



2008 Annual Meeting

CENTRAL STATES CHAPTER
OF THE
AMERICAN COLLEGE OF SPORTS MEDICINE

October 16th-17th, 2008
Embassy Suites
Kansas, City, MO

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American College of Sports Medicine

CENTRAL STATES CHAPTER ANNUAL MEETING



Embassy Suites Hotel on the Plaza: Kansas City, Missouri

October 16th & 17th, 2008

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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 Exercise in the Extremes. We have an outstanding lineup of speakers that will address this topic. Our first speaker is former astronaut Jim Pawelczyk, Ph.D., a payload specialist from the Neuroscience Lab (STS 90) who will be speaking on human limits in space. The Gatorade speaker this year is Randy Eichner, M.D. who will discuss blood aberrations in extreme sports. Speaking on physiological changes with resistance overtraining is Andrew Fry, Ph.D., a new member in the Central States Chapter. Leading off Friday will be Harold Laughlin, Ph.D., who will discuss the role of physical activity in preventing and treating cardiovascular disease at the endothelial level. Following lunch Ronald Terjung, Ph.D., will discuss exercise induced vascular adaptations. Midwest Dairy Council is sponsoring Mitzi Dulan, R.D., who will speak on nutrition for young athletes. In addition to these presentations there are a number of concurrent lectures Friday including topics such as exercise in geriatrics, performance changes with resistance overtraining, a case study of an elite athlete/heart transplant patient, and environmental impact on sympathetic vasoconstriction. The student focus of the meeting will include student oral presentations Thursday afternoon followed by poster presentations and the social. Thursday evening will be capped off with a student Quiz bowl. Lastly at the student meeting on Friday a round table discussion will take place composed of professionals from different public and private institutions. I hope that you enjoy the meeting. Please take special note of our sponsors listed on the following page. Without their continued support this meeting would not be possible.

Kenneth R. Turley, Ph.D., FACSM
Past-President CSC ACSM

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**Central State Chapter
of the
American College of Sports Medicine
FALL 2008 MEETING SCHEDULE**

THURSDAY, OCTOBER 16TH, 2008

12:00-1:00	Registration - Lobby	
1:00-1:15	Introduction Kenneth Turley, Ph.D., FACSM, Past-President CSC ACSM	Morelia II & III
1:15-2:15	Jim Pawelczyk, Ph.D., FACSM Penn State University What Price a Martian? Human Limits to Exploring the Red Planet.	Morelia II & III
2:15-2:30	Refreshment Break	
2:30-3:15	Randy Eichner, M.D. Science Advisory Board - Gatorade Sports Science Institute Hematologic and Biochemical Aberrations From Extreme Sports: Clinical Concerns SPONSOR – GATORADE	Morelia II & III
3:15-4:00	Andrew Fry, Ph.D., FACSM University of Kansas Physiological Alterations in Muscle Tissue with Resistance Overtraining SPONSOR - SHUGHART, THOMSON & KILROY	Morelia II & III
4:00-5:30	Student Oral Research Presentations Rosenkranz 4:15 p.m. (pg. 10) Doctoral Award Winner Company 4:30 p.m. (pg. 11) Master Award Winner Mikus 4:45 p.m. (pg. 12) Ade 5:00 p.m. (pg. 13) Borengasser 5:15 p.m. (pg. 14)	Morelia II & III
5:30-6:30	Poster Session and Chapter Social Presider: Philip M. Gallagher, Ph.D. Poster set-up begins at 4:30 Presenters are to be present from 5:30-6:30	Lapaz Ballroom
6:45-8:00	Central States Chapter Administrative Council Meeting Steve Sayers, Ph.D., President	Morelia II & III
6:45-8:00	Student Quiz Bowl	Monterrey III

FRIDAY, OCTOBER 17TH, 2008

8:45-9:00	Kenneth Turley, Ph.D., FACSM Announcements	Morelia II & III
9:00-10:00	Harold Laughlin, Ph.D., FACSM University of Missouri How does Physical Activity Contribute to Prevention and Treatment of Coronary Artery Disease: Role of the Endothelium?	Morelia II & III
10:00-10:50	A. Andrew Fry, Ph.D., FACSM University of Kansas Performance Alterations with Resistance Overtraining	Morelia II & III
	B. Mike Rogers, Ph.D., FACSM Wichita State University Effective Exercise Interventions for Older Adults	Monterrey II & III
10:50-11:00	Break	
11:00-11:50	A. Jeremy Patterson, Ph.D. Wichita State University Elite Tri-athlete – Heart Transplant Patient	Morelia II & III
	B – Heidi Kluess, Ph.D. University of Arkansas Environmental Modulation of Sympathetic Vasoconstriction	Monterrey II & III
12:00-1:30	Lunch Ronald Terjung, Ph.D., FACSM University of Missouri Vascular Adaptations Induced By Exercise	Lapaz Ballroom
1:30-2:15	Professional Business Meeting – Steve Sayers, Ph.D, Student meeting Moderator -Michael Rogers, Ph.D., FACSM– Wichita State	Morelia II & III Monterrey II & III
	<ul style="list-style-type: none">• Large/Research Institution – Tom Thomas, Ph.D., – University of Missouri• Small/Medium Institution – Joe Pujol, Ph.D., FACSM – Southeast Missouri State University• Private Institution – Kenneth Turley, Ph.D., FACSM – Harding University• Non-Academia - Joshua McCaig, J.D., Shughart, Thomson, & Kilroy	

2:15-3:15	Mitzi Dulan, RD America's Nutrition Expert® - www.nutritionexpert.com Fuel Like a Champion: Sports Nutrition for Young Athletes SPONSOR – MIDWEST DAIRY COUNCIL	Morelia II & III
3:15-4:15	Philip Gallagher, Ph.D. University of Kansas Heat Shock Proteins and Exercise	Morelia II & III
4:15-4:30	Closing Remarks – Kenneth R. Turley, Ph.D., FACSM	Morelia II & III

2007-2008 Administrative Council Members

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Learning Objectives

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 physiological responses to exercise are impacted by extreme environments and in unique/extreme 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, Stughart, Thomson and Kilroy, New Lifestyles, Sports Beans,

STUDENT DOCTORAL AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time - 4:15 p.m.

BODY COMPOSITION AND PHYSICAL ACTIVITY IMPACT AIRWAY HEALTH IN NON- ASTHMATIC PREPUBESCENT CHILDREN

S.K. Rosenkranz, K.E. Swain, B. Beckman, and C.A. Harms, FACSM.
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One out of every three children is considered to be overweight or obese in the United States. Obesity has important health consequences, including increasing risk for cardiovascular disease, diabetes, cancer, and asthma. Asthma is the most common chronic childhood disease in the United States. Along with childhood obesity, the prevalence of childhood asthma has increased dramatically over the past decade. Aerobic fitness reportedly offers protection against disease risk, even in the obese state. To date, little is known concerning the role of body composition and physical activity on airway health in children. **PURPOSE:** To determine whether body composition and/or physical activity would impact airway health in healthy prepubescent children. **METHODS:** Pulmonary function tests (forced expiratory flow in 1-sec, forced vital capacity, forced expiratory flow at 25-75% of vital capacity) and exhaled nitric oxide (eNO; a marker of airway inflammation) were performed pre and post exercise in 40 healthy (20 boys, 20 girls), non-asthmatic prepubescent children (Tanner stage 1) (age 9.7 ± 0.8 yrs) with a wide range of physical activity habits. Physical activity was determined via a checklist (BS-BAQ) consisting of 37 physical activities. Each subject completed an incremental exercise test to exhaustion (V_{O_2max}) on an electronically braked cycle ergometer. Body composition was measured via Dual Energy X-ray Absorptiometry. Subjects were then divided into groups by whether they met ACSM activity guidelines or not (active, inactive) and by body fat (high fat, $\geq 21.1\%$, low fat, $< 21.1\%$; 50th percentile for our subjects). **RESULTS:** The change in FEV_1 (pre-post exercise) was inversely related ($r=0.47$, $P<0.05$) to % body fat; subjects having the highest body fat demonstrated the greatest decrease in FEV_1 (i.e., airway constriction). The change in FEV_1 and eNO was not significantly different between active and inactive groups; however, mean values for FEV_1 and eNO tended to be higher (115%, 61%, resp) for inactive subjects. The change in FEV_1 (pre-post exercise) was related ($r=0.41$, $P<0.05$) to V_{O_2max} ; subjects with the lowest V_{O_2max} had the greatest decrease in FEV_1 . Also, the high fat inactive group had a significantly greater decrease in FEV_1 post exercise ($-11.0 \pm 3\%$), compared to the high-fat active ($-7.1 \pm 2.3\%$), the low fat inactive ($-4.0 \pm 2.6\%$) and the low fat active group ($-1.3 \pm 1.5\%$). **CONCLUSION:** These results suggest that physical inactivity and increased body fat negatively impact airway health in prepubescent children which may lead to increased prevalence of asthma in children.

STUDENT MASTERS AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time - 4:30 p.m.

BODY COMPOSITION COMPARISON: BIOELECTRIC IMPEDANCE ANALYSIS WITH DXA IN ADULT ATHLETES

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Body composition of athletes is an important tool to evaluate the health of the athlete, monitor the effects of a training program, and to determine optimal competitive body weight. There is a need for athletic population-specific BIA trials compared to established laboratory methods to test the validity of BIA. **PURPOSE:** The primary purpose of this study was to investigate the accuracy of bioelectrical impedance analysis (BIA) using dual energy x-ray absorptiometry (DXA) as the criterion in two groups: endurance athletes and power athletes. The secondary purpose was to develop accurate body fat percent (%BF) prediction equations for each group based on BIA data and/or the combination of BIA and anthropometric data. **METHODS:** 80 male athletes (40 elite endurance athletes and 40 power athletes), age 19-48 were recruited. Anthropometric measurements were taken (height; weight; and waist, umbilical, and hip circumference). Skinfolds were also measured at seven sites. Body composition was assessed by DXA and BIA. An athlete-specific BIA prediction equation was developed by stepwise regression analysis using DXA as the criterion and BIA data and anthropometric measurements as predictor variables. **RESULTS:** BIA significantly overestimated %BF by 6.40 ± 0.47 in the entire group ($p < 0.001$) and in both the endurance group (6.12 ± 0.60 , $p < 0.001$) and the power group (6.69 ± 0.73 , $p < 0.001$). The endurance and power group showed no significant difference in the error of estimation by BIA ($p = 0.554$), indicating that BIA had the same error in both groups. A new prediction equation was developed, that incorporated both anthropometric variables (umbilical circumference, hip circumference, and waist-to-hip ratio) as well as BIA variables (impedance quotient and reactance). The prediction equation produced an adjusted r^2 of 0.982 and SEE of 1.98 for the entire group. The addition of skinfolds in the regression equation eliminated all BIA variables. **CONCLUSION:** In an athletic population, BIA significantly overestimated %BF compared with DXA. The degree of overestimation was the same in both endurance athletes and power athletes. This study used DXA as the criterion to produce an athlete-specific BIA equation that can predict %BF in healthy males, 19-49 y, with BMIs ranging from 18.9 to 37.4. This equation used BIA measurements and anthropometric measurements, specifically trunk measurements, to account for trunk size, which is a common source of error in BIA equations. In addition, this prediction equation can be used with any BIA machine.

ORAL PRESENTATIONS

Presentation Time - 4:45 p.m.

EFFECTS OF STATINS AND EXERCISE ON METABOLIC SYNDROME RISK FACTORS: PRELIMINARY FINDINGS

CR Mikus¹, SJ Borengasser¹, SP Naples¹, MJ Ruebel¹, AT Whaley-Connell^{2,3}, NM Szary², TR Thomas¹, MH Laughlin⁴, JP Thyfault^{1,2,3}

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Individuals with Metabolic Syndrome (MSynd) have an increased risk for the development of type 2 diabetes and cardiovascular disease. To lower risk, MSynd patients are commonly prescribed statins (St), a lipid-lowering medication, and are advised to exercise. **PURPOSE:** The purpose of this study was to determine if daily exercise plus St-therapy is more effective than St-therapy alone at improving traditional MSynd risk factors. **METHODS:** Nineteen overweight/obese (BMI=26-42 kg·m⁻²) sedentary individuals with 2 of 5 MSynd risk factors were recruited and randomized to one of two treatment groups: 1) St-therapy (St: 40 mg simvastatin/d) or 2) St-therapy plus exercise (St+Ex; 40 mg/d simvastatin plus treadmill walking 45 min/d, 5d/wk at 65% VO₂max) for 12 weeks. Subjects were instructed to remain weight stable during the intervention. MSynd risk factors were measured prior to and following the 12 week interventions and were defined as follows: 1) blood pressure (BP) ≥ 130/85 mmHg, 2) fasting blood glucose (FBG) ≥ 100 mg/dL, 3) triglycerides (TG) ≥ 150 mg/dL, 4) high density lipoprotein (HDL) < 40 mg/dL for men or < 50 mg/dL for women, and 5) waist circumference (Waist) ≥ 102 cm for men or ≥ 88 cm for women. All data are reported as means±SE. **RESULTS:** Baseline age, body weight, body mass index and maximal oxygen consumption of St (n=8) and St+Ex (n=11) are as follows: 46±4 and 40±2 y, 98±7 and 98±7 kg, 34±2 and 34±2 kg·m⁻², and 25±2 and 26±2 ml·kg⁻¹·min⁻¹, respectively. Although no significant between-treatment effects were found, significant within-group effects were detected. Total cholesterol (TC) decreased in St+Ex (204±19 to 148±10 mg/dL, P<0.003) and St (171±6 to 147±8, P<0.05) while LDL decreased in St+Ex (160±21 to 102±11 mg/dL, P<0.003) and approached a significant decrease in St (121±9 to 98±9, P=0.07). Although improvements in HDL were not observed in either group (St: 50±4 to 49±3, St+Ex: 44±4 to 45±4 mg/dL), the ratio of TC:HDL significantly improved with St+Ex (5.24±0.91 to 3.62±0.42, P=0.02), but not in St (3.63±0.41 to 3.08±0.25, P=0.20). Surprisingly, FBG did not change in St+Ex (94±3 to 91±3, P=0.36), but increased significantly in St (97±4 to 107±4 mg/dL, P<0.003). SBP and DBP, Waist, and TG were unchanged in both groups. **CONCLUSIONS:** Preliminary findings suggest St-therapy plus exercise confers additional benefit over St-treatment alone in previously sedentary individuals. Further investigation utilizing a larger study population is needed to definitively determine the individual and combined effects of St-therapy and exercise on traditional MSynd risk factors.

This work is supported by the University of Missouri Research Board Grant.

ORAL PRESENTATIONS

Presentation Time – 5:00 p.m.

EFFECTS OF UPRIGHT, SUPINE, AND -6° HEAD-DOWN TILT POSTURE ON CARDIOVASCULAR AND EXERCISE PERFORMANCE

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Long-term microgravity exposure, via spaceflight or bed rest has been shown to produce significant cardiovascular deconditioning and decreases in exercise performance. However, there is little known about how acute microgravity exposure influences the cardiovascular system's ability to adjust to increases in physical work. **PURPOSE:** Therefore, the aim of this study was to compare cardiovascular and exercise performance during acute upright, supine and -6° head-down tilt positions. **METHODS:** Seven healthy inactive men (21.3 ± 2.1 yr) performed maximal cycle exercise tests (VO_{2peak}) in the upright, supine, and -6° head-down tilt on separate days. Oxygen consumption and heart rate were measured continuously throughout the testing procedures. Cardiac output (acetylene single-breath exhalation technique) was measured at multiple work rates (rest, 50, 100, and 150 W) and interpolated to the 100-watt work rate to minimize measurement error. Stroke volume was calculated from cardiac output and heart rate data. **RESULTS:** Peak oxygen uptake and heart rate was decreased in the supine and -6° head-down tilt positions compared to the upright (VO_{2peak} 2.01 ± 0.46 , 2.01 ± 0.51 versus 2.32 ± 0.61 L/min respectively, $P < 0.05$; peak heart rate 161 ± 14 , 160 ± 15 versus 172 ± 12 bpm, $P < 0.05$). However, cardiac output at 100-watts was similar in all three exercise positions (upright 8.61 ± 0.47 ; supine 9.46 ± 2.4 ; -6° head-down tilt 9.17 ± 0.84 L/min). Calculated stroke volume at 100-watts was significantly higher in the -6° head-down tilt position compared to the upright and supine positions (76.6 ± 4.7 versus 71.2 ± 4.5 , 75.6 ± 16.7 ml respectively, $P < 0.05$). **CONCLUSION:** These results suggest exercise capacity is immediately decreased upon exposure to a microgravity environment, prior to any cardiovascular deconditioning. Therefore, an astronaut's exercise performance should be evaluated with exercise tests in the -6° head-down tilt position prior to space flight in order to establish a baseline response to the adaptations that occur during long-term microgravity exposure.

ORAL PRESENTATIONS

Presentation Time – 5:15 p.m.

HEPATIC STEATOSIS AND METABOLIC RESPONSES TO HIGH FAT FEEDING IN FEMALE RATS BREED FOR HIGH AND LOW AEROBIC CAPACITY

Borengasser, S.J.², Rector, R.S.³, Naples, S.P.², Uptergrove, G.M.³, Morris, E.M.^{2,3}, Wei, Y.³, Ridenhour, S.E.³, Fritsche, K.L.⁵, Koch, L.G.⁶, Britton, S.L.⁶, J.A. Ibdah^{1,3,4}, and J.P. Thyfault^{1,2,3}

Research Service¹, HSTM VA Hospital; Departments of Nutritional Sciences², Internal Medicine-Division of Gastroenterology and Hepatology³, Department of Medical Pharmacology and Physiology⁴, and Department of Animal Sciences, University of Missouri; Department of Physical Medicine and Rehabilitation⁵, University of Michigan

Emerging evidence suggests that non-alcoholic fatty liver disease (NAFLD) can be triggered by physical inactivity and low aerobic fitness. To examine these links we utilize a novel model in which rats are artificially selected over several generations for high and low intrinsic aerobic capacity resulting in high capacity (HCR) and low capacity (LCR) runners (Science, 307:418-20, 2005). In a previous study we found male LCR rats, but not HCR, develop fatty livers on a standard chow diet demonstrating they have increased susceptibility for NAFLD. We then questioned if female LCR rats would also display NAFLD as previous reports find female obese rodents have reduced hepatic steatosis compared to males. Indeed, female LCR hepatic triglycerides (TAG) were significantly lower ($p=0.001$; $n=6$) when compared to age-matched male LCR rats but did not differ from age-matched female HCR rats fed a standard chow diet. Subsequently, we hypothesized LCR, but not HCR females may be susceptible to development of NAFLD when challenged with a high fat (HF) diet. To test our hypothesis, we assessed 25-week old LCR and HCR rats for development of hepatic steatosis, whole body insulin resistance (glucose tolerance tests), and adiposity (fat pad weights) on either a HF diet or standard chow diet ($n=5-6$ per group). After 7 weeks on a HF diet (71.6% kcal from fat), the female LCR rats had a doubling of fat pad mass and increased insulin resistance compared to the standard chow (16.7% kcal from fat) group while the HCR rats were protected against both maladaptations. Although increased adiposity and insulin resistance are both strongly linked to NAFLD, we surprisingly found the magnitude of the HF diet induced increase in hepatic TAG were similar between both strains (2-3 fold increase; $p<0.05$) highlighting a disconnect between peripheral alterations and hepatic fat deposition. However, despite similar TAG values, histological evaluation revealed that the female LCR livers did possess significantly more hepatocytes associated with macro lipid droplets compared to the HCR rats (25 ± 9 vs. 66 ± 10 % respectively, $p=0.005$). Further, we analyzed specific fatty acid species within hepatic TAGs using gas chromatography and discovered the LCR livers possessed a significantly higher ratio of unsaturated to saturated fatty acids (18:1/18:0) in leading us to speculate the type of fatty acid species in TAG may lead to different types of storage. In conclusion, HF diet induced insulin resistance occurred in LCR rats without a significant difference in hepatic TAG content between female LCR and HCR rats.

1.

PEDOMETER ACCURACY WHILE WALKING UNDER DIFFERENT FOOTWEAR AND GRADE CONDITIONS

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Inactivity is a major contributor to lifestyle-associated diseases such as obesity, heart disease, and osteoporosis. However, something as simple as walking can lessen the impact of these diseases, if done with sufficient frequency, intensity, and duration. Pedometers are a common method of measuring progress toward these minimum exercise prescription parameters. A number of studies have assessed the accuracy of pedometers but most have focused solely on walking and typically upon walking on level surfaces. This presents challenges to generalizing findings to the average adult whom in the course of a day ascends or descends stairs, walks up or down hills, walks on different surfaces, and wears different footwear. Each of these factors has the capacity to affect gait kinematics and therefore, the accuracy of the pedometer count. **PURPOSE:** The aim of this study was to assess the accuracy of a commonly available pedometer under different walking conditions. Specifically, the purpose was to assess the ability of the pedometer to correctly measure step count while walking on level, inclined, and declined treadmill surfaces while wearing “tennis shoes”, “flip flops”, and no shoes. **METHODS:** Eighteen college students (9 males and 9 females) classified as “minimum” risk per ACSM guidelines (20.58 ± 4.57 yr, 173.92 ± 8.44 cm, 71.39 ± 11.73 kg) volunteered for this study. Participants wore an inexpensive, commercially available pedometer on each hip. After a 5 minute warm up, each walked on a treadmill at 3.3 mph for 3 minutes for each of the experimental conditions, which were randomized for footwear (“tennis shoes”, “flip flops”, and barefoot) and gradient (level, incline, and decline). Steps for each trial were also tallied using handheld counters. **RESULTS:** A two-way within-subjects analysis of variance was conducted to evaluate the effect of footwear and grade on pedometer accuracy. No significant differences were found between the pedometer and handheld counts ($p \leq .05$). Significant differences were found in step counts between the footwear conditions ($p = .002$). Post-hoc analysis showed participants took significantly greater steps in the flip flop and barefoot conditions when compared with shoes ($p \leq .016$). No significant interactions were found in this sample using the multivariate criterion of Wilk’s lambda (Λ). **CONCLUSION:** These results indicate that the pedometer was accurate in assessing step count under a footwear and gradient conditions. These findings also suggest that a commonly available pedometer possesses the sensitivity to pick up differences in gait kinematics related to a variety of footwear conditions.

This study received no external support.

2.

Comparison of RPE, RER, HR, and Time to Exhaustion between Collegiate Male and Female Cross Country Runners during Graded Exercise Testing

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Purpose: To compare the differences between male and female cross-country runner's maximal oxygen consumption, RPE, RER, HR, and time to exhaustion. **Procedure:** 19 male and 16 female Division I, NCAA cross country runners from Oklahoma State University volunteered for participation in this study. All participants were run through the Bruce protocol, the following measures: RPE, RER, HR, and time to exhaustion. **Results:** There was a significant increase in male VO_{2max} vs. female VO_{2max} . There was a significant increase in male time to exhaustion vs. female time to exhaustion. There was a significant decrease in male RPE at stage 4 vs. female RPE at stage 4. All other stages and VO_{2max} showed no significant difference between male and female RPE. There was a significant decrease in male HR at stage 5 vs. female HR at stage 5. All other stages and HRM showed no significant difference between males and females. **Conclusion:** Overall some submaximal differences were found between the measured variables, but these differences were only seen at stage 4 of the GXT with the male and female submaximal data being very similar throughout the remainder of the test. There were however, significant differences between the genders in time to exhaustion and VO_{2max} – with the males showing an ability to continue the GXT longer than the females. The males also had a higher VO_{2max} . This could possibly be explained by a general increase in male muscle mass vs. females and the fact that the male runners finished 3rd at the NCAA National Cross Country Meet, while the females did not place in the NCAA National Cross Country Meet.

3.

RAZORSHARP NUTRITIONAL COUNSELING: PROVIDING NUTRITION EDUCATION FOR UNIVERSITY OF ARKANSAS ATHLETES

J.L. Brown, and R. Di Brezzo. Human Performance Laboratory and University Athletic Department, University of Arkansas, Fayetteville, AR; e-mail: jnelson@uark.edu

Proper nutrition is a vital factor for collegiate athletes who desire to improve their athletic performance. **PURPOSE:** The purpose of the RazorSharp Nutritional Counseling program is to provide an avenue for athletes at the University of Arkansas to seek nutritional information and dietary assistance in a confidential setting and to test the need for this pilot program. **METHODS:** Athletes from all University of Arkansas sports were allowed to participate in the RazorSharp Nutritional Counseling program. Both male and female athletes were allowed to meet one-on-one with a nutritional counselor to discuss his or her personal nutrition needs or concerns. The program, which was a collaborative effort between the University of Arkansas Athletic Department and the University of Arkansas Human Performance Laboratory, was created in 2006 to provide a confidential avenue for athletes to learn more about their individual dietary needs. Since the creation of RazorSharp, athletes have been informed about the nutrition program via promotion by the Nutritional Counselor(s), coaches, and athletic trainers. In addition to providing athletes with nutritional knowledge, the RazorSharp program has hoped to show a need for a comprehensive Sports Nutrition department for the University of Arkansas athletic programs. **RESULTS:** During the 2006-2007 academic year, 226 individual, 20 team, and 8 coach nutritional meetings occurred. During the 2007-2008 academic year, 336 individual, 11 team, and 11 coach nutritional meetings occurred. There was an increased need for individual appointments between the first and second year of the program; an increase of 110 appointments or 48.7% growth in the use of the RazorSharp program by individual athletes. **CONCLUSION:** The growth of the RazorSharp program has shown the potential need for a permanent Sports Nutrition program at a Division I level. Despite the fact that the need is being shown, such a program is not necessarily a part of all major athletic programs and should be considered as a vital education program. Based on this pilot study, athletic directors and administrators should budget for a similar program.

Supported by the University of Arkansas Athletic Department and the Human Performance Laboratory.

4.

PERCEIVED MUSCLE SORENESS IN FEMALE RUNNERS

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PURPOSE: The purpose of this study was to see if rating of perceived exertion correlated with perceived muscle soreness during delayed onset muscle soreness (DOMS). This study examined the pre and post running economy measures and perceived muscle soreness before and after a 30 minute downhill run (DHR) at - 15% grade and 70% of the subjects predetermined Maximum oxygen uptake ($VO_{2\text{ peak}}$). **METHODS:** Six female recreational runners (mean age = 24.5) performed level running at 65%, 75%, and 85% of their $VO_{2\text{ peak}}$ prior to DHR (baseline economy runs), as well as, immediately following and 4 successive days after the DHR. Speeds for economy runs post muscle damage were determined during the two baseline economy runs performed prior to DHR. Variables measured were; oxygen consumption (VO_2), minute ventilation (VE), heart rate (HR), respiratory exchange ratio (RER), rating of perceived exertion (RPE), muscle soreness, and creatine kinase (CK). **RESULTS:** Subjective response related to perceived muscle soreness increased significantly from a mean of 2 (pre DHR) to 62 (2 days post DHR) on a scale of 1-100. Creatine kinase levels increased 7 and 4 fold respectively one day and two days post DHR compared to pre DHR. Oxygen consumption increased from a baseline mean (1.8, 2.01, 2.27 L/min at 65%, 75%, 85% peak VO_2) to; 1.99, 2.19, 2.35 L/min immediately after DHR, 1.93, 2.13, 2.34 L/min 1 day post DHR, 1.83, 2.06, 2.34 L/min 2 days post DHR. Oxygen consumption at 65%, 75%, and 85% peak VO_2 represented a 11%, 9%, and 4% increase, 7%, 6%, and 3% increase, 2%, 2%, and 3% increase respectively immediately after, 1 day, and 2 days post DHR. Rating of perceived exertion did not change between the economy runs performed prior to or at any point after the DHR. **CONCLUSION:** Perceived muscle soreness is a better tool for recreational athletes than RPE during periods of DOMS. Running economy is adversely affected by DOMS.

Key words: *muscle soreness, oxygen consumption, running economy*

5.

HOME AND AWAY: NUTRIENT INTAKE IN FEMALE COLLEGIATE DIVISION I ATHLETES

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PURPOSE: The purpose of this study was to examine the difference in nutrient intake of National Collegiate Athletics Association (NCAA) Division I female athletes during home and away competition. **METHODS:** Twenty NCAA Division I collegiate, female athletes from golf (n=3), swimming (n=9), and gymnastics (n=8) participated in the study. Two, three-day diet records were used to estimate total caloric intake, macronutrient, and micronutrient levels. Records were taken during one home and one away competition. Participants were required to detail specifics about the food they ate including nutrient content. Records were analyzed using Diet Analysis Plus Software. **RESULTS:** Seven paired t-tests were run to assess home and away differences in total energy (Kcal), protein (g), fat (g), carbohydrate (g), calcium (mg), iron (mg), and Vitamin C (mg) intake. Results were only significant for calcium, $t(19) = 2.65$, $p = 0.016$. **CONCLUSION:** Calcium intake was significantly lower during away competitions than home competitions and fell below the adequate intake level set by the United States Department of Agriculture. This deficiency could promote injuries and poor bone health in athletes. Data trends also indicate low energy intake, disproportionate macronutrient distribution, low iron consumption, and high Vitamin C intake among the population tested. Overall, dietary intake of female collegiate athletes does not seem to be significantly affected by competition location or travel.

6.

THE EFFECT OF HIGH VELOCITY RESISTANCE TRAINING IN OLDER MEN AND WOMEN.

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Traditional resistance training (RT) with a strengthening component improves muscle strength and power in older men and women; however, the strenuous nature of traditional RT can make adherence to this exercise regimen difficult to maintain. Thus, alternative RT protocols are needed in this population to ensure continued participation. **PURPOSE:** To evaluate the effects of traditional RT (high load, slow velocity) compared to high velocity RT (low load, high velocity) on muscle strength (STR), peak power (PP), functional performance, work performed, and rating of perceived exertion (RPE) in older adults. **METHODS:** 38 men and women (Age: 72.4 ± 5.9 years; HT: 169.9 ± 9.9 cm; WT: 75.6 ± 20.2 kg) were randomly assigned to one of three groups for a 12-week study: control (C: n=12), strength (S: n=13), or velocity (V: n=13). S performed 3 sets of 8-10 reps at 80% 1RM slowly (concentric portion: 2-s; eccentric portion: 2-s) 3x/wk; V performed 3 sets of 12-14 reps at 40% 1RM as quickly as possible concentrically (eccentric portion: 2-s) 3x/wk. S, V, and C all performed lower extremity stretching exercises 3x/wk. Lower extremity STR and PP were obtained using computer-interfaced Keiser a420 knee extension machines. Functional performance measures included timed up and go, forward tandem walk, habitual and maximal gait velocity, timed stair climb and descent, and 400 meter walk. Statistical analyses were performed using analysis of variance (ANOVA), repeated measures (group x time) ANOVA, and independent samples t-tests. Statistical significance was accepted at $p < 0.05$. **RESULTS:** There were no significant difference in baseline muscle performance or function measures among the three groups (ANOVA: all $p > 0.05$). With training, STR increased by 26% and 25% in S and V, respectively, compared with C (group x time ANOVA: $p = 0.002$). With training, PP increased similarly in S and V by 12% and 24%, respectively, compared with C (group x time ANOVA: $p = 0.000$). There was no significant difference in average work performed between S (3673 J) and V (4070 J) (t-test: $p = 0.47$). In addition, RPE during resistance training was significantly lower in V (RPE=14.6) compared with S (RPE=16.7) (t-test: $p = 0.002$). **CONCLUSION:** Traditional RT with a strengthening component and high-velocity, low load RT both showed increases in strength and power, but had no effect on function. Despite similar effects on muscle performance and similar amounts of work performed, high-velocity RT was perceived to be less strenuous than traditional RT. Employing high velocity RT could have a beneficial impact on continued participation in RT exercise in this population.

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7.

THE EFFECT OF ENERGY PATCHES ON SUBSTRATE UTILIZATION IN COLLEGE FEMALE CROSS-COUNTRY RUNNERS

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Substrate utilization is an important factor for endurance athletes. Utilizing lipids for longer periods of time can improve performance by sparing carbohydrate during endurance activities. **PURPOSE:** The purpose of the study was to examine the effects of energy patches on substrate utilization during graded exercise test methods. **METHODS:** Twelve Division I female collegiate cross country runners volunteered for participation in this study. Age, height, body weight and respiratory exchange ratio (RER) were recorded during a pre-test (without the patch) and then in a post-test (with the patch). The post-test included a placebo patch group which consisted of 5 subjects and an active patch group consisting of 7 subjects. The RER was recorded using a TrueMax 2400 Metabolic Measurement System. RER was then used to determine if the energy patch's claim of increasing the ability to utilize fat following application had significance. The Bruce Protocol was used to achieve maximal exertion. **RESULTS:** The results of the present study indicated that there was no significant ($p > 0.05$) change in RER between the baseline RER measures and the placebo patch RER measures at any stage (1-5) and at max. There was a significant ($p < 0.05$) increase in RER while wearing the patch at stage 1 vs. the baseline data; however, there were no other differences in RER at any of the remaining stages (2-5) and at max for the active patch group. **CONCLUSION:** The results indicate that there was no increase ($p > 0.05$) in lipid metabolism when wearing the active patch vs. not wearing a patch. In fact, the one stage that exhibited any significant difference in RER while wearing the active patch indicated a decrease in lipid metabolism. It is possible that the energy patch may increase beta oxidation with a larger subject number; however, in the present study the runners had no significant ($p > 0.05$) shift toward fat utilization in subjects given the active patch.

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8.

HEART RATE AND BLOOD PRESSURE CONTRIBUTIONS TO RATE-PRESSURE-PRODUCT DURING RECOVERY FROM RESISTANCE EXERCISE

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Myocardial oxygen consumption (MVO_2) has been shown to be positively correlated with exercise intensity, whether aerobic or anaerobic in nature. MVO_2 is estimated by the rate pressure product (RPP) where the product of both heart rate (HR) and systolic blood pressure (SBP) are used to calculate this variable. What is not known is whether HR and SBP contribute equally to RPP with different loads. **Purpose:** Therefore, the purpose of this study was to determine the relative contributions of HR and SBP to recovery RPP across the range of typical resistance exercise relative intensities (i.e., % 1 RM). **Methods:** Nineteen weight-trained men served as subjects ($X \pm SD$; age = 24.5 ± 2.9 yrs, hgt. = 1.79 ± 0.03 m, body wgt. = 88.3 ± 11.7 kg). Each subject performed sets of 10 repetitions at 50, 60, 70, 80, 90 and 100% of 10 RM loads for the parallel barbell back squat, using 5 min rest intervals. A V5 ECG lead was used to determine HR during and after each set. Recovery SBP was determined within 15 sec after each set using a mercury column sphygmomanometer. In a separate session, all subjects performed a maximal effort discontinuous GXT on a cycle ergometer, during which recovery HR and SBP were monitored. Beta weights were determined from multiple regression analyses to determine the relative contributions of both HR and SBP to the explained variance of RPP at each intensity ($p \leq 0.05$). **Results:** HR and SBP were only moderately correlated for any condition ($r \leq 0.40$). With increasing loads, the relative contributions of HR decreased, while those of SBP increased. The GXT resulted in considerably different contributions when compared to any resistance exercise intensity (see table).

Exercise	Intensity	% Explained Variance		Adj. R^2
		HR	SBP	
Pre-Exercise		60.6%	39.1%	0.992
Resistance Exercise	50% 10 RM	61.0%	38.8%	0.995
Resistance Exercise	60% 10 RM	58.9%	40.4%	0.992
Resistance Exercise	70% 10 RM	58.5%	40.3%	0.987
Resistance Exercise	80% 10 RM	54.8%	43.3%	0.978
Resistance Exercise	90% 10 RM	53.7%	44.8%	0.983
Resistance Exercise	100% 10 RM	47.0%	52.5%	0.994
GXT	100%	41.7%	57.9%	0.996

Conclusions: During resistance exercise, recovery myocardial oxygen consumption becomes increasingly dependant on the pressure-load as the intensity increases. Regardless, the role of pressure load during recovery from this resistance exercise was less than during recovery from a GXT.

9.

PROPHYLACTIC SUPPLEMENTATION OF A NANO-SIZED SILICA MINERAL ANTIOXIDANT COMPLEX ON CHANGES IN CLINICAL SAFETY PARAMETERS AND BODY WATER

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A nano-sized silica mineral antioxidant complex (MIC) is purported to alter cellular chemistry kinetics by delivering reduced hydrogen ions to the cell and reducing blood lactate levels. Furthermore, the chemical structure of MIC supports osmotic characteristics that may impact levels of body water. **PURPOSE:** The purpose of this study was to examine the effects of 7 days of prophylactic MIC supplementation on changes in clinical safety parameters and body water. **METHODS:** On three occasions, fifteen males (23.6 ± 3.7 yrs, 180 ± 8 cm, 85 ± 11 kg, 16 ± 5 %) were tested using identical procedures under a control (CON), rice flour placebo (PLA) and microhydrin (MIC) condition. PLA and MIC supplementation was completed in a prophylactic fashion over a seven day period (4 x 250 mg capsules/day). After controlling for diet and exercise habits, participants arrived fasted and donated a blood sample before and after supplementation for determination of serum and whole blood clinical safety markers. Total body (TBW), extracellular (ECW) and intracellular (ICW) water measurements using bioelectrical impedance spectroscopy were taken before and after supplementation and before and after a peak VO_2 test. Repeated measures (2 x 3) ANOVA were completed on all variables using a p-value of 0.05. **RESULTS:** No significant changes ($p > 0.05$) were found for any component of the lipid and metabolic panels, kidney/liver enzymes, markers of protein breakdown and complete blood counts. Supplementation resulted in no change in TBW ($p = 0.43$), ECW ($p = 0.65$) and ICW ($p = 0.38$) after each condition. Similarly, no significant group x time interactions were found for ECW ($p = 0.19$), although TBW ($p = 0.09$) and ICW ($p = 0.052$) tended to change. Significant time effects for TBW ($p < 0.01$) and ICW ($p < 0.001$) were found. Within-group analysis of post-exercise body water revealed significant increases in ICW in PLA (+0.51 L; $p < 0.005$) and MIC (+0.43 L; $p < 0.01$) along with a significant increase in TBW for MIC (+0.59 L; $p < 0.01$). **CONCLUSION:** Clinical safety markers did not change after seven days of prophylactic MIC supplementation and was well tolerated. MIC supplementation did not stimulate any changes in body water compartments, while immediate increases in TBW and ICW after maximal exercise were found. Post-exercise ICW levels increased in PLA and MIC while TBW only increased in MIC.

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10.

AN EXAMINATION OF RELATIONSHIPS BETWEEN CURRENT CORE STRENGTH AND CORE STABILITY TESTING MEASURES

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Current training practices place an emphasis on the core musculature of the body for improved coordination and performance. This has developed a need for valid tests of core strength and core stability that allow for testing of progress as a result of the training program. **PURPOSE:** The purpose of this study was to determine the relationships between regularly used tests for core strength and core stability. **METHODS:** Twenty-three subjects volunteered for the study. Over the course of four testing sessions subjects completed the Sahrman Test for core strength, and five tests for core stability. Core stability tests included the prone bridge, right bridge, left bridge, torso flexion, and torso extension tests. The tests were administered to each subject in a randomized order. **RESULTS:** Pearson product moment correlation tests examined the relationships between core strength and core stability measures. No significant relationships ($p > 0.05$) were found between core strength and the core stability measures tested by the prone bridge, left bridge, or torso extension. There appeared to be a significant ($p < 0.05$) moderate relationship ($r = -0.437$) between core strength measures and the torso flexion measures for core stability. **CONCLUSIONS:** These results indicate not only a moderate inverse relationship between core strength and core stability as measured by the torso flexion test, but also suggest there is no relationship between core strength as measured by the Sahrman Test and the five core stability measures. These findings suggest further research is necessary to determine valid and reliable methods for testing core strength and core stability.

11.

EFFECT OF AMINO ACID AND CO-ENZYME Q10 SUBLINGUAL ADMINISTRATION ON MUSCLE PERFORMANCE

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Sublingual absorption occurs when a chemical comes in contact with the buccal mucosa on the underside of the tongue, where it diffuses through the membrane of the dense capillaries in the area. Nutrients, chemicals, and drugs may be administered this manner to provide faster absorption and response. **PURPOSE:** To assess the effectiveness of a sublingual, ergogenic product containing vitamins, minerals, amino acids, and a co-enzyme on muscle performance. **METHODS:** Twenty-nine Division I, NCAA linemen voluntarily participated in the study after signing an approved consent form. On day one, all participants warmed up, stretched, and were tested on maximum bench press repetitions of 225 lb., the vertical jump, and grip strength. One week later participants were randomly given the placebo or the treatment spray and again tested in the same manner. **RESULTS:** Subjects (20.11 ± 1.45 yrs; 132.1 ± 9.85 kg; 191.19 ± 3.85 cm). Results of repeated measures ANOVAs yielded no significant group interaction effects for any of the variables. Within group analysis yielded a significant ($p=0.02$) increase in bench press repetitions for the treatment group. No similar significant treatment group results were found for the vertical jump or the grip strength. The treatment group demonstrated greater improvement in each measured area with a significant improvement in the bench press. **CONCLUSION:** It is possible that a standardized dose (4 sprays) is too limiting for individuals averaging over 290 lbs and should be administered based on body weight. Also, the tests used were field-tests and may not be sensitive enough to elicit subtle responses. Additional research should focus on computerized strength testing for greater data discrimination.

12.

FLUIDOTHERAPY'S EFFECTS ON HUMAN HEAT SHOCK PROTEIN 70 AND 27 IN MALES AND FEMALES.

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There are various heat treatment modalities that have recently been used to induce heat shock proteins within the human body. **Purpose:** The purpose of this investigation was to evaluate fluidotherapy's ability to increase the expression of heat shock protein 70 (Hsp 70) and increase phosphorylation of heat shock protein 27 (Hsp 27). **Methods:** Twelve subjects (6 males and 6 females, 18-31 years) received a muscle biopsy from both the soleus and gastrocnemius in the non-treatment extremity and then received a 70 to 90 minute fluidotherapy Heat Treatment (HT) to the contra-lateral leg. Twenty four hours after the HT, biopsies from the soleus and gastrocnemius were collected from the HT leg. All collected muscle samples were then analyzed for any changes in Hsp 70 and Hsp 27 expression using western immunoblotting. Blood samples were taken from the antecubital vein both pre and post HT. Pre HT blood samples were used to evaluate the amount of estradiol in the blood during the time of the test. Estradiol levels were found using enzyme linked immunosorbant assay (ELISA) testing. All data was analyzed using a repeated measure ANOVA. Alpha level was set at $P < 0.05$. **Results:** There were no significant differences in the estradiol levels of both males and females prior to the testing. There were no significant increases of either Hsp 70 or Hsp 27 in both the male and female subjects. **Conclusion:** These results suggest fluidotherapy is not a recommended heat treatment method for initiating a response for the heat shock proteins.

13.

Comparison of Vertical Jump Performance of Collegiate Male Track Sprinters vs. Male Track Long-Distance Runners

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The specific training of the muscle fibers of the track sprinters was significantly different than the long distance runners so, we suspect that there would be a difference in vertical jump performance. **Purpose:** The purpose of this study was to compare the vertical jump performances between track athletes, with one subject group of athletes in 1600 meter races and longer (LDR) and the other subject group participating in events 200 meters or less (TS). We hypothesized that the TS would have a higher vertical jump versus LDR. **Methods:** Twenty male volunteers, ages 19-23, members of the University of Central Missouri's track and field team were the test subjects (10 TS,10 LDR). The measuring device that was used for testing the vertical jump was the Vertec. Subjects were allowed to warm up independently prior to testing, and were allowed 3 attempts, recording the highest of the three. . The test was conducted at the University of Central Missouri's track and field stadium, on a rubber outdoor track surface. **Results:** Long Distance Run group had a 62.6 cm vertical jump versus the TS that had a 75.7 cm vertical jump. The difference of the two groups average was 13.1 cm. **Conclusion:** The results of our research testing support our hypothesis that the sprint athletes would have the higher average of vertical jump performance.

14.

THE INFLUENCE OF HYDRATION STATUS ON ANAEROBIC PERFORMANCE: A REVIEW

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Hydration is a critical factor in exercise performance. Studies examining the impact of dehydration on anaerobic performance represent a small proportion of the literature and results have been discordant. One problem in describing effects related to anaerobic performance is the variation in exercise mode. Various modes may be dominated by the anaerobic energy systems, but still contain inherent differences. Thus, when examining anaerobic performance, mode-specific testing (i.e., simulating sport-specific demands) is necessary to increase ecological validity. **PURPOSE:** This review examines the influence of dehydration on exercise dominated primarily by anaerobic ATP production. The purpose of this review was to outline confounding factors potentially responsible for the discordance in the literature, identify key trends, and distinguish best practice for future research. **METHODS:** Forty-three original investigations and five review articles were identified in the current review. The review is divided into three sections which examine the influences on muscular strength/endurance, single anaerobic bouts, and repeated anaerobic work bouts. **RESULTS:** In general, research indicates a critical level of water deficit that affects anaerobic performance exists, but may be comparatively larger than the deficit impairing endurance performance. Decreases in aerobic capacity/performance occur with dehydration by 2% of body weight. Higher levels of dehydration (3-5%) are likely necessary before muscular strength or single anaerobic work bouts are impaired. Evidence suggests moderate dehydration (3% of body weight) may impair repeated anaerobic bouts which place an increased demand on aerobic metabolism. Thus, a critical performance duration component not yet well-defined may exist. **CONCLUSIONS:** Interactions between dehydration level, dehydration mode, testing mode, length of anaerobic performance, and recovery period during repeated anaerobic bouts may make definitive quantification of the critical water deficit necessary to influence anaerobic performance difficult. Therefore, ecological validity must be a primary concern. Research on the impact of dehydration on anaerobic performance ought to be situation and sport specific. Future research design must consider: (i) dehydration mode including influences of time and physiological stress; (ii) ecological validity of performance measures; (iii) and the contribution of individual energy pathways.

15.

ACUTE CORTISOL AND TESTOSTERONE RESPONSE TO RESISTANCE EXERCISE: EFFECTS OF LOAD DURING SINGLE REPETITION SETS

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The benefits of resistance training have been attributed in part to the acute endocrine response following an exercise stimulus. While many studies have examined the acute response to resistance exercise in various forms, none have compared the endocrine response to a single repetition scheme at various work loads such as occurs with one repetition maximum testing. **PURPOSE:** The purpose of this study was to determine if a dose response relationship between resistance training load and acute endocrine response exist following an exercise protocol utilizing one repetition sets at three different exercise loads. **METHODS:** Five collegiate male weightlifters participated in three separate trials with 100%, 50%, 75% of 1RM loads in three different multi-joint barbell exercises. The testing sessions, separated by 48 hours were approximately equal in total number of repetitions and total number of sets performed. For each blood samples were obtained pre- and post-exercise as well as 48 hours after the last testing protocol. **RESULTS:** Repeated measures ANOVAs were performed for cortisol and testosterone concentrations across all seven blood samples. Because of low sample size (n=5), statistically significant differences were not observed between the seven cortisol (p=0.061) or testosterone (p=0.056) samples. Though not reaching statistical significance in this small sample size, the time point most different from the other time points was the 48 hour post 1RM load for testosterone. **CONCLUSION:** The data may indicate that the acute testosterone response to single repetition resistance exercise may not be as important as changes that occur in the 1-3 days following the exercise bout. Secondly, the data suggests that testosterone levels in males may be affected by load even following extremely low volumes of resistance exercise.

16.

UNDERSTANDING THE ASSOCIATION BETWEEN PERCEIVED MENTAL AND PHYSICAL HEALTH AND FUNCTIONAL FITNESS IN OLDER ADULTS

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Research has shown positive relationships between physical function and quality of life among older adults. Those older adults who have experienced higher levels of functioning and independence, also report higher quality of life and perceived health status. While strides have been made in this topic, research is stagnant when determining if there are age-related associations between self-reported scores of perceived mental and physical health and functional fitness levels. **PURPOSE:** The purpose of this study was two-fold; to examine the relationship between perceived mental and physical health and assessed functional fitness and to discover if associations between age and self-reported health (physical and mental) exist. **METHODS:** Participants ($n = 57$) with a mean age of 82 ± 5.3 years completed the Senior Fitness Test (SFT) to determine their present level of functional fitness. The SFT includes the chair stand, arm curl, 6-minute walk, 8-foot up-and-go, sit-and-reach, and back scratch tests. Perceived mental and physical health was assessed using the SF-36v2 health survey. Results were analyzed using Pearson's correlation tests to discover if relationships between functional fitness and self-reported health were present, and to further identify associations between self-reported health and age. **RESULTS:** As expected, significant ($p < .05$) relationships were found between self-reported physical health and the chair stand test, the 6-minute walk, the arm curl, and the 8-foot up-and-go. Higher reports of physical health were associated with higher performance on the senior fitness test variables. No significant relationships were observed between self-reported mental health variables and functional fitness. In addition, the relationship between age and self-reported health variables was non-significant. This is interesting to note since it has been previously suggested that with age, mobility and strength decline. **CONCLUSION:** These results indicate a relationship between functional fitness and perceived physical health, but no relationships between functional fitness and mental health or perceived health and age. Future recommendations include exploring other variables that might affect such relationships, or lack thereof (activity level, socioeconomic status, or ethnicity, among others). In addition, future studies should include a wider distribution of age, and gender proportionate sample sizes.

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17.

BALANCE MEASURES USING THE BIODEX BALANCE SYSTEM IN PHYSICALLY ACTIVE AND NON-ACTIVE WOMEN

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Muscular strength decreases as we age and consequently the incidence of fall related injuries will increase in older adults with poor strength in their lower extremity. **PURPOSE:** The purpose of this study was to see if relationships existed between the overall stability index score on the Biodex Balance System, with scores of isokinetic strength in physically active and non active older women. **METHODS:** Twenty female subjects aged 41-60 participated in the study with mean (\pm SD) age and body weight at 51.85 ± 5.58 yr. and 163.35 ± 29.07 pounds. Each participant completed a physical activity questionnaire (in order to divide into groups) and they were tested on weight, flexibility, balance, and isokinetic strength. There was no exercise intervention involved. Weight was obtained using a metric scale and flexibility of the shoulders, hamstrings and lower back weretested using a sit and reach device. Balance was tested using the Biodex Balance System and a score called "overall stability index" was obtained. The level of difficulty chosen was 4 out of 12, which represents a more difficult platform setting. A setting of 1 is the most difficult (dynamic) and 12 is the least difficult (static). Strength was tested isokinetically using a Cybex II isokinetic dynamometer. Each participant completed five maximal repetitions at $60^\circ/s$ on knee extensors and flexors. **RESULTS:** A completely randomized factorial design (CRF-22) with two treatment levels, physical activity and strength, revealed no significant differences on measures of balance ($p > .05$). Although physical activity level had the strongest relationship with respect to balance, $F(1, 16) = .95$; $p = .34$, the results were not significant. There were no significant differences in measures of strength, $F(1, 16) = .57$; $p = .45$, or the interaction between the two independent variables, strength and physical activity, $F(1, 16) = .30$; $p = .59$. Although there are no significant differences between the high ($M = 2.68$) and low ($M = 3.34$) strength group, the means indicated that stronger individuals had better scores on balance measures. The physical activity questionnaire showed a similar trend. A higher perceived physical activity level ($M = 2.60$) displayed higher scores on balance than the lower perceived activity level ($M = 3.44$). **CONCLUSION:** These results indicate that no significant differences existed between the overall stability index score with scores of isokinetic strength in physically active and non active older women. However, mean values indicated that stronger and more physically active women performed better on the balance measurement.

18.

SUBJECTS CORRECTLY ASSESS PAIN DURING EXPERIMENTAL INDUCED ANTERIOR KNEE PAIN AND A 20-MINUTE CRYOTHERAPY TREATMENT

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Pain is a common complaint following injury. In order to investigate pain, objective measures must be taken. **PURPOSE:** The purpose of this study was to determine how correct subjects are in assessing a change in pain every minute without knowing their previous pain measure during and following experimentally induced anterior knee pain and a 20-minute cryotherapy treatment. **METHODS:** For this human subjects approved study, thirty physically active healthy male subjects (age = 23.0 ± 3.25 yrs, ht = 180.92 ± 5.87 cm, mass = 81.3 ± 15.9 kg) volunteered to participate. Each subject completed a preparticipation health history questionnaire to ensure that they were free from any lower extremity orthopedic, neurological, cardiovascular, or endocrine conditions. Subjects were then randomly assigned to a 1 of 3 treatment groups (saline infusion/cryotherapy, no saline infusion/ cryotherapy, or saline infusion/sham). Immediately following assignment, pain perception measures were scored every minute by during a 6 minute pre-treatment, 20 minute treatment, and 10 minute posttreatment period (36 total pain score measures). Immediately following each of the 36 pain score measures, subjects verbally stated if their perceived pain was the “same”, “better”, or “worse” than their previous pain score. **RESULTS:** There was no difference between what the subjects reported their pain as feeling and the subsequent stated pain ($F_{2,28} = 1.32$; $P = .28$). Statistically there was however a difference between each minute within each treatment (Tukey-Kramer, $P < .0001$). It is likely this difference is not practically significant considering the largest difference between what was scored and stated was about 0.55 mm. **CONCLUSION:** When examining experimentally induce pain or a 20-minute cryotherapy treatment on decreasing pain, the use of new 100 mm VASs and what an individual states about their pain every minute seems to produce fairly accurate results.

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19.

THE EFFECTIVENESS OF A THREE SET VS. ONE SET RESISTANCE TRAINING PROGRAM

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One of the main issues society has with weight training is the immense time commitment involved and the fact that we live in such a busy society. So far, research has suggested that one set could possibly be all that is necessary to achieve desired results in a weight training program. **PURPOSE:** The purpose of this study was to test if one set or multiple set training programs are more effective. **METHODS:** Eighteen males and females were recruited for the study, with 8 subjects completing the protocol (6 in the three set group and 2 in the one set group). Pre and post assessments were performed on body fat, resting energy expenditure (REE) and 5 different exercises to determine if there was improvement in overall strength. **RESULTS:** There was a 42% increase and 72% increase in strength, body fat was reduced 2.6% and 1.6%, REE was reduced by 251 kcals and 8 kcals, in three set and one set groups respectively. **CONCLUSION:** The results indicated that one's goal may determine the best method. If the primary goal is strength then one set is not only better but sufficient however, unexpectedly REE will not increase regardless of the method. If one's goal was to reduce body fat, the three set program is superior.

Key Words: Resting Energy Expenditure, Weight Training, One Set, Three Set, Body Fat
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GAITRite: LIMITATIONS AND GAIT VARIABILITY ACROSS MODES OF LOCOMOTION IN YOUNG ATHLETIC SUBJECTS

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The GAITRite System is a highly portable and convenient device used to measure pressure characteristics and spatial-temporal parameters during gait. The system consists of pressure sensors embedded in series in the 20-foot long walkway mat that relay analog signals to the GAITRite software. This software acquires pressure data at a frequency of 60 Hz and provides ordinal pressure data (7 levels) across each footfall. Although the GAITRite has been used fairly extensively to study spatial-temporal characteristics and gait variability as a proxy measure for dynamic stability and falls risk in older groups, little information is available on either the pressure-measurement capacity of the device or variability of spatial-temporal parameters in young, athletic groups. Therefore the purpose of this study was to determine whether there are limitations in the collection of data with the GAITRite system across differing modes of locomotion in athletes on the University of Kansas Track Team and to measure the variability in spatial-temporal gait characteristics for this group across differing modes of locomotion. Five male subjects (Age=21±1.6 yr; Ht=182±4.9 cm; Wt=73.0±7.3 kg) performed 3 trials of each of 5 modes of locomotion across the GAITRite mat (walk, fast walk, jog, single task (ST) narrow walk, and DT narrow walk). Subjects performed 3 trials of each mode listed above. The ST narrow walk consisted of a narrow base walk (50% ASIS distance) while the DT consisted of performing the narrow base walk while reciting the days of the week in reverse order. Comparison to previous usual walking data (Hollman et al, 2007) in older (81.0±5.9 yr) subjects:

Variable	Young Men (current study)		Older Population	
	Mean ± SD	Variability (COV)	Mean ± SD	Variability (COV)
Stride Length (cm)	166.0 ± 37.8	1.95	83.0 ± 160.0	NA
Stride Velocity (m/s)	1.12 ± 0.21	3.38	8.5	8.5

A ceiling effect was found with the GAITRite system in that pressure readings during jogging trials the highest (7) level was exceeded in 90% of steps. This young, athletic group also had higher stride length and velocity during usual walking and lower stride velocity variability, consistent with compromised dynamic stability, compared with the older group.

21.

EXERCISE EFFECTS ON THE LEVEL OF OXIDATIVE STRESS IN TYPE II DIABETIC MICE

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Diabetes mellitus type 2 has become a major health concern around the world, and in our nation has even become an epidemic. The metabolic changes associated with diabetes can lead to many devastating physiological results, including skeletal myopathy. **PURPOSE:** The purpose was to examine the effects of endurance training on skeletal muscle function, the level of oxidative stress, and blood glucose in Type 2 diabetic mice. **METHODS:** Twenty-eight mice were *db/db* Type 2 diabetic mice and 29 were non-diabetic controls. Both *db/db* and control mice were randomly divided into trained or untrained groups. The exercise protocol for both of the training groups was running on the treadmill at 16.3-24 m/min, 30 minutes per day, 5 days per week for 5-8 weeks. The untrained mice were limited to cage activity. At the end of training, data including body weight, blood glucose, tissue weight, and glutathione concentrations were collected. All data, except blood glucose, were analyzed via a 2 (training) x 2 (disease) factorial ANOVA. When appropriate Tukey's procedure was used for post-hoc tests. Post-training glucose was analyzed using a 2 x 2 ANOVA with pre-training weight as the covariate. **RESULTS:** The GSH/GSSG ratio was not significantly different diabetic mice and controls indicating that oxidative stress did not occur due to disease. Significantly higher reduced glutathione, GSH ($p=.0004$), and oxidized glutathione, GSSG ($p=.0001$) were observed in diabetic mice. Training had no effect on glutathione. Blood glucose levels were significantly ($p<.0001$) higher in diabetic mice, but training had no effect in either group. Body weight was significantly higher in diabetics than non-diabetics ($p<.0001$). Trained diabetics had a significantly ($p = .0128$) lower body weight than untrained mice. Training did not effect body weight of non-diabetic mice. No difference was observed in weight of the right vastus muscle tissue in relation to diabetes or training. **CONCLUSION:** The findings indicate that Type 2 diabetes did not cause oxidative stress. However, glutathione concentrations were increased in the skeletal muscle of diseased animals. Further research is necessary to investigate the mechanism of increased glutathione in Type 2 diabetic mice.

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22.

**INFLUENCE OF A 30 DAY PERIOD OF NONTRAINING ON
CARDIOVASCULAR DECONDITIONING OF ELDERLY STROKE SURVIVORS**

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Stroke survivors participating in a health related aerobic training program following a stroke may reduce their risk of developing secondary diseases and improve aerobic capacity and functional abilities. Unfortunately, many stroke survivors do not continue participating in such programs. **PURPOSE:** The purpose of this study was to investigate the cardiovascular changes that occur following a 30 day period of nontraining of elderly stroke survivors participating in a health related exercise program. Data was collected during exercise training sessions conducted at the Fort Hays State University Stroke Wellness and Research Center from 2003-2008. Breaks of 30 days are built into the Stroke Center's operating schedule concurrent with the academic calendar. **METHODS:** Two men and three women (age 73.4 ± 11.4) were included in the study. Prior to the deconditioning period, subjects were an average of 62.2 ± 47.63 months post stroke and had participated in the FHSU Stroke and Research Center's training for an average of 24.0 ± 19.7 months. A one group pretest and post test was conducted on select cardiovascular measures at rest, during aerobic training, and during recovery. Cardiovascular variables measured included heart rate, systolic and diastolic blood pressure, rate pressure product, rate pressure product per watt, mean arterial pressure, pulse pressure, cardiac index, vascular compliance and vascular resistance. Measurements were taken with a computer based blood pressure and cardiovascular monitoring system. Four subjects also completed a Physical Activity Level Questionnaire. **RESULTS:** Repeated measures ANOVAs showed a statistically significant decrease in exercise diastolic blood pressure ($p \leq 0.05$). Survey results showed subjects rated their physical activity during breaks as significantly lower ($p \leq 0.05$) than during periods of regular attendance (2.5 ± 0.50 and 4.00 ± 0.82). **CONCLUSION:** The results indicate that although elderly stroke survivors report significantly lower physical activities levels during breaks from training, exercise diastolic blood pressure was the only variable to be significantly affected by 30 days of nontraining in the subject group investigated.

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23.

ACUTE EFFECTS OF STATIC, DYNAMIC AND COMBINED STRETCHING ON POWER AND RATE OF FORCE DEVELOPEMENT

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Pre-exercise stretching is commonly employed in warm-up activities. While controversial, recent evidence suggests that static stretching may decrease muscle power and rate of force development. **PURPOSE:** To compare the effects of static (SS), dynamic (DS), static followed by dynamic (SDS), and dynamic followed by static (DSS) stretching on peak power and rate of force development during leg extension and vertical jump activities. **METHODS:** Nine men (19-36 ys. old) performed the following pre-exercise activities in randomized order: No stretching (NS), SS, DS, SDS, and DSS over a period of two weeks. Static and dynamic stretching protocols each consisted of seven separate movements or positions corresponding to the same muscle groups. Each static stretch was held for thirty seconds for each limb and the dynamic stretches were repeated ten times for each limb. Following the pre-exercise activity, subjects performed five leg extensions at 60% of their 1-repetition maximum and five vertical jumps with a counter movement. Peak power (PP) and rate of force development (RFD) were measured during both exercises. Due to the fact the data was not normally distributed, a Friedman non-parametric test was performed with an alpha level set at $P < 0.05$. **RESULTS:** Results are presented in the table below as Mean \pm SEM.

Treatment	PP - Leg Press (Watts)	RFD - Leg Press ($N \cdot S^{-1}$)	PP - Vertical Jump (Watts)	RFD - Vertical Jump ($N \cdot S^{-1}$)
NS	1501 \pm 104	2771 \pm 466	5417 \pm 276	8755 \pm 1399
SS	1502 \pm 100	2241 \pm 251	5419 \pm 266	8329 \pm 1227
DS	1595 \pm 102*†‡	2724 \pm 395	5657 \pm 292	8909 \pm 1268
DSS	1550 \pm 122	2693 \pm 332	5307 \pm 193	9173 \pm 1318
SDS	1590 \pm 114†	2579 \pm 326	5548 \pm 271	9759 \pm 1175

* - indicates significantly different than NS, † - indicates significantly different than SS, ‡ - indicates significantly different than DSS.

CONCLUSION: These data suggest that static stretching does not inhibit muscle performance compared to no stretching; however, dynamic stretch may improve muscle power.

BONE TURNOVER RESPONSE TO RESISTANCE-TRAINING

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Resistance-trained athletes have significantly greater bone mineral density (BMD) than endurance trained athletes. Alterations in the balance between bone formation and resorption are critical for long-term changes in BMD and bone mineral content (BMC) to occur. **PURPOSE:** The objective of the study was two-fold: 1) to determine the acute response of serum bone turnover markers and hormones to a single bout of resistance-training (RT); and, 2) to compare the effects of fasting versus feeding to the hormonal and bone turnover response following RT. **METHODS:** Three recreationally active males, aged 24-34, participated in the study. Subjects completed both fasted (RT-) and fed (RT+) trials between 06:00 and 08:00 am. For the fed trial, a dietary supplement was ingested two hours prior to exercise and consisted of 500-kcal, 12-g of fat, 80-g of carbohydrate, 9-g of protein, 500-mg of calcium, and 240-IU of vitamin D. RT consisted of three sets of ten repetitions for eight exercises at 60% (first set) and 80% (second and third sets) of one-repetition maximum (1-RM). Blood was drawn immediately prior to exercise (baseline), immediately following exercise (0-min), 15-min, 30-min, 60-min, 120-min, and 24-hr following exercise. Total testosterone (T), intact parathyroid hormone (iPTH), and cortisol (COR) were determined using chemiluminescent immunoassay. Serum bone-specific alkaline phosphatase (BAP) and tartrate resistant alkaline phosphatase, isoform 5b (TRAP-5b) were measured using ELISA. Results are expressed as percent change relative to baseline. A one-tailed t-test was used to determine if percent changes relative to baseline were significant. Data are presented as means \pm standard deviation. **RESULTS:** BAP was suppressed following feeding when compared to a 10-hr fast (8.07 ± 3.29 versus 21.60 ± 2.17 U/L). Following RT-, BAP decreased significantly by $14.8 \pm 3.2\%$ at 60-min ($p < 0.01$), COR decreased by $27.1 \pm 4.4\%$ at 0-min ($p < 0.05$), and iPTH decreased by $41.1 \pm 2.0\%$ at 15-min and by $56.8 \pm 8.7\%$ at 30-min ($p < 0.05$). Following RT+, COR decreased by $24.3 \pm 6.8\%$ at 30-min ($p < 0.05$) and increased by $26.1 \pm 8.3\%$ at 24-hr ($p < 0.05$). Intact PTH decreased by $41.3 \pm 5.2\%$ by 15-min and by $24.3 \pm 13.1\%$ by 60-min ($p < 0.05$). **CONCLUSION:** Bone formation was suppressed following feeding when compared to a 10-hr fast. Bone formation increased following RT, regardless of feeding state. Both COR and iPTH decreased following RT. Caution must be used when interpreting these results because the inter-individual variation in bone turnover markers and hormones was large. However, based on these preliminary results, RT appears to be a viable exercise-based intervention for maintenance of BMD in men.

25.

COMPARISON OF EXERGAMING TO TRADITIONAL VIDEO GAMES ON MOOD, ATTENTION, AND SHORT-TERM MEMORY

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Two factors linked to childhood obesity are lack of free-time physical activity and increases in “screen time”, including television, computer use, and video game activity. Yet, while the Surgeon General’s Call to prevent childhood obesity (USDHHS, 2004) has cited these factors as culprits, a concurrent development in the video game industry has been interactive video game technology (IVGT) or ‘exergaming’. Since regular exercise is shown to have affective benefits, there is potential that exergaming may produce additional benefits including improvements in concentration and short-term memory (STM) that might be of interest to exercise scientists and physical educators. **PURPOSE:** the purpose of this study was to determine whether a single bout of exergaming benefited short-term psychological factors including mood, concentration, and STM compared to traditional video game activity. **METHODS:** One-hundred and five children from a local school district were divided into an exergaming group (EG) (n=59; age=10.75 .88yr) or a traditional video game group (VG) (n=46; age=9.59 2.06 yr). Subjects in the exergaming group participated in 30 minutes of activity on an interactive video game cycle ergometer at a self-selected intensity. Subjects in the control condition played 30 minutes of traditional video game activity. In all conditions, subjects completed several affective measures at pre- and post-activity including the Positive Affective Negative Affect Schedule for Children (PANAS-C), a 60-second concentration grid exercise, and a digit span recall test for STM. **RESULTS:** A series of 2 x 2 mixed-design ANOVAs were performed to examine the effects of condition (exergaming, control) and time (pre-activity, post-activity) on positive affect (PA) and negative affect (NA), concentration, and STM. A significant main effect for condition was found for PA ($F(1,103) = 14.94, p < .001$) and concentration ($F(1,103) = 11.84, p < .001$), indicating the exergaming group had higher PA and concentration at both time periods. For STM however, a significant time x condition interaction was found ($F(1,103) = 4.03, p < .05$), indicating that STM increased from pre-post activity for the exergaming group, while STM decreased from pre-post activity for the video game group. **CONCLUSION:** Results indicate that there may be transient cognitive benefits for children who engage in exergaming activity similar to cognitive and affective benefits found in traditional exercise. Future work should examine affective benefits through more extended usage of exergaming.

A COMPARISON OF TWO PRE-SEASON MEASURES OF BODY WEIGHT, PEAK TORQUE, AND PERCENT DECLINE IN COLLEGE WRESTLERS.

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(Sponsor: B.H. Jacobson FACSM)

PURPOSE: The purpose of this study is to determine if there is a difference between two pre-season measures of body weight (BW), peak torque (PT) and percent decline (PD) in college wrestlers. **METHODS:** Eight Division I collegiate wrestlers volunteered for participation in this study. The wrestlers BW was recorded along with PT and PD of the quadriceps femoris at 180 %/sec using a Biodex II isokinetic machine. The subjects completed fifty maximal leg extensions at 180 %/sec. Peak torque was recorded as the greatest amount of torque produced during any one repetition and PD was determined by taking the initial PT minus the final PT divided by the initial PT. T-tests were used to determine if significant ($p < 0.05$) changes occurred in these measures between one year of pre-season measures and the following year of pre-season measures. Both recording times were scheduled during the second week in November. **RESULTS:** The results of the study indicated that there was a significant ($p > 0.05$) increase in PT from the first pre-season measure compared to the following pre-season measure. There was no significant ($p > 0.05$) change in BW or PD between the two years. **CONCLUSIONS:** The results suggest that the off season training programs are significantly increasing strength in the lower extremity without compromising the wrestlers body weight. The lack of significant change in PD indicates that even though PT was increasing the final PT during the 50 rep test had also increased. This is important information for the coach and the strength training staff showing that the training programs are having a positive impact on strength.

27.

THE EFFECT OF MUSIC ON VO₂ MAX ASSESSMENT

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There has been little research done on the affects of music at a maximal level of intensity during aerobic exercise. **PURPOSE:** The purpose of this research was to determine if listening to music increases an individual's ability to perform at a higher intensity during a VO₂max assessment. **METHODS:** Eight participants (6 males and 2 females) 22 yrs, completed a VO₂max test using the Bruce protocol with or without music in random order. The RPE, RER, and heart rate were used to confirm the subjects were at maximal level. The VO₂ max from each subjects test were compared to see if there was an increase in the subjects V02max while listening to music. **RESULTS:** There was a mean increase of .42 ml/kg/min (48.63 vs 49.05 ml/kg/min) when listening to music during a maximal aerobic test. A paired T-test was conducted to determine if the means were actually different [T=.46]. **CONCLUSION:** From the data collected there was no difference in VO₂ max of individuals performing a maximal aerobic test while listening to music.

28.

BODY WEIGHT AND METABOLIC SYNDROME AT FOLLOW-UP TO A WEIGHT MANAGEMENT PROGRAM

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After an exercise program, many individuals revert back to a sedentary lifestyle which may cause a return of the metabolic syndrome. **PURPOSE:** The purpose of this study was to evaluate components of the metabolic syndrome as well as physical activity (PA) habits of subjects approximately one-year following completion of a weight management study. **METHODS:** Eleven subjects (5 male and 6 female) who successfully completed the weight management study were contacted 12-18 mo post program. In the initial study overweight individuals with the metabolic syndrome underwent a diet- and exercise-induced reduction in body weight (10%) followed by a period of controlled partial weight regain (50% of weight lost). At 12-18 mo follow-up, four subjects were classified as high active (high PA) and seven as low active (low PA) using the Paffenbarger Physical Activity Questionnaire and pedometers; high PA >10,000 steps/d or >23kcal/kg body wt/wk, and low PA <10,000 steps/d or <23kcal/kg body wt/wk. Measurements consisted of body weight (kg), body mass index (BMI) (kg/m²), body fat % (BF%) (three-site skinfold), waist circumference (WC), waist-hip-ratio (WHR), abdominal adipose tissue (AT) assessed via computed tomography (CT), BP, insulin sensitivity, and plasma lipids. Data was analyzed using a two-way ANOVA, time (post-study, follow-up) x group (high PA, low PA); **RESULTS:** With all subjects combined (n = 11), body weight was not significantly different between post-study and follow-up (89.7±4.0 vs. 91.1±4.9 kg), and BMI followed this pattern (30.7±1.3 vs. 31.2±1.8 kg/m²). However, there was a significant interaction on these two variables, indicating the high PA group was better at maintaining body wt (p=0.03) and BMI (p=0.03) during the follow-up period. Post hoc analysis revealed a trend for significance when comparing the changes in body weight during the follow-up period by group (89.4±6.9 to 84.5±8.2 kg for high PA group; 89.9±5.2 to 94.8±6.2 kg for low PA group). Additionally, in the combined group, body fat % was significantly increased at follow-up (32.3±2.3 vs. 36.0±2.2 %). The high PA group had decreased fasting glucose and the low PA group had increased BMI, triglycerides (TG), total abdominal AT (TAT), subcutaneous AT (SAT), and visceral AT (VAT) at follow-up. At follow-up, the high PA group had superior BMI, BF%, WC, TAT, SAT, and low density lipoprotein-cholesterol (LDL-C) values when compared to the low PA group. **CONCLUSION:** These results suggest that individuals completing a weight management program may have difficulty maintaining body weight and metabolic syndrome variables unless they continue to be physically active.

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29.

FED AND FASTED EFFECTS OF PLYOMETRIC EXERCISE ON HORMONES AND BONE TURNOVER MARKERS

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PURPOSE: Bone responds to impact and strain forces, such as those induced by high-intensity exercise, by up-regulating bone remodeling. Alterations in the balance between bone formation and resorption are essential for changes in bone density and mineral content to occur. The objective of the study was two-fold: 1) determine the acute response of serum bone turnover markers and hormones to a single bout of high-intensity plyometrics (PLY); and, 2) compare the effects of fasting vs. feeding on the bone turnover response to PLY. **METHODS:** Three recreationally active males, aged 24-34, participated in the study. Subjects completed fasted (PLY-, 10 hr) and fed (PLY+, 2 hr pre-exercise) sessions in random order between 06:00 and 08:00 am. PLY consisted of 1 set of 10 repetitions for 12 jumping exercises, separated by a 10 second rest between jumps and a 2 minute rest between sets. Blood was drawn immediately prior to exercise (baseline), immediately following exercise (post), 15 min, 30 min, 60 min, 120 min, and 24 hr following exercise. Total testosterone (T), intact-parathyroid hormone (iPTH), and cortisol (COR) were determined using a chemiluminescent immunoassay. Bone-alkaline phosphatase (BAP, marker of formation) and tartrate-resistant alkaline phosphatase, isoform 5b (TRAP-5b, marker of resorption) were measured in the serum by ELISA. Results are expressed as percent change relative to baseline. A one-tailed t-test was used to determine if percent changes were significant. Data are presented as means \pm SD. **RESULTS** Following plyometric exercise, BAP was significantly suppressed 15 and 60 min during fasting ($p < 0.05$), however no difference from baseline were found in the fed condition. TRAP-5b was suppressed in both the fasted (24 hr, $p < 0.01$) and fed states (15 min, $p < 0.05$). T significantly declined at 15, 30 ($p < 0.05$) and 60 min post exercise ($p < 0.001$) in the fasted trial, but was only significantly below baseline at 60 min in the fed trial ($p < 0.005$). At 30 and 60 min post for the fasted and 60 and 120 min for the fed trial, cortisol fell significantly below pre exercise levels, ($p < 0.005$). No significant changes in iPTH were observed under either dietary condition. **CONCLUSIONS:** Individual variation in the hormone and bone turnover marker response to plyometric exercise is large. It appears that the post exercise effects on bone turnover markers and hormones measured have a greater change from baseline in the fasted versus fed state. However, due to the small sample size and large inter-individual variation, additional data will be needed to provide more definitive conclusions.

EFFECTS OF SHORT-TERM HMB SUPPLEMENTATION ON QUADRICEPS PEAK TORQUE FOLLOWING AN OVER-REACHING TRAINING PROTOCOL

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PURPOSE: The purpose of this study was to determine the extent of muscular fatigue and reduction in performance due to a rigorous strength training protocol and to determine if Creatine is effective in curbing any reductions in performance. **METHODS:** Peak torque (PT) and Percent Decline of the quadriceps were examined using an isokinetic dynamometer. Thirteen apparently healthy college-aged male participants with prior weight training experience were randomly assigned supplementation with HMB (n=7; age = 22.14) or supplementation with placebo as a control (n=6; age = 22.00). Supplements were given to the participants for 10 days. Participants started supplementing 3 days prior to beginning the workouts and stopped supplementing 2 days after ending the workouts. Participants underwent pre-testing and post-testing on the isokinetic dynamometer. The isokinetic test involved 50 maximal leg extensions of the dominant leg. Following pre-testing the participants performed a lower body workout for 5 days designed to fatigue the quadriceps muscles. The workout involved 5 to 6 sets of high weight, low repetition strength training. Post-post testing was completed 3 days following completion of the strength training. **RESULTS:** There was no significant change in PT or Percent Decline following 5 days of the over-reaching strength training protocol for either group ($p>0.05$). **CONCLUSION:** Creatine has been reported to aid in muscle recovery following strenuous exercise. Our results indicate no decline in PT or Percent Decline when Creatine was supplemented during an over-reaching training protocol. Results of this study also indicate no significant decrease among the placebo group. It is possible that the training protocol did not allow for muscle exhaustion, thereby affecting the results. Also, the control group may have performed at a higher level than expected due to a placebo effect.

31.

HEAT AND VASODILATION IN FEMALE RATS

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PURPOSE: The purpose of this study is to determine the effects of temperature on vasodilation during elevated temperature. **METHODS:** The femoral arteries of 8 F344 rats, 2-3 months old were dissected out and cut into 2mm sections. These sections were isolated and submerged in a Krebs-Henseleit solution. Artery tension maximums (g) were established using Potassium Chloride and norepinephrine length tension curves. To precontract the vessels, they were treated with Phenylephrine, (10^{-5} M). Acetylcholine (ACh) was then applied in a concentration dependant manner ($10^{-7.5}$ to 10^{-5} M). The concentration response curves were fit with nonlinear regression and the EC50 and slope were calculated. **RESULTS:** The EC50 at 37°C (-6.48 ± 0.06 logM ACh) and 41°C (-6.48 ± 0.11 logM ACh) were not different. However, the slope at 37°C (-1.17 ± 0.06 g/logM ACh) was lower than the slope at 41°C (-1.39 ± 0.06 g/logM ACh; $p < 0.05$). **CONCLUSION:** In the femoral artery, vasodilation is enhanced in female rats by heat.

YEASTS AND MOLDS FOUND IN PROTECTIVE ATHLETIC MOUTH GUARDS AND POSSIBLE DISEASE IMPLICATIONS

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Protective athletic mouth-guards (PAM) are currently required equipment in many contact sports, including American football. While PAM have been found to protect athletes' teeth, little is known about the microorganisms that such devices may harbor and potentially transmit to the wears. **PURPOSE:** The purpose of this study was to examine PAM for the presence of yeasts and molds and to relate the microorganisms to potential oral and respiratory diseases. **METHODS:** Sixty-two Division 1 football players were divided into 4 groups with 2 groups wearing their PAM all season and the other two groups having their PAM changed at mid-season. All PAM were collected at the end of the season. Each device was analyzed for the presence of yeasts and molds by cutting the PAM and touching its surfaces and depths to Sabourauds dextrose agar. The cultures were allowed to incubate at room temperature for two weeks. Positive cultures were analyzed using standard identification methods, including molecular techniques. **RESULTS:** A total of 84 PAM were retrieved during the entire study from all groups. These PAM yielded a total of 21 yeasts and 108 molds. The most common species of yeasts were *Rhodotorula muciliginosa* (7) and *Candida parapsilosis* (9) while the most common species of molds were *Penicillium chrysogenum* (11) and *Cochliobolus spp.* (10). These microbes along with all of the other isolates have been implicated as either pathogenic or opportunistic in producing oral and respiratory diseases, including exercise-induced asthma (EIA). **CONCLUSION:** The results of this study confirm that PAM act as reservoirs for both yeasts and molds and may be a source for both oral and systemic diseases, including allergic reactions.

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33.

THE EFFECTS OF A 12-WEEK EXERCISE PROGRAM ON FUNCTIONAL STRENGTH, FITNESS, AND MEMORY

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With increasing life expectancy, the fastest growing segment of our population is older adults, especially those over 85. There is a definite need to develop programming to help older adults maintain their independence. **PURPOSE:** The purpose of this study was to evaluate the impact of a 12-week exercise program for older adults on functional strength, functional fitness, body composition, and memory. **METHODS:** Nineteen older adults (71 ± 6.5 y) participated in the program. The exercise program (60 min, 3 d-w⁻¹ for 12 wks) consisted of flexibility, balance, strength, and cardiovascular components. The Senior Fitness Test, handgrip strength, hip and waist circumference, sagittal abdominal diameter, and Weschler's Memory Scale were assessed pre- and post-exercise program. **RESULTS:** A doubly multivariate ANOVA showed significant time effects for waist circumference, functional strength, functional fitness, and memory (all $p < .01$). Waist circumference decreased from 95.00 ± 12.66 cm to 89.41 ± 12.15 cm ($p < .0001$). The chair stand test improved from 12.42 ± 3.93 repetitions to 14.84 ± 3.08 repetitions ($p < .01$). The arm curl increased from 13.47 ± 3.88 repetitions to 16.42 ± 3.32 repetitions ($p < .01$). Handgrip strength increased from 20.47 ± 7.58 kg to 29.32 ± 8.78 kg ($p < .0001$). The 8-foot up-and-go test decreased from 5.27 ± 1.33 s to 4.67 ± 1.12 s ($p < .001$). The 6-minute walk test distance increased from 532.36 ± 87.93 ft to 598.63 ± 90.01 ft ($p < .0001$). Immediate memory increased from 106.11 ± 14.68 to 113.63 ± 15.31 ($p < .01$). Delayed memory increased from 109.05 ± 15.02 to 118.21 ± 13.91 ($p < .0001$). Total memory increased from 107.05 ± 14.69 to 115.84 ± 14.43 ($p < .0001$). **CONCLUSIONS:** The results indicate that the 12-week exercise program was successful in improving functional strength, functional fitness, and memory.

34.

BONE RESPONSE TO VARIED DOSES OF BICYCLING

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This study was designed to investigate the relationship between bone mineral density (BMD) and training volume (TV) in adult male cyclists. **METHODS:** Six male participants (37.8 +/- 6.4 yrs) were tested in duplicate, 12 weeks apart, for BMD at four sites: total body (TB), lumbar (L), hip (H), and distal radius (R). Participants were also measured for weight, % body fat, and VO_{2max} . TV, in hours, over the 12 weeks was also recorded for each participant at their usual level. **STATISTICS:** Dependent t-tests were performed for all measurements to analyze changes over time. Mean values for all BMD measurements, weight, VO_{2max} , and % body fat were calculated for each participant. Pearson's correlation coefficients were calculated for all mean BMD measurements against TV and also against weight. **RESULTS:** Mean scores were found for TV (8.01 +/- 3.75 hr/wk), VO_{2max} (4526.00 +/- 303.09 ml), weight (77.12 +/- 17.53 kg), and % body fat (17.46 +/- 6.33 %). BMD for R was found to be different over time ($t = -3.55$, $p < 0.05$). No differences were found in other BMD measurements (TB, L, or H), weight, % body fat, or VO_{2max} over time. No significant correlations were found between any mean BMD measurement (TB, L, H, R) and TV ($r = 0.267$, $r = 0.145$, $r = -0.159$, $r = 0.464$). No significant correlations were found between any mean BMD measurement (TB, L, H, R) and weight ($r = 0.258$, $r = 0.502$, $r = 0.565$, $r = -0.273$). **CONCLUSION:** These results suggest that there is no significant relationship between BMD and training volume in adult male cyclists. Therefore, training volume is not predictive of BMD in adult male cyclists. BMD appears to be dependent on factors other than those tested in this study. However, further study over a longer training period is needed to investigate this possible relationship more thoroughly. In addition, this study will seek to include a greater number of participants to increase the statistical power of its findings.

35.

USE OF SINGLE LIMB EXERCISE TRAINING TO IMPROVE CARDIOVASCULAR FUNCTION IN CHRONIC STROKE.

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Blood flow regulation may be influenced by physical activity levels and metabolic demand. For people post-stroke, a sedentary lifestyle and decreased use of the hemiparetic limb may affect blood flow to the affected lower limb. In our previous work, we found significant differences in resting femoral artery diameter and blood flow velocity in the hemiparetic limb when compared to the less affected side. In an attempt to improve cardiovascular function, a single limb exercise (SLE) protocol that focused on the hemiparetic limb was used for the training intervention. **PURPOSE:** The purpose of this study was to describe the effect of a SLE training protocol on oxygen uptake (VO_2), femoral artery diameter, and blood flow velocity in the hemiparetic limb in people post-stroke. **METHODS:** Ten individuals (5 males, 61.5 ± 11.7 years of age; 50.8 ± 59.7 months post-stroke) with mild to moderate stroke (lower extremity Fugl-Meyer score: $26.7/34 \pm 3.3$) participated in the study. Doppler ultrasound was used to assess femoral artery diameter and blood flow velocity at three timepoints (baseline, midpoint, post-intervention). Participants performed SLE training using only the hemiparetic limb 3 times per week for 4 weeks using a Biodex System knee extension/flexion exercise protocol with a pace of $150^\circ \cdot \text{sec}$ at 40 repetitions per set. Oxygen uptake (VO_2) during SLE was assessed at baseline and post-intervention. Statistical significance was set at $\alpha \leq 0.025$. **RESULTS:** Using repeated measures ANOVA, significant improvements for femoral artery diameter (baseline: $0.89 \text{ cm} \pm 0.03$ (SE) vs post SLE: $0.97 \text{ cm} \pm 0.03$; $p < 0.001$) and blood flow velocity (baseline: $67.35 \text{ cm} \cdot \text{sec}^{-1} \pm 4.38$ (SE) vs post-SLE: $76.7 \text{ cm} \cdot \text{sec}^{-1}$; $p < 0.001$) were found in the hemiparetic limb after SLE training. No significant increases were observed in femoral artery diameter ($p = 0.12$) or blood flow velocity ($p = 0.24$) for the untrained limb. During submaximal exercise, VO_2 peak decreased after the intervention by 24.4% (baseline: 7.0 ± 0.6 (SE) to $5.3 \pm 0.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$; $p = 0.015$). **CONCLUSION:** These data suggest that SLE improves femoral artery adaptations in hemiparetic lower extremity following stroke. SLE training focused on the hemiparetic limb may be considered as an effective intervention for people post-stroke to improve blood flow and oxygen uptake for performing daily functional activities.

Disclosures: None

36.

EFFECTS OF EXERCISE-INDUCED DEHYDRATION ON ANAEROBIC CAPACITY AND PERFORMANCE IN COLLEGIATE WOMEN BASKETBALL PLAYERS

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A typical college basketball game includes 40 minutes of playing time over a period of 2 hours and requires both the anaerobic and aerobic energy systems to perform the activities that occur within the game. Athletes may become dehydrated if they do not take in sufficient fluids to offset the fluid loss. Since basketball is a game of fast action and swift moves, it is important to establish if dehydration causes a decline in skills and associated movements. **PURPOSE:** The purpose of this research is to test the hypothesis that 2.5% dehydration decreases anaerobic capacity and performance in collegiate women basketball players. **METHODS:** Participants were 10 women basketball players from the University of Central Missouri between the ages of 18 and 23 years, (mean = 20.20 yr). A urine specific gravity test was used to ensure participants were initially hydrated between the values of 1.00 to 1.02. The subjects shot 20 free-throw shots with the ball being bounced to them as though they were in an actual game, and their anaerobic power was assessed using the Wingate test pre- and post-dehydration. Exercise-induced 2.5 % dehydration was done by having the subjects ride a mechanically braked bike at moderate intensity in a heat-controlled room with the temperature at 29°C. **RESULTS:** Although some participants were affected by the loss of water, exercise-induced dehydration did not decrease anaerobic power. Free-throw shots is the only variable that approached statistical significance ($p=.07$). The mean number of shots when subjects were hydrated was 13.4 versus 12.3 when dehydrated, (mean difference of ± 1.1) which could ultimately influence the outcomes of games. **CONCLUSION:** Based on the results of this study dehydration of 2.5% does not change basketball performance or anaerobic capacity in collegiate women basketball players.

37.

STRIDE PHASE KINEMATICS IN YOUTH BASEBALL PITCHERS AND THEIR RELATION TO OVERUSE INJURIES

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Coaches try to reduce the number of injuries sustained by youth baseball pitchers by teaching proper mechanics at a young age. Unfortunately, the mechanics taught to beginning pitchers are based on data from adolescent and adult pitchers and may result in techniques that could injure young pitchers. **PURPOSE:** The purpose of this study was to quantify pitching kinematics in pitchers under the age of ten and discuss how the kinematics may relate to common overuse injuries observed in young pitchers. **METHODS:** Nine pitchers (age: 9 yrs, height: 1.1 ± 0.09 m, mass: 36.8 ± 0.78 kg) participated in this study. Testing protocols were explained to each pitcher and their parent(s) who all provided consent. Reflective markers were attached to each participant before throwing three fastballs for strikes toward a catcher located 13.4 m from a pitching mound. Each pitch was digitally recorded by three synchronized video cameras (120 Hz) and each participant was allowed a 60 s rest between trials. Following testing, marker locations were digitized in each frame and the three-dimensional location of each marker was calculated using DLT. Linear displacement data were filtered independently in each axis using a 2nd order Butterworth filter set at a cut-off frequency of 13.0 Hz. Standard techniques were used to calculate pitching motion kinematics. **RESULTS:** During the stride, the velocity of forward trunk rotation increased from $267.7^\circ/\text{s} \pm 192.7^\circ/\text{s}$ to $644.3^\circ/\text{s} \pm 339.8^\circ/\text{s}$, the throwing shoulder was abducted from $87.5^\circ \pm 3.6^\circ$ to $100.2^\circ \pm 3.8^\circ$ and the elbow was flexed from $133.6^\circ \pm 11.8^\circ$ to $101.1^\circ \pm 11.2^\circ$. Horizontal abduction of 4.7° was observed for the initial 68% of the stride phase. Upon reaching the angle of greatest horizontal abduction, all participants horizontally adducted the shoulder back toward the neutral position. Internal rotation of the shoulder was observed for 15% of the stride phase with the throwing shoulder moving from an angle of $32.3^\circ \pm 52.7^\circ$ to an angle of $9.2^\circ \pm 46.1^\circ$. From this point, through the remainder of the stride, the throwing shoulder was externally rotated to an average angle of $81.8^\circ \pm 30.2^\circ$. **CONCLUSION:** The data indicate that unlike older pitchers, pitchers less than ten years of age have the propensity for placing the throwing shoulder in an unstable position by internally rotating it during the stride. When internal shoulder rotation is repeatedly displayed during the stride, higher levels of activity are likely required from the biceps and supraspinatus. The underdeveloped nature of these muscles in young pitchers and may result in them being placed in a position of increased risk for developing overuse tendonopathies.

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38.

PROMOTING PHYSICALLY ACTIVE TROOP MEETINGS IN GIRL SCOUTS

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Many children fail to achieve sufficient levels of physical activity, and girls tend to be less active than boys. Further, physical activity tends to decline in adolescence. **PURPOSE:** This study evaluated the effect of an intervention delivered through Girl Scouts Juniors troops that was designed to create more active troop meeting environments. **METHODS:** Seven Girl Scout troops were randomized to intervention (n = 3, with 34 girls) or standard care control (n = 4, with 42 girls) conditions. Girls ranged in age from 9 to 13 years. Intervention troop leaders were trained to implement policies to promote physical activity opportunities at troop meetings. **RESULTS:** Intervention troops were successful in providing greater opportunities for physical activity relative to control troops. Intervention troop leaders promoted physical activity in the troop meetings more frequently than control troop leaders. **CONCLUSION:** Implementing policies to provide more healthful environments in Girl Scouts troop meetings appears feasible on a broader scale.

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A PROPOSED SCORING SYSTEM FOR QUANTIFICATION OF METABOLIC SYNDROME SEVERITY

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Metabolic syndrome (MetS) is a significant risk factor for cardiovascular disease, type 2 diabetes, and mortality. Currently, there is no established tool to quantify severity of MetS. Furthermore, it is unclear which trait(s) contribute the most to MetS presence. **PURPOSE:** The aims of the current study were to establish a scoring system for assessing presence and severity (number of traits) of MetS and to determine the most influential contributor to the incidence of MetS. **METHODS:** Overweight and sedentary adults (N=208) were obtained from previous exercise intervention studies at the University of Missouri and the University of Kansas. Measurement were obtained for the following traits: waist circumference (WC), fasting glucose (FG), high density lipoprotein cholesterol (HDL-C), systolic blood pressure (SBP), triglycerides (TG), body mass index (BMI), C-reactive protein (CRP), tumor necrosis factor α (TNF α), percent body fat (% fat) and aerobic capacity (VO₂max). Two MetS scoring systems were formulated: one including all five current NCEP ATP III MetS criteria (5score) and one including all 10 variables (10score). Traits were divided into quartiles with points assigned according to worsening metabolic profile. Additionally, weighted multipliers were added to reflect relative risk of each trait. MetS score was defined as the summary score of all traits. **RESULTS:** 5score displayed a sigmoidal relationship with MetS whereas 10score was linearly related to MetS risk. Both 5score ($r^2=0.74$) and 10score ($r^2=0.23$) were significant predictors of MetS severity (both $p<0.0001$). Backward elimination and forward selection revealed traits contributed to MetS in the following order: for women, HDL-C>FG>TG>SBP>WC, for men, TG>FG>WC>SBP>HDL-C, and combined TG>FG>HDL-C>SBP>WC. According to forward selection, HDL-C explained 21% ($p<0.0001$) of the null deviance in women and was the most influential factor for MetS incidence. TG was determined to be the most influential factor in men and combined, accounting for 34 and 27% of the null deviance, respectively (both $p<0.0001$). **CONCLUSIONS:** 5score and 10score are significant predictors of MetS presence and severity. Inclusion of redundant markers for obesity and inflammation in 10score may have weakened its relationship to MetS. Additionally, MetS traits behave differently between genders. HDL-C is the most influential contributor to incident MetS in women, whereas TG is the most influential factor in men and combined genders.

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