catherine Mikus, University of Missouri  
**Seven Days of Aerobic Exercise Improves Hyperemic Responses to Glucose Ingestion in Patients with T2DM**

**4:00 – 6:00 POSTER SESSION AND CHAPTER SOCIAL**  
*Room: Regency D1 & D2*  
*Presided by John Thyfault, PhD*

Central States Chapter Administrative Council Meeting at 5:30  
Greg Kandt, PhD, President

**6:00 – ? PLEASE ENJOY MASS STREET**

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**FRIDAY, OCTOBER 22<sup>ND</sup>, 2010**

**8:15-8:30 ANNOUNCEMENTS**

*Room: Regency D1 & D2*

Philip Gallagher, PhD

**8:30 – 11:30 CONCURRENT SYMPOSIUMS**

**SESSION A: CLINICAL APPLICATIONS RELATED TO SPORTS MEDICINE**

*Room: Regency D1 & D2*

*Chair: Phill Vardiman, PhD*

8:30-9:15 Gretchen Oliver, PhD, ATC  
University of Arkansas

**Proper Mechanics and Injury Prevention of the Baseball and Windmill Softball Pitch**

9:15-10:00 Murphy Grant, MS, ATC  
University of Kansas

**Functional Rehabilitation – Athletic Training Room to the Field**

10:00-10:15 Break

10:15-11:00 Lisa Bartels, DPT  
Postural Restoration Institute

**Integration of Postural Restoration Methodology with Traditional Athletic Training Intervention**

11:00 – 11:45 Phill Vardiman, PhD, ATC  
University of Kansas

**Soft Tissue Mobilization:**

**SESSION B: EXERCISE AND METABOLISM**

*Room: Regency C*

*Chair: Philip Gallagher, PhD*

8:30 – 9:15 Mark Haub, PhD  
Kansas State University

**Carbohydrate Intake and Metabolic Health**

9:15 – 10:00 Scott Richmond, PhD  
Missouri State University

**Innate Immunity, Inflammation and Insulin Sensitivity**

10:00 – 10:15 Break

10:15 – 11:00 Paige Geiger, PhD  
University of Kansas Medical Center

**Heat Shock Proteins: Novel Therapeutic Targets for the Treatment of Insulin Resistance and Type 2 Diabetes**

11:00 – 11:45 Kevin Short, PhD  
University of Oklahoma

**The Role of Physical Activity in Reducing Cardiometabolic Risk in Children**

**12:00-1:30 LUNCH**

*Room: Regency B*

12:45 – 1:30 Scott Trappe, PhD  
Ball State University  
**Exercise in Space: Strategies for Skeletal Muscle Health**

**1:45 – 4:40 AFTERNOON SESSIONS**

*Room: Regency C (except Student Meeting)*

1:45 – 2:35 **I. PROFESSIONAL BUSINESS MEETING (Greg Kandt, PhD) – Regency C**

**II. STUDENT MEETING (To Post-Doc or not to Post-Doc...) – Regency D1 & D2**

2:40 – 3:30 Bryan Smith  
University of Kansas  
**Exercise and Energy Intake: Does Exercise Influence Energy Intake**

3:30 – 4:15 Young Sub Kwon  
Washburn University  
**Palm Cooling Delays Fatigue during High-Intensity Resistance Training**

4:15 – 4:20 Closing Remarks

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## 2009-2010 Administrative Council Members

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### **President**

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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; Midwest Dairy Council; New Lifestyles; and the Health, Sport and Exercise Science Department, University of Kansas.

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## STUDENT DOCTORAL AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time - 3:15 p.m.

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### OUTCOMES OF A WEIGHT LOSS, WEIGHT REGAIN INTERVENTION AT ONE YEAR

#### FOLLOW-UP

M.L. Kearney, M.A. Linden, S.O. Warner, Y. Liu, K.C. Dellsperger, A. Chockalingam, A.T. Whaley-Connell, P.S. Hinton, J.P. Thyfault, and T.R. Thomas  
University of Missouri, Columbia, MO  
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#### ABSTRACT

While it is relatively common to track weight maintenance, physical activity (PA), and metabolic health following a weight-loss intervention, follow-up after a weight loss, weight regain intervention has not been previously reported in humans. **PURPOSE:** The purpose of this investigation was to examine whether changes in weight and metabolic parameters observed at the completion of a supervised weight loss, weight regain intervention study were maintained at one year follow-up and whether PA level would influence the maintenance of these parameters. **METHODS:** Thirty-three subjects (16 male, 17 female) from a weight loss, weight regain intervention (n = 67) returned for follow-up analysis 12-18 months following weight regain. The parent study included a 4-6 month period of controlled weight loss followed by 4-6 months of controlled weight regain with and without exercise during the regain period. At follow-up, subjects were classified as either active or inactive based on an estimated energy expenditure division of 1400 kcal/wk. Subject data included body weight, waist circumference (WC), waist-to-hip ratio (WHR), heart rate (HR), blood pressure (BP), estimation of percent body fat (%BF), abdominal and thigh computed tomography scans for adipose tissue (AT), and blood samples to assess insulin sensitivity (IS), triglycerides (TG), cholesterol, and C-reactive protein (CRP). Results were analyzed by 2-way ANOVA to determine if differences were maintained at follow-up from baseline (BL) and from post weight-regain (PWR) and if differences existed between active and inactive subjects. **RESULTS:** The decrease in body weight from BL to PWR was not significant at follow-up, but there was a trend (p = 0.057) to maintain weight in the active group as well as a trend to increase weight in the inactive group (p = 0.053) from PWR to follow-up. The decreased %BF was maintained at follow-up in both groups. Total abdominal AT and visceral AT were maintained in the active but not the inactive group from PWR to follow-up. Systolic BP was not maintained, and diastolic BP increased in both groups at follow-up. Changes in WC, IS, TG, high-density lipoprotein cholesterol, and thigh adipose tissue were not maintained at follow-up. No changes were seen in HR, WHR, CRP, total cholesterol, or low-density lipoprotein cholesterol. **CONCLUSION:** Physical activity influences the ability to maintain some but not all of the positive metabolic changes seen after a weight loss, weight regain intervention. It appears that in general, more active individuals are better able to maintain beneficial metabolic changes while less active individuals regress in metabolic health.

Funded by NIH DK067036.

Presentation Time - 3:30 p.m.

## **A RELIABLE METHOD FOR ASSESSING ROTATIONAL POWER**

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### **ABSTRACT**

Rotational training is a type of core training that can involve different implements (medicine balls, cable pulleys, etc.) and is said to be beneficial for rotational power athletes. Currently, there is no reliable assessment of rotational power. **PURPOSE:** To determine the test-retest reliability of kinetic and kinematic rotational characteristics of a pulley system when performing a rotational exercise of the axial skeleton in the transverse plane. **METHODS:** Healthy, college-age men (n=8) and women (n=15) reported for three testing sessions with a cable pulley system. While sitting 10 feet in front of the pulley system on a box 0.5m tall with the pulley system's cable adjusted to shoulder height, participants held the handle with both arms extended in front of their body and started their motion with their torso rotated towards the machine. Each participant rotated their torso forcefully until they reached 180° of rotation, then slowly returned to the starting position, three times per trial. Three loads were used: 9% body weight, 12% body weight, and 15% body weight. An external dynamometer was attached by a nylon tether to the weight stack of the pulley system to determine weight stack power. The repetition with the greatest power for each trial for each load was analyzed. RMANOVA (day x load x gender) with Tukey post-hoc analyses were used to determine sex and load differences for power. Intra-class correlation coefficients were utilized to determine the repeatability of the power measures for both the men and the women. Significance was set a priori at  $p < .05$ . **RESULTS:** The mean peak power repetition (watts) for all subjects was  $20.09 \pm 7.16$  (9%BW),  $26.17 \pm 8.6$  (12%BW), and  $30.74 \pm 11.022$  (15%BW) at the first training session and  $22.3 \pm 8.087$  (9%BW),  $28.7 \pm 11.295$  (12%BW), and  $33.52 \pm 12.965$  (15%BW) at the second training session with an ICC of .97 (9%BW), .94 (12%BW), and .95 (15%BW). When participants were separated by sex, there were no significant differences between groups. **CONCLUSION:** A pulley system and an external dynamometer can be used together as a reliable research tool to assess rotational power.

Presentation Time - 3:45 p.m.

**SEVEN DAYS OF AEROBIC EXERCISE IMPROVES HYPEREMIC RESPONSES TO  
GLUCOSE INGESTION IN PATIENTS WITH T2DM**

C.R. Mikus<sup>1</sup>, S.T. Fairfax<sup>1</sup>, J.L. Libla<sup>1</sup>, L.J. Boyle<sup>1</sup>, L.Vianna<sup>1</sup>, D.J. Oberlin<sup>1</sup>,  
G.M. Uptergrove<sup>1</sup>, S.H. Deo<sup>1</sup>, A. Kim<sup>1</sup>, J.A. Kanaley<sup>1</sup>, P.J. Fadel<sup>1</sup>, J.P. Thyfault<sup>1,2</sup>.  
<sup>1</sup>University of Missouri and <sup>2</sup>Harry S. Truman Memorial Veterans Hospital, Columbia, MO.  
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**ABSTRACT**

Type 2 diabetes is associated with vascular complications characterized by endothelial dysfunction, including impaired vasodilatory responses to insulin. Insulin mediates blood flow in part by stimulating two pathways in the endothelium; one leads to the production of the vasodilator nitric oxide, and the other mediates production of endothelin-1, a vasoconstrictor. The vasodilatory effects of insulin account for up to 40% of insulin-mediated glucose disposal; however, insulin-stimulated vasodilation is impaired in type 2 diabetes, contributing to diminished vascular perfusion and delivery of glucose to target tissues. **PURPOSE:** The purpose of this study was to determine whether aerobic exercise improves blood flow responses to a glucose load in patients with type 2 diabetes. **METHODS:** We assessed femoral blood flow (Doppler ultrasound) responses to an oral glucose tolerance test (OGTT; 75g glucose) at 15 min intervals for 120 min in eleven obese (BMI, 34±1 kg/m<sup>2</sup>), sedentary (aerobic capacity, VO<sub>2</sub>peak, 23±1 ml/kg/min) individuals (53±2 y) with non-insulin dependent type 2 diabetes (HbA1c, 6.63±0.18%) before and 12-24 h after 7 d of supervised treadmill and cycling exercise (60 min/d, 60-75% VO<sub>2</sub>peak). **RESULTS:** Fasting glucose, insulin, and femoral blood flow were not different after 7 d of exercise (125±8 vs. 120±7 mg/dl, 11±2 vs. 10±1 µIU/ml, and 313±38 vs. 309±28 ml/min), nor were glucose or insulin responses to the OGTT (27064±1628 vs. 28013±1942 AUC<sub>0-120</sub>, *P*=0.12 and 5968±1034 vs. 4479±696 AUC<sub>0-120</sub>, *P*=0.09). Estimates of whole body insulin sensitivity (Matsuda's Composite Whole Body Insulin Sensitivity Index), however, increased from 2.96±0.34 at baseline to 3.57±0.55 post-exercise (*P*<0.05). Prior to 7 d exercise, femoral blood flow did not change in response to the OGTT (1±7, -7±5, 0±6, and 0±5 % of fasting femoral blood flow, at 75, 90, 105 and 120 min, respectively). In contrast, after 7 d of exercise, femoral blood flow increased by 33±9, 39±14, 34±7, and 48±18% above fasting levels at 75, 90, 105 and 120 min following ingestion of the glucose load, respectively (*P*<0.05 vs. corresponding pre-exercise time points). **CONCLUSIONS:** These data are the first to demonstrate that 7 d of aerobic exercise enhances femoral blood flow responses to glucose ingestion in obese individuals with type 2 diabetes and support previous work demonstrating that acute exercise improves endothelial function in this population. These early adaptations likely contribute to favorable metabolic and cardiovascular outcomes associated with chronic exercise training in type 2 diabetes.

Supported by MU iCATS (CRM and JPT), T32 AR048523 (CRM), and VHA CDA (JPT).

## POSTER PRESENTATIONS (4:00-6:00)

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### 1. RELATIONSHIP BETWEEN BODY COMPOSITION AND LIFE SATISFACTION IN OLDER ADULTS

L. Adams, A. Alfrey, J. Cannizzo, M. Powers, M. Gray, and R. Sawyer.  
Department of Kinesiology and Health Studies, University of Central Oklahoma, Edmond, OK.  
e-mail: [lenoch1@uco.edu](mailto:lenoch1@uco.edu)

While declines occur in physical, cognitive, and social functioning as we age, life satisfaction can be an important component of life for older adults. However, high body fat percentages may impair quality of life, as well as increase frailty associated with low bone mineral densities. **PURPOSE:** The purpose of this study was to determine whether body fat percentage (BF%), bone mineral density (BMD), trunk fat (TF) and lean tissue mass (LTM) possessed a relationship with satisfaction with life in older adults who volunteered to participate in a one-year study of resistance training. **METHODS:** Men and women over the age of 75 years (n=50) completed the Satisfaction with Life Survey (SLS) in order to assess their perception of life fulfillment. The survey consisted of a 7-point Likert scale, with five questions and a maximum score of 35. Participants' BF%, LTM, TF, and BMD was determined via the dual-energy x-ray absorptiometry total body scan (iDXA; GE Lunar). **RESULTS:** Pearson Product Moment correlation coefficients revealed no significant relationships between any of the body composition variables and the SLS. **CONCLUSION:** BF%, BMD, TF, and LTM do not appear to influence satisfaction with life. It should also be noted the SLS scores were above the average satisfaction score of 20-24, while body composition was more varied between individuals. This suggests satisfaction with life may be influenced by other variables aside from body composition in this population.

### 2. HEALTH AND STRESS CHARACTERISTICS OF UNIVERSITY ADMINISTRATORS

D.K. Applegate, J.M. Olson, R. Di Brezzo.  
Human Performance Laboratory, University of Arkansas, Fayetteville, AR;  
e-mail: [dapple@uark.edu](mailto:dapple@uark.edu)

Job related stress is seen as a major health concern and university administrators are not immune. Most administrators experience numerous demands including work and social commitments related to work. **PURPOSE:** The purpose of this study was to examine university administrators' stress levels and certain health parameters. **METHODS:** Seven high level administrators (6 Provosts and 1 Vice Provost) from Southeastern Conference Universities participated in this study (4 men and 3 women). Resting blood pressure, weight, height and body fat using Bioelectrical Impedance Analysis were measured. Participants were asked to fast for 12 hours before coming to the lab. Blood lipid profiles were measured and analyzed using a portable cholesterol system. From height and weight each participant's Body Mass Index (BMI) was calculated. Stress was measured using a modified University Administrative Concerns Questionnaire. This test is separated into four different parts: role, task, social, and conflict, to identify specific stressors. **RESULTS:** For this particular population of administrators the results were somewhat encouraging. Only one of the participants had high blood pressure. According to body fat measurements two men and two women were classified as obese. However when classified by BMI one man and one woman were classified as overweight and one man was obese. The mean ratio of total cholesterol and high density lipoproteins (HDL) was 3.73. Four participants (57%) had high cholesterol levels but three of the four also had high HDL levels. Two participants (29%) had impaired fasting glucose. Results showed that the mean stress score was 72.3 on a scale of 0-145 (moderate stress level). When divided by section administrators perceived the highest stress levels from task based components of their jobs. **CONCLUSION:** This particular group of administrators reflects a mass turnover. Of the seven Provosts measured five are relatively newly appointed (2-3 years) and represent a younger administration. This may be why this group did not have some of the negative health impact. However stress levels were moderately high and could begin to impact health with increased time as a Provost. Based on these results, administrators are not at a higher risk of cardiovascular disease than the average American.

### 3. GIP AND GLP RESPONSES TO A GLUCOSE CHALLENGE AFTER SEVEN DAYS OF EXERCISE TRAINING

L. J. Boyle<sup>1</sup>, C. R. Mikus<sup>1</sup>, J. L. Libla<sup>1</sup>, D. J. Oberlin<sup>1</sup>, P. J. Fadel<sup>2</sup>, J. P. Thyfault<sup>1,3</sup>

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The incretin factors, glucagon like peptide (GLP) and glucose-dependent insulin releasing polypeptide (GIP) have been a recent focus for potential therapies in the treatment of type 2 diabetes. It is estimated that 50-70% of insulin secreted after glucose ingestion is due to the release of incretin factors from the gut. Studies have shown that short and long term lifestyle interventions improve glucose stimulated insulin secretion. However, while previous studies have shown that long term lifestyle interventions can change GIP responses to a glucose challenge in sedentary, obese subjects, the effects of a short term exercise training intervention on GIP or GLP remain unknown. **Purpose.** The purpose of this study was to determine if 7 days of exercise would change plasma GIP and GLP levels during an oral glucose tolerance test (OGTT) in subjects with type 2 diabetes. **Methods.** Twelve, obese, previously sedentary subjects with type 2 diabetes ( $53.4 \pm 1.8$  yrs.,  $33.7 \pm 1.5$  kg·m<sup>-1</sup>·min<sup>-1</sup>,  $22.5 \pm 1.5$  ml·kg<sup>-1</sup>·min<sup>-1</sup>) participated in exercise training for 60 minutes a session at 75% heart rate reserve for 7 consecutive days. An OGTT (75g of glucose) was administered pre and post treatment. Subjects consumed a standardized diet 3 days before each OGTT and additional calories were added during the 7 days of exercise to maintain energy balance. Plasma concentrations of GIP and GLP were assessed during the OGTT (times 0, 30, 60, 90, and 120 min) using an enzyme linked immunosorbant assay. **Results.** Seven days of exercise had no effect on baseline GIP ( $37.5 \pm 9.9$  to  $35.9 \pm 9.7$  pg·ml<sup>-1</sup>) and GLP ( $2.3 \pm 0.1$  to  $2.4 \pm 0.2$  pM) nor were the area under the curve (AUC) responses for the incretins changed during the OGTT (GIP:  $31761.9 \pm 2780.0$  to  $30170.7 \pm 2511.5$  pg·ml<sup>-1</sup>·120 min; GLP:  $427.9 \pm 51.9$  to  $439.5 \pm 58.0$  pM·120 min). Furthermore, there was no significant change in an index of glucose-stimulated insulin secretion ( $\Delta$ Cpeptide<sub>0-30</sub>/ $\Delta$ Glucose<sub>0-30</sub>) nor was this index significantly correlated to indices of immediate GIP and GLP secretory responses ( $\Delta$ GIP<sub>0-30</sub> or  $\Delta$ GLP<sub>0-30</sub>) at baseline or post 7 days of exercise. **Conclusion.** Seven days of exercise training resulted in no changes in GIP or GLP responses during an OGTT in subjects with type 2 diabetes. Longer term lifestyle interventions, including exercise and/or weight loss, may be needed to see improvements in glucose stimulated GIP and GLP secretory responses and insulin production.

Supported by a MU iCATS (CRM and JPT), T32 AR048523 (CRM, LJB), VHA CDA (JPT).

### 4. FITNESS BENEFITS FOR MIDDLE SCHOOL STUDENTS ENROLLED IN A PE4LIFE PROGRAM

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There are a variety of school programs recently funded to help curb the epidemic of obesity in children. Some of these programs focus solely on the physical domains of health, while others address nutritional, and life skills. **PURPOSE:** To evaluate the effectiveness of the PE4life program in middle school students on physical measures such as PACER test, sit-and-reach, curl up, and body mass index (BMI) in comparison to a non-PE4life curriculum. **METHODS:** Two middle schools volunteered for this investigation; one followed the PE4life curriculum while the other did not. The study was conducted over two years. The PACER test and BMI scores were collected at the beginning and end of year one and two. At the beginning and end of the first year the curl-up, push up, and sit-and-reach tests were administered. At the beginning and end of the second year the one minute sit-up and the V-sit-and-reach tests were administered. **RESULTS:** There was a significant time by school interaction result for the PACER test ( $F [1,202] = 22.67, P < .001$ ). PE4life students improved 31% from 29.6 laps, while non-PE4life students improved 14% from 21.63 laps. Similarly there was a significant time by school interaction for BMI scores ( $F [1,294] = 3.91, P < .05$ ). PE4life students decreased from 21.63 to 21.54 kg/m<sup>2</sup> and non-PE4life students increased from 21.79 to 21.84 kg/m<sup>2</sup>. During Year One, PE4life students improved their sit-and-reach scores greater than non-PE4life students ( $F [4,391] = 11.17, P < .001$ ). Push up and curl up scores did not change over time amongst the two groups of students ( $P > .05$ ). During Year Two, there was a significant interaction effect between school, sex, and time for V-sit-and-reach and one-minute sit-up tests ( $P < .05$ ). For the V-sit-and-reach test, girls and boys in the PE4life program improved their scores, while girls and boys in the non-PE4life school decreased their scores from fall to spring. For the one minute sit-up test, girls and boys in both schools improved over the year, however the boys in the PE4life school exhibited the largest increases in score compared to all other groups. **CONCLUSION:** While both schools demonstrated improvements in physical fitness, the students enrolled in the PE4life program demonstrated greater improvements overall. Regardless of the program, the need for physical and life skills education is evident in today's society. With the incorporation of new equipment and/or technology, students in the PE4life program may have been internally motivated to perform to a greater extent than the non-PE4life students.



## 5. GLYCEMIC RESPONSE TO TORTILLA CONSUMPTION: INFLUENCE OF PHYSICAL ACTIVITY AND INSULIN RESISTANCE

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Insulin resistance (IR) reduces glucose uptake and leads to elevated glucose levels (EGL). Foods that limit postprandial glycemic response (PPGR) and exercise can help limit EGL. Two food items that have been shown to mitigate postprandial glycemic response when added to a meal are bean and nopal (segment of prickly pear cactus). **PURPOSE:** The main purpose of this study was to compare the postprandial glycemic response of a tortilla containing 100% corn flour to tortillas containing different ratios of corn, nopal, and/or pulse (bean) flour. A secondary purpose was to determine if there was a correlation between insulin resistance and postprandial glycemic response to tortilla consumption, and if physical activity influences this relationship. **METHODS:** Subjects (n=25) consumed 6 different types of tortillas. Bean and/or nopal flour was added to corn flour tortillas to determine if these ingredients mitigated the glycemic response. We also investigated if individuals meeting or exceeding the Center for Disease Controls' (CDC) physical activity (PA) recommendations had lower IR than those who did not and if that influenced the PPGR. PPGR to different types of tortillas was measured for 3 hours. Participants also completed a physical activity questionnaire to determine PA levels. **RESULTS:** There were no significant differences in total area under the curve (AUC) (p=0.360) or peak postprandial glycemic values (p=0.120) between the different types of tortillas. No significant correlation (p<0.05) existed between HOMA-IR and the AUC for any of the different types of tortillas except the control (100% corn flour) tortilla (p=0.039). There was a significant inverse correlation between PA and HOMA-IR (r=-0.553, p=0.002). **CONCLUSION:** We found that substituting bean and/or nopal for corn in a tortilla did not reduce glycemic response. It also was found that those who met CDCs' recommendations had lower IR compared to those who did not and that this did significantly affect PPGR to 100% corn flour tortillas.

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## 6. ACTIVATION OF ESTROGEN RECEPTOR $\alpha$ POTENTIATES INSULIN-STIMULATED GLUCOSE UPTAKE INTO SKELETAL MUSCLE OF FEMALE RATS

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Considerable clinical and experimental evidence exists demonstrating the ability of estrogen to modulate glucose metabolism. Previous studies suggest estrogen receptor  $\alpha$  (ER $\alpha$ ) is involved in estrogen-mediated regulation of glucose metabolism and is critical for the maintenance of whole body insulin action. However, very little is known regarding the mechanisms of action of ER $\alpha$  in insulin-responsive tissues. **PURPOSE:** The purpose of the current study was to determine the effects of *in vivo* ER $\alpha$  activation on skeletal muscle glucose uptake, insulin signaling, and GLUT4 protein levels. **METHODS:** Ovariectomized 2 month-old female Sprague Dawley rats were given subcutaneous injections of propylpyrazoletriyl (PPT; 10 mg/kg), diarylpropionitrile (DPN; 10 mg/kg), estradiol benzoate (EB; 20  $\mu$ g/kg), or vehicle every 24 hours for 3 days. 24 hours after the final injection, *in vitro* skeletal muscle glucose uptake was measured, and insulin signaling intermediates were determined by Western blot analysis. **RESULTS:** Activation of ER $\alpha$  with PPT resulted in increased insulin-stimulated glucose uptake into the soleus (slow-twitch) and extensor digitorum longus (EDL; fast-twitch) muscles, potentiation of insulin signaling intermediates (as measured by pAkt and PAS) and increased phosphorylation of AMPK. In addition, GLUT4 protein was significantly increased in the EDL muscle. In contrast, rats treated with EB or DPN for 3 days did not show an increase in insulin-stimulated skeletal muscle glucose uptake compared to vehicle treated animals. **CONCLUSION:** These new findings suggest that specific activation of ER $\alpha$  results in increased insulin-stimulated glucose uptake into the skeletal muscle. Modulation of ER $\alpha$  may represent a powerful tool in the prevention of insulin resistance and type 2 diabetes, particularly in postmenopausal women at increased risk for the disease.

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## 7. RhoA EXPRESSION IN RAT SKELETAL MUSCLE FOLLOWING ECCENTRIC EXERCISE

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RhoA is a small GTP-binding protein that helps with actin organization on the cytoskeleton. It has recently been shown that RhoA is essential to focal adhesion kinase (FAK) activation in stretched cardiac myocytes and, as such, may have a role in overloaded skeletal muscle. **PURPOSE:** The purpose of this study is to determine what role RhoA may have in skeletal muscle after a bout of eccentric exercise. **METHODS:** Male Wistar rats were randomly assigned to either a control group (CON), an eccentric exercise group (EE) (downhill running), or a heat shock (core temp 41°C for 20 min) + EE group (HS). The soleus (SOL), vastus lateralis red (VLR) and vastus lateralis white (VLW) muscles were removed at 2h and SOL and VLW at 48h following exercise. Protein expression of RhoA was determined using western immunoblotting. **RESULTS:** RhoA expression decreased in SOL EE versus (CON  $p=.008$ ) at 2hr. There were no differences in RhoA expression in VLR and VLW between groups at 2hr and there were no differences in RhoA expression between groups in SOL or VLW at 48hr. **CONCLUSION:** RhoA decreases in SOL 2hr post-eccentric exercise but not in other muscle groups or time points. This is conflicting with data that show RhoA increases after overloading of previously suspended hindlimbs in rats. More research is needed to determine the role RhoA may play in mature skeletal muscle.

## 8. TABATA INTERVALS AND ITS EFFECTS ON VO<sub>2</sub> MAX AND ANAEROBIC CAPACITY

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Tabata Intervals are said to be the most time-efficient cycling fitness builder ever created. The main aim of this project was to collect data to gain the knowledge needed to determine if this statement was true. **PURPOSE:** The purpose of this study was to examine the changes of participants' VO<sub>2</sub> max and anaerobic capacity using the Tabata Intervals cycling workout. It was hypothesized that both VO<sub>2</sub> max and anaerobic capacity would significantly increase. **METHODS:** Recreationally active college students (eight men and two women) performed twelve 20 second sprints with 10 seconds rest (Tabata Intervals) on a Velotron ergometer bike. Pre and post testing was performed to document the participants' beginning and ending peak power and mean power output (Wingate test) and VO<sub>2</sub> max. Subjects performed Tabata Interval cycling workouts once a day, three times per week, for six weeks. **RESULTS:** VO<sub>2</sub> max increased from  $43.39 \pm 4.68$  ml/kg/min to  $46.03 \pm 4.9$  ml/kg/min, mean watts output increased 11.1% from  $527.22 \pm 82.13$  W to  $585.78 \pm 91.72$  W. Peak watt output also changed by 7.1% from  $803.11 \pm 130.16$  W to  $859.89 \pm 151.21$  W, but was not significant. **CONCLUSION:** All data collected supported the hypothesis that both VO<sub>2</sub> max and anaerobic capacity would increase. After the six week training program there was a significant increase in VO<sub>2</sub> max by 2.6 ml/kg/min, or 6.1%. There was also an increase in mean watt output in the 30 second Wingate test, however peak power output did not change.

## 9. STABILITY IN THE ADAPTATION OF THE VISUOMOTOR SYSTEM

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The factors which impact the stability of a newly adapted visuomotor system are not fully understood. The plasticity of the visuomotor system is important for adapting to transient or permanent visual changes brought about by pathology, pharmacology, or microgravity. A visuomotor rearrangement paradigm was created by using visual displacement lenses during a simple pointing task. **PURPOSE:** The objective of this study was to determine whether a visuomotor system that is adapted to an unnatural new steady state is maintained without vision or practice. **METHODS:** Subjects performed a ballistic pointing task using a hand-held laser pointer, while constrained to movements of elbow flexion and glenohumeral rotations. A normal vision condition was performed to determine an individual's typical variability. The visuomotor system was then rearranged using 20° lateral displacement lenses with repeated pointing until a criterion of >30 successful target hits was achieved. Without delay, the eyes were closed and movement was constrained for five minutes of rest. Lastly, the visually displaced pointing task was repeated. The transverse errors of pointing were recorded for all trials. **RESULTS:** The average error during normal vision was  $\pm 1.8^\circ$  from target. The average initial trial error with displacement goggles was  $12.5^\circ$  and subjects needed an average of 4.8 trials to regain the  $1.8^\circ$  normal bandwidth. Following rest, the average initial error was  $8.1^\circ$  which was significantly less than the initial  $12.5^\circ$  ( $p < 0.001$ ) and required significantly less trials (2.7;  $p < 0.001$ ) to regain the  $1.8^\circ$  normal bandwidth. **CONCLUSIONS:** Practice with displacement goggles created a newly adapted state. During the 5 minute rest period, the visuomotor system did not return to the original normal state, nor did it fully maintain the newly adapted state. Thus, the plasticity of the newly adapted visuomotor system is not stable during conditions of no visuomotor activity. Nevertheless, the system learned how to quickly adapt to the new conditions.

## 10. EFFECTS OF EXERCISE SEQUENCE ON STRENGTH, SPEED, AND AGILITY DURING RESISTANCE TRAINING

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**INTRODUCTION:** Manipulating variables in a training program (i.e. sets, reps, lifts, sequence, etc.) is designed to maximize strength and power performance (Pearson et al., 2000). Due to the complexity of designing resistance-training programs, changing one variable could potentially set an athletic team apart from others in performance. **PURPOSE:** The purpose of this study was to investigate if one exercise sequence outperformed another by comparing pre to post difference between the groups. **METHODS:** This study compares two specific types of exercise sequences: traditional, which performs the prescribed exercises in a traditional or blocked manner (by completing every set of an exercise before moving to the next), and circuit, which performs the prescribed exercises in a circuit or alternating manner (by completing the first set of each prescribed exercise, then going to the second set of each exercise.) Thirty-nine adolescent athletes from two separate high school football teams completed identical six-week resistance-training programs with the only difference being the sequence of the exercises. Each group tested pre-and post-intervention on hang clean, bench press, squat, 40-yard dash, and a 5-10-5 drill. A strength index was used to measure overall strength gained by dividing the sum of the three lifts by total body weight. The results indicated that the only significant difference between groups occurred with hang clean. Significant gains in strength were made by both, circuit and traditional sequences, when comparing each exercise independently pre-to post-intervention. **CONCLUSION:** These results suggest that if strength gains are desired, then either a circuit or traditional style of exercise sequence will work equally well.

## 11. BICARBONATE LOADING AND ITS EFFECTS ON NONTRADITIONAL ANAEROBIC POWER TESTS

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Sodium bicarbonate is a well documented buffer chemical used to increase performance in anaerobic events. It performs by allowing hydrogen ions to bind to the bicarbonate portion of the molecule and, in doing so, helps control pH levels. Larger dosages of sodium bicarbonate have been associated with gastrointestinal distress. **PURPOSE:** 1. To find if low dosage sodium bicarbonate loading increased performance on a resisted sprinting test. 2. To test for the reproducibility of resisted sprint testing as a means of judging anaerobic power. **METHODS:** With a dosage of 0.1 g/kg bicarbonate (BIC) or 0.5 g sodium chloride placebo (CON), participants pulled a dragging sled with a bodyweight relative load. The distance covered over 30 seconds of dragging was recorded. 3 rounds were performed with two minutes rest in between each round. Each participant completed both the bicarbonate and placebo trials in a single blinded protocol. Each subject completed one trial and then one week later came back for the second trial. **RESULTS:** There was no statistically significant improvement shown by the 15 subjects on performance. Closed T scores were 0.10 at 15 seconds into the second round for cumulative distance. When distances weren't scored cumulatively, the T score was 0.873 at 15 seconds into the first round. The average ratings of perceived exertion were similar enough between the bicarbonate and placebo trials to suggest that the test was effective in taxing the subjects. The high RPEs (avg. 7.26 CON 7.66 BIC round 1, 8.53 CON 8.60 BIC round 2, 9.33 CON 9.47 BIC round 3,) increased from round to round. Both groups experienced an insignificant amount of GI distress. **CONCLUSION:** The study did yield reproducible results, but overall failed to find that 0.1 g/kg of sodium bicarbonate had a significant effect on performance in a nontraditional anaerobic power test.

## 12. ANAEROBIC POWER OUTPUT IN COLLEGE DIVISION 2 ATHLETES

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The Wingate anaerobic test is considered to be an accurate measure of anaerobic capacity of an individual. This test may indicate how well an individual metabolizes energy for anaerobic work, primary muscle composition (ratio of FT to ST muscle fibers), and sport specific neural adaptations. To our knowledge, there appears to be a paucity of information regarding division 2 college athletes of various sports. **PURPOSE:** The purpose of this study was to develop norms on the Wingate anaerobic test for division 2 college athletes participating in volleyball, baseball, softball, men and women's basketball, and wrestling. **METHODS:** After signing IRB approved informed consent, each subject's height and weight was measured, and percent body fat was determined by bioelectrical impedance (*Inbody520*, Biospace Inc, CA). Subjects were then guided through the Wingate procedures and given a 5 minute warm-up on the bike, with 2-3, 10 sec sprints evenly dispersed. Wingate protocol allowed for a 5 second sprint before the calculated resistance was dropped (.075kg/kg); then given 30 seconds to complete the resisted sprint continuously. Peak Power (PP) and Mean Power (MP) in both watts and watts/kg were recorded. **RESULTS:** The data collected for each sport is recorded in the table below. Mean and Standard deviation were recorded for each sport.

Means ± SD					
Sport	PP (W)	PP (W/kg)	MP (W)	MP (W/kg)	% BF
Volleyball	771.00 ±112.3	10.67 ±1.3	504.62 ±52.6	6.95 ±0.4	23 ±4.6
Baseball	1158.90 ±243.3	13.28 ±2.7	682.60 ±79.4	7.75 ±0.47	17 ±5.2
Softball	634.88 ±115.8	9.54 ±1.1	400.38 ±57.0	6.04 ±0.6	28 ±6.7
Men's BB	1133.88 ±222.3	12.61 ±1.5	719.69 ±109.8	8.04 ±0.5	12 ±3.7
Women's BB	840.57 ±154.4	11.33 ±1.3	490.14 ±49.8	6.67 ±0.5	25 ±5.1
Wrestling	1014.71 ±194.2	12.76 ±0.7	642.00 ±124.6	8.07 ±0.4	15 ±3.7

PP (W), Peak Power in Watts; MP (W), Mean Power in Watts; PP (W/kg), Peak Power in Watts per kilogram; MP (W/kg), Mean Power in Watts per kilogram; BB, basketball.

**CONCLUSION:** Based on the current data, these results provide norms for comparison of peak anaerobic power and mean anaerobic power in division 2 college athletes from baseball, softball, wrestling, men and women's basketball.

### 13. DIETARY PROTEIN AND GLUCOSE INTAKE DO NOT CORRELATE WITH POSTPRANDIAL GLUCOSE RESPONSES

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**PURPOSE:** Poor postprandial glycemic control is a risk factor for the development of type 2 diabetes and cardiovascular disease. It is not completely understood how much of a role diet or body composition plays in glycemic control. Evidence suggests that increasing protein (PRO) intake or decreasing carbohydrate (CHO) intake will reduce postprandial glucose (PPG) responses, a marker of glycemic control. The purpose of this study was to determine if the PRO or CHO intake during a meal (grams or % of energy intake) or body composition correlated with PPG responses in healthy subjects during 3 days of low physical activity using a continuous glucose monitoring system (CGMS). **METHODS:** Healthy, previously active adults (n = 11; 8 men & 3 women; Age = 29 ± 3 years) were consented and asked to reduce physical activity below 5,000 steps/day for a 3 day period. During the 3 day period subjects wore CGMS units to measure minute to minute blood glucose levels and recorded detailed dietary intake logs. Dietary variables and PPG responses to one meal during the last day of the 3 day period were compared to determine if diet impact postprandial glycemic control. Mean PPG was calculated as the post meal – pre meal blood glucose concentration (mg/dL) for 2 hours following the meal. Subjects were also measured for body composition by dual energy x-ray absorptiometry. **RESULTS:** The mean percent of kcals from CHO and PRO for the meal was 58.49 ± 18.65% and 14.98 ± 6.37%, respectively. The grams of CHO and PRO consumed were 150.31 ± 87.12 and 39.35 ± 20.71 respectively. Neither grams nor percentage of energy intake for CHO or PRO correlated to the peak postprandial glucose levels or the mean PPG responses. The % body fat and lean body mass for the subjects was 19.99 ± 5.99% and 61.29 ± 13.93 kg. A higher % body fat directly correlated with mean MAGE (r=0.61; p<0.05), but not peak glucose. A higher lean body mass also correlated with lower mean MAGE (r=-0.61; p < 0.05). **CONCLUSION:** In subjects asked to lower physical activity for 3 days, CHO or PRO intake did not correlate with postprandial glycemic control responses to one meal; however, a higher % body fat was significantly correlated with higher glycemic responses. These data suggest that glycemic responses during states of inactivity may be linked to body fat stores.

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### 14. COMPARISON BETWEEN ECCENTRIC AND HIGH VELOCITY TRAINING ON LOWER BODY STRENGTH IN OLDER ADULTS

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High velocity resistance training has become a popular exercise modality, but little is known about how it compares to eccentric training in older adults. **PURPOSE:** The purpose of this study was to determine which exercise program (high velocity or eccentric) was more beneficial on measures of lower body strength. **METHODS:** Nineteen community dwelling older adults aged 65 and older were divided into two groups; eccentric (ECC) and high velocity (HV). Both groups exercised three times per week for 8 weeks, performing 3 sets of 8-12 repetitions on the seated leg press, seated leg curl, and seated leg extension using pneumatic exercise equipment. The HV group trained at 50% of one-repetition maximum (1RM), completing the concentric phase "as quickly as possible" followed by a 2-3 second eccentric phase. The ECC group trained at 75% of 1RM completing the concentric phase in a more rhythmic pattern (~3 seconds) and the eccentric phase in 3-5 seconds. Subjects were tested pre and post intervention on 1RM of the leg press, leg curl, leg extension. Data were analyzed using a repeated measures analysis of variances, one within-subject factor and one between-subject factor. **RESULTS:** Analysis showed no significant baseline differences in the groups for demographics or strength measures. Post intervention no significant main effects were found for any of the strength measures based on group (leg press: F<sub>1,17</sub> = 1.76, p = .20; leg curl: F<sub>1,17</sub> = 2.66, p = .12; leg extension: F<sub>1,17</sub> = 0.88, p = .36). However significant main effects were found for time (leg press: F<sub>1,17</sub> = 53.97, p < .0001; leg curl: F<sub>1,17</sub> = 42.49, p < .0001; leg extension: F<sub>1,17</sub> = 60.26, p < .0001). Since no group differences were found, groups were combined to see the 1RM for leg press improve from 329.21 ± 123.09 lbs. to 472.58 ± 157.58, a 44% increase. 1RM Leg curl increased 33% from 75.89 ± 27.56 to 100.84 ± 37.48 lbs. A 44% increase was also seen in 1RM leg extension, 61.47 ± 22.33 to 88.58 ± 31.09 lbs. **CONCLUSIONS:** Eight weeks of HV and ECC training induced similar positive changes in 1RM strength. However, the HV training program was able to achieve the results with considerably less total work.

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## 15. IMPACT OF EXERCISE TRAINING ON ENDOTHELIAL TRANSCRIPTIONAL PROFILES IN HEALTHY SWINE: A GENOME-WIDE MICROARRAY ANALYSIS

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While the salutary effects of exercise training on conduit artery endothelial cells are well recognized in animals and humans with cardiovascular risk factors or disease, whether a healthy endothelium is amenable with exercise training is less certain. **PURPOSE:** The purpose of this study was to evaluate the impact of exercise training on endothelial transcriptional profiles using a genome-wide microarray analysis. **METHODS:** Brachial and internal mammary endothelial gene expression was compared between a group of healthy pigs that exercise-trained for 16-20 weeks (n=8) and a group that remained sedentary (n=8). **RESULTS:** 251 genes from brachial artery endothelial cells were differentially expressed ( $\geq 1.5$ -fold and  $FDR \leq 20\%$ ) between exercise-trained and sedentary pigs; whereas only one gene (gene title: CILP; 2.9-fold difference) was altered in the internal mammary artery. **CONCLUSION:** We demonstrated that in healthy pigs exercise training can modulate expression of endothelial cell genes in the conduit vessel perfusing the working skeletal muscles (i.e. brachial artery). In contrast, endothelial cells from the internal mammary artery (a vessel perfusing tissues that are metabolically less active during exercise) do not appear to be responsive to exercise training. Together, these data suggest the idea that a healthy endothelium is indeed responsive to exercise training and support the concept that the influence of exercise on endothelial gene expression is not homogenous throughout the vasculature.

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## 16. During High Intensity Workouts of Different Modalities.

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**Introduction:** A debate exists over which workout is most intense. Through research and data collection, we hope to produce results which will answer this debate among coaches. **Purpose:** The purpose of this research project is to compare four different high intensity 3 minute workouts consisting of running up stairs, running on a track, jumping in place, and water exercise. **Methods:** Subjects were twelve students (6 males and 6 females), ages 18-24. These individuals were tested to see the differences between subjective responses to the workout versus objective physiological responses. Subjects performed a dynamic warm up and one of four trials with at least one day separating each trial. Blood lactate was determined by finger stick and recorded every three minutes following exercise bout. Heart rate was recorded prior to and immediately after exercise. RPE was also recorded immediately after workout. **Results:** Results are shown below in table 1.

Table 1. *Subjective and Objective Means $\pm$ SD.*

Workout	Post ex La* (mmol/dl)	5-min Post La* (mmol/dl)	HR (bpm)	RPE
Track run	9.2 $\pm$ 3.8	9.4 $\pm$ 2.8	190.6 $\pm$ 9.0	15.1 $\pm$ 1.7
Stair Climb	10.9 $\pm$ 3.5	12.6 $\pm$ 3.9	186.3 $\pm$ 16.5	15.8 $\pm$ 1.6
Jumping	7.3 $\pm$ 4.3	4.9 $\pm$ 2.8	169.8 $\pm$ 21.6	12.2 $\pm$ 2.3
Swimming	8.9 $\pm$ 2.5	7.7 $\pm$ 2.5	156.4 $\pm$ 17.5	13.7 $\pm$ 2.1

\*La = Blood Lactate concentration

**Conclusion:** Even though the stair climb was subjectively perceived to be the hardest, objective measures did not support this finding. Not one specific workout was most intense, but swimming revealed the lowest means in heart rate and RPE.

**Key Words:** blood lactate, RPE, heart rate, intensity

## 17. TRANSITION TO ANTI-ATHEROGENIC BRACHIAL ARTERY SHEAR PATTERNS DURING PROLONGED LEG CYCLING: ROLE OF THERMOREGULATORY VASODILATION

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Aerobic exercise training (2 – 4 weeks) in which the lower limbs are primarily active improves brachial artery flow-mediated vasodilation in humans, suggesting improvements to endothelial health. The hemodynamic signals that may underlie this improvement to endothelial health are unknown because a detailed study of shear patterns in the brachial artery during prolonged, steady state dynamic leg exercise has not been undertaken. **PURPOSE:** to test the hypothesis that, during prolonged leg cycling, brachial artery shear patterns transition to a more anti-atherogenic signal characterized by increased mean and antegrade, but decreased retrograde, shear rate. Additionally, we tested the role of cutaneous vasodilation in these alterations to the pattern of brachial artery shear rate during prolonged leg exercise. **METHODS:** brachial artery diameter and velocity profiles and forearm skin blood flow and temperature were measured at rest and during 50 minutes of steady state, semi-recumbent leg cycling (120W) in fourteen males. **RESULTS:** As expected, prolonged leg cycling exercise resulted in an initial decrease but subsequent increase in forearm vascular conductance. Antegrade shear rate was increased throughout the exercise period ( $P < 0.05$  vs. baseline), while both mean and retrograde shear rate responded in a biphasic manner. Mean shear rate was reduced initially, but subsequently increased in parallel with the increase in forearm vascular conductance; retrograde shear rate was increased in magnitude (more negative) initially, but subsequently decreased back toward baseline as exercise progressed (all  $P < 0.05$  vs. baseline). When the forearm was cooled via water-perfused suit between minutes 30 and 40 to blunt cutaneous vasodilation attendant to exercise, forearm vascular conductance was reduced and the magnitude of retrograde shear rate was increased from  $-49.7 \pm 13.6$  to  $-78.4 \pm 16.5$   $s^{-1}$  ( $P < 0.05$ ). In addition, both mean shear rate and antegrade shear rate were reduced by cooling (both  $P < 0.05$ ). Importantly, these responses resolved with removal of cooling during the final 10 minutes of exercise (retrograde shear rate:  $-46.9 \pm 12.5$   $s^{-1}$ ). **CONCLUSIONS:** We conclude that prolonged, steady state dynamic exercise is associated with biphasic changes in brachial artery shear patterns, characterized first by decreases in mean and increases in retrograde shear rate, and subsequently by increases in mean and decreases in retrograde shear rate. There appears to be a causal role for thermoregulatory cutaneous vasodilation in the transition toward anti-atherogenic shear patterns in the brachial artery during prolonged leg exercise.

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## 18. MUSCLE ACTIVATION ASYMMETRY IN FEMALES WITH LOWER BACK PAIN DURING A STEP OVER FUNCTIONAL TASK

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The **purpose** of this single-blind study was to determine if muscle activation asymmetry differed in female subjects with chronic lower back pain (LBP), chronic sacroiliac joint pain (SJP), and control (CTL) groups while performing a step-over functional task. The LBP and SJP groups were hypothesized to have different muscle activation patterns compared to the CTL group. **Methods:** Women were classified in the LBP ( $n=10$ ), SJP ( $n=10$ ), and CTL groups ( $n=10$ ) based on their history of low-back pain and structural palpatory examination. A Noraxon Telemetry system measured knee angle and muscle activity for the erector spinae, rectus abdominus, gluteus medius, rectus femoris, and biceps femoris at 1500Hz. Each subject completed 3 step-over trials for each side on a NeuroCom Balance Master System; the task consisted of the leading leg stepping onto a raised block, followed by the trail leg swinging over the block and to the floor on the other side. The movements of the task were split into four phases by using the leading knee angles. Phase 1 was unsupported flexion of the knee, phase 2 was supported extension of the knee, phase 3 was supported flexion of the knee, and phase 4 was unsupported extension of the knee coming to the ground. After calculating the relative activation of each muscle using standardized tasks, absolute differences between the right and the left sides of the body were used to evaluate muscle activation asymmetry. Comparisons were adjusted for out-of-phase differences. Group differences were statistically evaluated with Kruskal-Wallis tests. Because of small sample size,  $\alpha=0.10$  was used. **Results:** The erector spinae had significant asymmetry in the following cases: in the leading leg in phase 1 SJP had significantly less asymmetry than LBP & CTL ( $P=0.02$ ); in the leading leg in phase 4 SJP had significantly less asymmetry than LBP & CTL ( $P=0.04$ ); in the trail leg in phase 4 SJP had significantly less asymmetry than CTL ( $P=0.06$ ). The rectus femoris had significant asymmetry in the trail leg in phase 4, SJP had less asymmetry than LBP ( $P=0.09$ ). Phases 2 and 3 showed no asymmetry. **Conclusions:** SJP reduced asymmetry for the erector spinae may be related to a locking mechanism to promote sacroiliac joint stability, perhaps for pain avoidance in this task. Other muscles and phases were not impacted by muscle activity asymmetry.

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## 19. THE RELATIONSHIP BETWEEN FUNCTIONAL FITNESS AND BALANCE CONFIDENCE IN SENIOR ADULTS

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With older adults that are experiencing a decline in functional fitness abilities later in life, it is important to not only know their specific functional fitness ability level but also their psychological confidence in their ability to performance daily activities. Both of these contribute to the extent of independence and life satisfaction that may be observed in an individual's life. **PURPOSE:** The purpose of this study was to examine the correlation between older adult's functional fitness and balance confidence. Researchers hypothesized that the Activities-Specific Balance Confidence (ABC) survey would be most highly correlated to the 8-Foot Up-and-Go portion of the Senior Fitness Test (SFT) protocol since it is a determinate of dynamic balance. **METHODS:** Forty-six men and women over the age of 75 years completed the ABC survey, hand-grip strength assessment, and the SFT battery. The ABC is a survey consisting of a series of 16 questions about balance confidence in various situations. The hand-grip strength assessment tests the maximal grip strength as indicated on a hand-grip dynamometer. Lastly, the SFT consists of six tests that are associated with an individual's functional fitness. These tests include Chair Stand, Arm Curl, 6-Minute Walk, 8-Foot Up-and-Go, Sit-and-Reach, and Back Scratch. The relationships between the ABC and the various functional measures were assessed using the Pearson's product moment correlation coefficient. **RESULTS:** Results showed a strong negative correlation between balance confidence and performance of the 8-Foot Up-and-Go test ( $r = -.823, p = .000$ ), while a positive correlation was observed between the ABC and the 6-Minute Walk test ( $r = .646, p = .000$ ). The SFT Chair Stand was moderately correlated with the ABC ( $r = .445, p = .003$ ). Correlations between ABC and Arm Curl ( $r = .292, p = .051$ ), Sit-and-Reach ( $r = .192, p = .206$ ), Back Scratch ( $r = .380, p = .012$ ), and hand-grip ( $r = .352, p = .018$ ) were weak. **CONCLUSION:** These results indicate that older individuals who have confidence in their balance perform better on functional fitness tests, particularly those measuring dynamic balance and walking performance.

## 20. SKELETAL MUSCLE HYPERTROPHY: A COMPARISON OF HIGH FREQUENCY STRENGTH TRAINING TO LOW FREQUENCY TRAINING

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**Introduction:** Strength training frequency is a fundamental element in prescribing exercise programs. **Purpose:** The purpose of this study was to determine the effect strength training frequency has on skeletal muscle hypertrophy. **Methods:** Participants were 2 males and 2 females (training age >2.5yrs). Participants were placed into 1 of 2 training groups, 1 male and 1 female in each group, a high frequency training group (HFT) and low frequency training group (LFT). HFT trained each muscle group 3 times per week versus LFT training each muscle group one time per week; number of sets (volume) per muscle group was constant at 9 per week. LFT group trained 3 days per week splitting the body into a three sessions over three days: 1) pectoralis, deltoids and triceps, 2) upper back, and biceps, 3) quadriceps, hamstrings, calves, and abdominals. HFT trained each muscle group on three different days "total body workouts." All workouts were separated by 48 hrs. Participants had a pre and post training body composition test with the BOD POD to measure gains in total fat free mass. Training period lasted 4 weeks. **Results:** Differences in total fat free mass (FFM) improvements existed. HFT improved FFM ( $\bar{x} + 0.65$  kg, SD  $\pm 0.45$  kg, gain 1.12% FFM) while the low frequency group lost FFM ( $\bar{x} - 0.34$  kg,  $\pm 0.24$  kg, loss .05% FFM). SEE of BOD POD  $\sim 1.87$  % bodyfat. **Conclusion:** These results suggest higher frequency training may produce fat free mass changes greater than low frequency with equal volume. LFT group were training prior to study with an HFT protocol.



## 21. PI(3,5)P2 IS A NOVEL ENDOGENOUS REGULATOR OF CALCIUM HOMEOSTASIS AND CONTRACTILITY IN CARDIOMYOCYTES.

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The newly identified phosphatidylinositol 3,5-bisphosphate (PI(3,5)P2) has been shown to dramatically increase in response to stressors (i.e. insulin and inflammation). These rapid changes suggest that PI(3,5)P2 may play a role in mediating adaptation; however, its functions in mammalian cells have yet to be fully elucidated. It has recently been shown that the enzyme myotubularin-related protein 14 (MTMR14), which regulates PI(3,5)P2 levels, is important for skeletal muscle fatigue and Ca<sup>2+</sup> homeostasis. **PURPOSE:** To determine if PI(3,5)P2 can modulate cardiac muscle contractility by altering intracellular Ca<sup>2+</sup> in cardiomyocytes. **METHODS:** Left ventricular muscle strips and isolated cardiomyocytes were obtained from wild-type C57BL/6 mice and exposed to exogenous PI(3,5)P2 during field stimulation and Ca<sup>2+</sup> imaging. Next we investigated whether PI(3,5)P2 directly opened ryanodine receptors (RyR2) to release Ca<sup>2+</sup> from the sarcoplasmic reticulum (SR) using [<sup>3</sup>H]ryanodine binding and single RyR2 channel recordings. RyR2 channel activity was assessed using reconstituted cardiac SR vesicles in planar lipid bilayers from purified pig cardiac muscle SR. [<sup>3</sup>H]ryanodine binding and RyR2 channel activity was recorded in the absence and presence of PI(3,5)P2. **RESULTS:** Exposure to PI(3,5)P2 increased peak force, slope and area of left ventricular muscle strips under field stimulation. Ca<sup>2+</sup> imaging of cardiac myocytes revealed that PI(3,5)P2 increased intracellular Ca<sup>2+</sup> levels by modulating the release of internal Ca<sup>2+</sup> stores. We found that PI(3,5)P2 directly binds to the RyR2, increases the open probability of the channel, and sensitizes RyR2 to diastolic and systolic concentrations of Ca<sup>2+</sup>. **CONCLUSION:** We provide evidence that PI(3,5)P2 is a potent regulator of intracellular Ca<sup>2+</sup> homeostasis, by directly activating and sensitizing the RyR2 channel. We believe that this action of PI(3,5)P2 on the RyR2 causes additional release of Ca<sup>2+</sup> during Ca<sup>2+</sup>-induced Ca<sup>2+</sup>-release, which can directly increase the strength of contraction in cardiac muscle. Regulation of PI(3,5)P2 may help explain the positive inotropic effects of stressors like insulin on the myocardium. Future studies will focus on the effects of exercise and cardiovascular disease in the regulation of PI(3,5)P2. Supported by: the Missouri Life Sciences Research Board, the National Institutes of Health- NIAMS and the American Heart Association.

## 22. THE IMMUNE RESPONSE TO LONG-TERM EXERCISE IN SEDENTARY-OBESE COLLEGE-AGED STUDENTS

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There are many diagnostic tests that provide information to physicians for sedentary and obese patients that are in need of exercise prescription to combat cardiovascular and metabolic risk factors. **PURPOSE:** The purpose of this investigation was to evaluate the effects of different training volumes on the immune system as measured by Serum Immunoglobulin-A. **METHODS:** Fourteen male and 17 Females subjects were randomly selected to participate in a 400 kcal exercise group (400K) (6 males, 5 females), a 600 kcal exercise group (600K) (6 males, 8 females), or a 0 kcal group (CON) (2 males, 4 females). Subjects in the 400K and 600K groups performed supervised exercise protocols 5 days a week for 10 months that equaled the amount for their specified group. The CON subjects participated in no activity. Each of the subjects received three fasted blood draws (BD) from the antecubital vein at baseline, after 5 months and 10 months of the study protocol. Blood samples were then analyzed for Complete Blood Count (CBC) using a Hematology Analyzer (Beckman Coulter, Brea, CA) and Serum Immunoglobulin-A (s-IgA) using Enzyme Linked Immunosorbant Assays (ELISA) (Zeptometrix Corporation, Buffalo, NY). All data was analyzed using a repeated measures ANOVA. **RESULTS:** There were no significant differences in the CBC or s-IgA levels at the three time points. **CONCLUSIONS:** These results suggest that sedentary-obese college-aged students who participate in different training volumes of long-term exercise will not see a significant change in CBC or s-IgA levels.

### 23. PERCEIVED EXERTION DURING EXERCISE: IS WATER EXERCISE ACTUALLY EASIER?

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Exercising in the water is becoming a topic of increased interest for many as a means to diversify exercise routines.

**Purpose:** The aim of this study was to compare the perceived intensity and physiological intensity of resistance training in water to resistance training on land by measuring blood lactate concentrations, heart rate, and perceived rate of exertion.

**Methods:** Participants included twelve collegiate female volleyball players from the University of Central Missouri. Participants performed 25 repetitions of transverse shoulder adduction/abduction in water at chest height with resistance paddles at a rate to induce fatigue. The participants then performed the same exercise on land using a light resistance exercise band. Perceived rate of exertion was recorded immediately following exercise, heart rate was measured and recorded immediately, three minutes, and five minutes post exercise, and blood lactate levels were measured and recorded three and five minutes post exercise. **Results:** Heart rate immediately following pool exercise ( $119 \text{ bpm} \pm 11$ ,  $85 \text{ bpm} \pm 14$ ,  $83 \text{ bpm} \pm 11$ ), immediate, three and five min post exercise respectively, was significantly higher than heart rate immediately following land exercise ( $105 \text{ bpm} \pm 8$ ,  $85 \text{ bpm} \pm 11$ ,  $85 \text{ bpm} \pm 10$ ) immediate, three, and five minutes post exercise respectively. Perceived rate of exertion was higher for land exercise ( $17 \pm 1.2$ ) than that recorded for pool exercise ( $15 \pm 1.78$ ). Blood lactate levels measured after water exercise were higher ( $4.0 \pm 1.2 \text{ mmol/L}$ ,  $3.8 \pm .6 \text{ mol/L}$ ) than those measured following land exercise ( $3.1 \pm .7 \text{ mmol/L}$ ,  $3.3 \pm 1.1 \text{ mmol/L}$ ). **Conclusion:** Based on the objective data collected (heart rate and lactate), resistance training in the water with paddles is more intense than resistance training on land with light resistance exercise bands however, it is perceived to be less strenuous.

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