2012 Annual Meeting

CENTRAL STATES CHAPTER

OF THE

AMERICAN COLLEGE OF SPORTS MEDICINE

October 18th-19th, 2012
Hilton Garden Inn
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American College of Sports Medicine

CENTRAL STATES CHAPTER ANNUAL MEETING

AMERICAN COLLEGE of SPORTS MEDICINE®
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CONTENTS

Welcome to the 2012 Central States Chapter ACSM Conference. This year's conference will be emphasizing resistance exercise for health and performance as well as human-pet interactions and implications for physical activity. Thursday will start off with a presentation from a pioneering leader in the field, Dr. Tom LaFontaine, who will share his experiences using exercise as a treatment for people at risk for chronic diseases. Dr. Bryan Mann from MU will give an applied lecture on advanced resistance exercise techniques that can improve performance in both athletes and normal populations. Dr. Phil Gallagher from KU, will then provide a synopsis of the cellular effects of resistance exercise in skeletal muscle with a focus on the aging population. Together, Drs. Mann and Gallagher will provide a translational view of resistance exercise techniques and cellular outcomes. The next two speakers will be researchers who investigate how human-dog interactions impact physical activity and health. Dr. Rebecca Johnson from MU will show her research related to community based dog walking programs and their impact on meeting physical activity recommendations. Dr. Johnson's colleague from the Centers of Disease Control, Dr. Jacqueline Epping, will then discuss how dog walking can improve health outcomes. The afternoon speaking sessions will finish off with some excellent student research presentations before transitioning to the social hour and poster session featuring over 70 posters. Finally, be sure to cheer on the Quiz Bowl teams who will be competing for a trip to national ACSM.

Leading off Friday will be Dr. Craig Emter from MU, who will provide the latest data on exercise and treatment of heart disease. Dr. Scott Rector also from MU, will give us an update on exercise for the treatment of non-alcoholic fatty liver disease. We will then have 2 breakout sessions. One session will focus on sports medicine and will include Dr. Aaron Gray from MU discussing the epidemic of ACL injuries in female athletes followed by Dr. Phil Vardiman, from KU presenting his research on medical care in international Olympic caliber athletes. The other breakout session will be focused on metabolic and cardiovascular outcomes. Dr. Pam Hinton from MU will present her research linking obesity and insulin resistance to bone health while Dr. Jaume Padilla, also from MU, will show his research related to exercise and endothelial health. We will then have a lunch along with the Gatorade Sponsored talk presented by Monique Ryan, RD, a sports nutritionist, who will give us the latest information on sports nutrition research and practice. Following lunch we will have a business meeting for professionals and a student session focused on the ups and downs of pursuing a doctoral degree. The last sessions will be Dr. Steve Sayers from MU presenting his research on power training for older adults while Drs. Jeremy Barnes and Jason Wagganer from SEAMO will meet with the students to discuss fitness certifications.

I hope that you enjoy the meeting.

John P. Thyfault, PhD
Past-President CSC ACSM

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Central States Chapter
of the
American College of Sports Medicine
FALL 2012 MEETING SCHEDULE
HILTON GARDEN INN, COLUMBIA MO

THURSDAY, OCTOBER 18TH, 2012

		Location
10:00-11:45	Registration - Lobby	
11:45-12:00	Opening Remarks John Thyfault, Past-President CSC ACSM	Cypress/Sycamore
12:00-12:45	Tom LaFontaine, PhD – Optimus Fitness, Columbia, MO Title: Resistance Training in Clinical Practice	Cypress/Sycamore
12:45-1:30	J. Bryan Mann, PhD – Assistant Professor, University of Missouri Title: Velocity Based Training	Cypress/Sycamore
1:30-1:45	Break	
1:45-2:25	Phil Gallagher, PhD – Associate Professor, University of Kansas Title: Resistance exercise, aging, and skeletal muscle.	Cypress/Sycamore
2:30-3:05	Rebecca Johnson, PhD, RN, FAAN – Professor, University of Missouri Title: Meeting PA Recommendations: Generalizability of Dog Walking Programs for Communities.	Cypress/Sycamore
3:10-3:45	Jacqueline Epping, M.Ed and Chair - Physical Activity and Health Branch, Division of Nutrition and Physical Activity, CDC Title: Paws to Consider: Increasing Physical Activity and Improving Health through Dog Walking.	Cypress/Sycamore
3:45-4:00	Break	
4:00-5:15	Student Oral Research Presentations 4:00 (pg. 11) – B.K. Jakel, Central Arkansas – Undergraduate Research Award 4:15 (pg. 12) – A.J. Locke, Central Missouri State - Undergraduate 4:30 (pg. 13) – J.D. Adams, U of Arkansas – MS Research Award 4:45 (pg. 14) – T.D. Heden, U. of Missouri – Doctoral Research Award 5:00 (pg. 15) – J.M. Crissey, U. of Missouri – Doctoral	Cypress/Sycamore

5:15-6:15	Poster Session and Chapter Social	Hawthorn
	Presider: Andy Fry, Ph.D. Poster set-up begins at 5:15 Presenters are to be present from 5:30-6:30	
6:30-7:45	Quiz Bowl	Cypress/Sycamore

FRIDAY, OCTOBER 19TH, 2012

8:45-9:15	Craig Emter, PhD, Assistant Professor, University of Missouri Title: Exercise Training for Heart Patients: What do we REALLY know?	Cypress/Sycamore
9:20-9:50	R. Scott Rector, PhD, Assistant Professor, University of Missouri Title: Treating Nonalcoholic Fatty Liver Disease: Does Exercise Modality Matter?	Cypress/Sycamore
10:00-10:15	Break	
10:15-10:55	I. Cardiovascular/Metabolism - Pam Hinton, PhD, Associate Professor, University of Missouri Title: Effects of excess adiposity and insulin resistance on bone health.	Cypress/Sycamore
	II. Sports Medicine - Aaron Gray, MD, Assistant Professor, University of Missouri Title: The epidemic of ACL injuries in female youth athletes.	Hawthorn
11:00-11:40	I. Cardiovascular/Metabolism - Jaume Padilla, PhD, Postdoctoral Fellow, University of Missouri Title: Exercise-Induced Signals for Vascular Endothelial Adaptations: Insights from Animal and Human Studies	Cypress/Sycamore
	II. Sports Medicine - Phillip Vardiman, PhD, Assistant Professor, University of Kansas Title: Gold Medal Sports Medicine: Integrative Model of Medical Care During International Competition.	Hawthorn
12:00-1:30	Lunch	Cypress/Sycamore
12:30-1:15	Gatorade Speaker Monique Ryan, RD, MS – Personal Nutrition Designs, LLC Title: Taking Sports Nutrition from Research to Practice: Strategies for hydration, > fueling, recovery, and muscle building.	

1:30-2:15	I. Professional Business Meeting – Steve Burns, Ph.D	Hawthorn
	II. Do I want to get a Doctorate degree? Issues for grad students	Cypress/Sycamore
2:15	Break	
2:30-3:15	I. Steve Sayers, PhD, Associate Professor, University of Missouri Title: Power training in older adults: Where do we go from here?	Hawthorn
	II. Jeremy Barnes, PhD, ACSM-HFS, Professor, and Jason Wagganer, PhD, Assistant Professor, ACSM-HFS, Southeast Missouri State University. Title: Fitness Certifications: What you need to know.	Cypress/Sycamore
3:15	Closing Remarks – John Thyfault	Cypress/Sycamore

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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 physical activity and physical inactivity contribute both positively and negatively to health in different populations.
- Recognize the importance of research in understanding problems related to physical inactivity.

CEC Credit

The CSC-ACSM meeting is offering 10 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, Mizzou Advantage, University of Missouri, Department of Nutrition and Exercise Physiology, University of Missouri, and Hans Rudolph, Inc.

2012 Undergraduate Student Research Award Winner – Oral Presentation 1

COMPARISON OF SERRATUS ANTERIOR AND TRAPEZIUS MUSCLE ACTIVITY DURING PUSH-UP AND STABILITY BALL PRESSES

B.K. Jakel and A.J. Bruenger.

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Muscle activation of the core and the prime movers of the shoulder have been studied in depth during the performance of stability ball chest presses. Little research has been performed to find the stability ball's effect on the activation of the serratus anterior (SA) and upper trapezius (UT) during bar (SBB) and dumbbell (SBD) presses. Training of the SA has been shown to be beneficial for overhead athletes and sufferers of shoulder impingement. An increased UT/SA muscle activation ratio is a sign of abnormal scapular motion. The push-up (PU) is typically recommend for SA training, but it is not know if stability ball presses may be as beneficial. **PURPOSE:** To compare muscle activation of the SA and UT during PU to SA and UT activation during SBB and SBD presses. **METHODS**: 15 strength trained males (mean ± SD, age: 23 ± 2 y, height: 175 ± 5 cm, weight 184 ± 18 lbs) participated. Participants were prepped and electrodes were placed on standardized landmarks for the SA and UT. Participants performed three 5 s maximal voluntary isometric contractions (MVIC) for each muscle against manual resistance. A 60 s rest period between each MVIC trial was allowed and a 10 min rest period was given at the end of MVIC testing. Participants then completed one set of five repetitions in randomized order of PU, and SBB and SBD presses. A 1 min rest was allowed between sets. The SBB and SBD presses were performed at the same weight as experienced during the PU. This weight was determined via force plate in the PU starting position. Repetition speed was standardized at 1 s eccentric, 1 s concentric for all exercises and was regulated by metronome. Hand placement was normalized to the subject's shoulder width for PU and SBB presses. The middle three repetitions were analyzed and averaged. EMG was collected at 1000 Hz. Data were quantified by root mean square and normalized to MVIC activity. Repeated measure ANOVAs were performed for each muscle and Bonferoni post hoc tests were performed if significant differences were observed. Alpha level was set at 0.05. **RESULTS:** The SA activity was significantly lower during SBB presses (55 ± 19%) compared to both PU (73 ± 25%, $p = 0.008$) and SBD presses (76 ± 28%, $p = 0.001$). The PU and SBD SA activity were not significantly different ($p = 1.00$). The UT activity was not significantly different ($p = .80$) for the PU (24 ± 28%), SBB (28 ± 30%) and SBD (28 ± 38%). **CONCLUSION:** The PU and SBD have similar SA and UT activity. Therefore, the SBD press can be used as an alternate SA exercise in place of the PU. The SBD press could be performed with greater resistance than a PU and thus may be a better exercise for SA training, but this hypothesis would need to be confirmed with additional research.

2012 Masters Student Research Award Winner – Oral Presentation 2

EFFECTS OF OBESITY ON THERMOREGULATION WHEN CONTROLLING METABOLIC HEAT PRODUCTION DURING EXERCISE IN THE HEAT

J.D. Adams, M.S. Ganio, A. Matthews, J.M. Burchfield, R.N. Werner, A.J. Chokbengboun, and A.A. LaChance.

Human Performance Laboratory, Department of Health, Human Performance, and Recreation, University of Arkansas, Fayetteville, AR.; email: jxa014@uark.edu

Previous research has shown that obese individuals are at greater risk for heat illnesses because of impaired thermoregulation. However, laboratory studies investigating thermoregulatory function in obese individuals are difficult to interpret because of the failure to control metabolic heat production during exercise. **PURPOSE:** To determine if there are differences in thermoregulatory function between obese and non-obese females when controlling metabolic heat production during exercise. **METHODS:** Twenty-four healthy females, 13 obese (43.3 ± 4.3 % fat, 77.2 ± 13.7 kg) and 11 non-obese (27.8 ± 6.0 % fat, 55.7±6.7 kg), cycled for 60 min in a warm environment (~40°C, 30% humidity) at a work load that elicited either 300 W of metabolic heat production (fixed heat production; FHP) or 175 W/m^2 of skin surface area (body surface area; BSA). Before and during exercise, rectal temperature (T_{re}), mean skin temperature (T_{sk}), oxygen uptake (VO_2), and sweat rate were measured. **RESULTS:** In the FHP trial, when absolute heat production was similar between obese (290 ± 16 W) and non-obese (299±18 W) individuals ($P > 0.05$), no differences in T_{re} (38.20 ± 0.40 vs. 38.19 ± 0.4°C, respectively), T_{sk} (36.80 ± 1.70 vs. 36.0 ± 0.70°C), VO_2 (1.06 ± 0.04 vs. 1.07 ± 0.06 l/min), or sweat rate (0.87 ± 0.28 vs.0.70 ± 0.15 l/hr) existed (all $P > 0.05$). In the BSA trials, relative heat production was similar between obese and non-obese individuals (169 ± 8 vs. 177 ± 5 W/m^2; respectively). In the BSA trial, no differences in T_{re} (38.4 ± 0.34 vs. 38.07 ± 0.25°C, respectively), T_{sk} (36.72 ± 1.05 vs. 36.22 ± 0.76°C), VO_2 (1.14 ± 0.10 vs. 1.02 ± 0.09 l/min), or sweat rate (0.76 ± 0.17 vs.0.66 ± 0.14 l/hr) existed (all $P > 0.05$). **CONCLUSION:** When obese and non-obese females exercised at a fixed metabolic heat production or a heat production relative to body surface area there were no thermoregulatory differences between groups. Thus, the relative minor exercise heat-stress imposed in this setting did not result in thermoregulatory differences between obese and non-obese young females.

2012 Doctoral Student Research Award Winner – Oral Presentation 3

PRIOR AEROBIC EXERCISE AND THE INCRETIN EFFECT IN NORMAL-WEIGHT AND OBESE INDIVIDUALS

T.D. Heden, Y. Liu, M.L. Kearney, Y. Park, K.C. Dellsperger, T.R. Thomas, J.A. Kanaley.

Department of Nutrition and Exercise Physiology, University of Missouri, Columbia, MO; email: tdheden@mail.mizzou.edu (Sponsor: J.A. Kanaley, FACSM)

Prior aerobic exercise and its associated energy deficit reduce postprandial triacylglycerol (TAG) and insulin concentrations, but the mechanisms are not entirely understood. The incretin hormones glucagon-like peptide one (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP) play a role in regulating postprandial triacylglycerol (TAG) and insulin concentrations, but the effects of acute aerobic exercise on postprandial GLP-1 or GIP responses are unclear. **PURPOSE:** To examine if prior aerobic exercise alters the postprandial response of the incretin hormones GIP and GLP-1 and if this is associated with reduced postprandial TAG and insulin concentrations in normal-weight (NW) and obese (Ob) individuals. **METHODS:** Thirteen NW (body mass index [BMI] = 18.5-24.99 kg/m^2) and 13 Ob (BMI > 30 kg/m^2) individuals participated in two, 4-d trials in random order including an exercise (EX) and a no exercise (NoEX) trial. Diet was controlled during both trials. The EX trial consisted of 1 h of treadmill walking (55-60% of VO_2peak) during the evening of day 3 of the trial, 12 h prior to a 4 h mixed meal test on day 4, during which frequent blood samples were taken to assess postprandial lipemia, glycemia, insulin, c-peptide, GIP, and GLP-1 responses. Insulin secretion was estimated using the Insulinogenic Index and insulin clearance was estimated using the molar ratio of insulin to c-peptide. **RESULTS:** Postprandial TAG's were 40% lower after EX in Ob individuals ($P<0.05$) but were not significantly altered in NW individuals ($P>0.05$). The drop in postprandial high-density lipoprotein cholesterol was attenuated with EX in Ob individuals ($P<0.05$). Insulin responses were 22% lower after EX in Ob ($P<0.05$), and this was associated with reduced pancreatic beta cell insulin secretion ($P<0.05$), with no change in insulin clearance ($P>0.05$). Glucose, c-peptide, GIP, and GLP-1 were not different between trials. **CONCLUSION:** A 1 h bout of moderate intensity aerobic exercise the night prior to a mixed meal attenuates postprandial TAG and insulin responses in Ob, but not NW, individuals, an effect not mediated by alterations in GLP-1 or GIP.
Supported by University of Missouri Research Council Grant and Institute for Clinical and Translational Science Pilot Grant.

Oral Presentation 4

EFFECTS OF EXERCISE AND METFORMIN ON INSULIN-INDUCED VASODILATION IN SKELETAL MUSCLE ARTERIOLES OF OLETF RATS

J.M. Crissey, J. Padilla, N.T. Jenkins, J.S. Martin, R.S. Rector, J.P. Thyfault, FACSM; and M.H. Laughlin, FACSM.

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Insulin-induced vasodilation is obligatory for glucose disposal, and is impaired with insulin resistance. **PURPOSE**: We examined the effects of endurance (EXT) and interval sprint (IST) exercise training with and without metformin (MET) treatment on acetylcholine (ACh) and insulin-stimulated vasodilation in skeletal muscle arterioles of high and low oxidative muscle from obese, insulin resistant Otsuka Long Evans Tokushima Fatty (OLETF) rats. **METHODS**: Rats remained sedentary (SED), or were treated with EXT, IST, MET, EXT+MET, or IST+MET from 20-32wks of age (n=11-13). At sacrifice, 2nd order arterioles from red (G2A-Red) and white (G2A-White) gastrocnemius muscle were isolated for *in vitro* assessment of vasomotor responses to ACh (10^{-9}-10^{-4} M), insulin (1-1000 μIU/mL), and insulin (1-1000 μIU/mL) + tezosentan (non-selective ET-1 receptor antagonist; 3 μM). **RESULTS:** EXT and IST enhanced ACh responses in both G2A-Red and G2A-White to a greater extent than MET alone (all $p<0.05$). In the G2A-Red, EXT improved insulin-induced vasodilation compared to IST, while MET was greater than IST alone (all $p<0.05$). ET-1 blockade improved the vasodilatory response to insulin in IST compared to EXT, and MET in the G2A-White, whereas IST+MET exhibited less dilation compared to IST (all $p<0.05$). **CONCLUSION:** The effects of EXT and IST on insulin-induced vasodilation in 2nd order arterioles of high and low oxidative portions of the gastrocnemius muscle are similar; but the mechanisms appear to be different. EXT selectively improved the vasodilatory actions of insulin in G2A-Red, yet was unaffected by ET-1 blockade, suggesting the dilation is mediated by nitric oxide. Conversely, no vasodilation in response to insulin was observed in the G2A-White following IST, yet a marked dilation occurred with insulin + ET-1 blockade. Overall these data suggest that the type of exercise training, and treatment with MET, have differential effects on ACh- and insulin-induced vasodilation in skeletal muscle arterioles perfusing high vs. low oxidative muscle fibers in the obese, insulin resistant OLETF rat.
Supported by the University of Missouri Life Sciences Fellowship (J.M.C), NIH T32-AR048523 (N.T.J. and J.S.M.), AHA 11POST5080002 (J.P.), VA-CDA-IK2 BX001299-01 (R.S.R.), and NIH RO1HL036088 (M.H.L).

Oral Presentation 5

THE EFFECTS OF CAFFEINE ON TIME UNTIL EXHAUSTION DURING TREADMILL RUNNING

A.J. Locke*, K.D. Sartin*, and D.J. Accola*.

*Department of Nutrition and Kinesiology, University of Central Missouri, Warrensburg, MO; email: ajl60561@ucmo.edu Faculty Sponsor: S. Burns PhD

Caffeine is often used to enhance athletic performance. Today, committees are questioning if it should be a substance banned during competition. **Purpose:** The primary purpose of this study was to determine the effect caffeine had on the time until exhaustion while running. **Methods:** Participants included 8, moderately active males (22.0 ± 1.7 years, 184.9 ±5.3 cm, 83.8 ±11.4 kg). Subjects reported to the lab on 3 separate occasions, with no less than 48 hours of rest in between each visit. On the first visit, subjects ran on a treadmill to determine their max heart rate. This was done by increasing the speed until volitional exhaustion; the final speed and heart rate are considered maximums. They returned to the lab two additional times and ran at 70% of their max heart rate, determined during the first visit, for 15 minutes. Immediately after the 15 minutes concluded, the treadmill speed was increased to the final speed at which exhaustion was reached during trial one. This pace was maintained until volitional exhaustion. On one occasion subjects were given water with caffeine (5mg/kg) and on the other water without caffeine 45 min prior to each run. Rate Perceived Exertion (RPE) was recorded every 5 minutes and after the exhaustive bout. Blood lactate was sampled immediately following each test, and every minute for three minutes thereafter. Heart rate was monitored throughout all tests. **Results**: A one-way ANOVA was conducted to determine if time until exhaustion increased due to the consumption of caffeine before exercise. No significant difference in the time until exhaustion was observed when compared to the placebo (caffeine time = 208.0±77.1 seconds, placebo time = 154.9±44.1 seconds). **Conclusion:** These results suggest that caffeine does not have an effect on time until exhaustion following submaximal running.

#1

A 20-MINUTE CRYOTHERAPY DOES NOT ALTER PASSIVE DORSIFLEXION RANGE OF MOTION AND PLANTARFLEXORS MUSCULOTENDON STIFFNESS

K. Akehi, B.C. Long, E.C. Conchola, and T.B. Palmer*.

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Cryotherapy is commonly used for injury prevention, treatment, or therapeutic rehabilitation. However, cryotherapy and its influence on tissue extensibility, elasticity, and joint range of motion (ROM) are not well understood. **PURPOSE:** The purpose of the study was to determine if a 2-kg crushed ice bag application to the plantarflexor muscle group influences passive ankle dorsiflexion ROM, passive plantarflexors torque (PPT), and passive musculotendon stiffness (MTS) at 4 joint angles ($\theta_{1,2,3,\&4}$) separated by 5°. **METHODS:** For this human subject approved study, 20 recreationally active college-aged participants (male: n=9, age=21.63±2.00yrs, ht=178.31±6.72cm, mass=78.54±32.89kg; and female: n=11, age=19.5±0.52yrs, ht=166.46±9.41cm, mass=67.58±8.31kg) with no known lower extremity injuries in the 6 months prior to data collection volunteered. Participants reported to the laboratory on 3 days. Day 1 was a familiarization session. This consisted of reading and signing the informed consent document and ensuring they were aware of the testing procedures. Days 2 and 3 consisted of testing only. On each day, participates randomly received 1 of 2 treatments, a 2-kg crushed ice bag or nothing. For each treatment, we assessed passive ankle dorsiflexion ROM, PPT, and MTS prior to and following both treatments. Each posttreatment measure was taken immediately and at 10, 20, and 30 minutes following both treatments. We also measured surface interface temperature every minute during data collection. The maximum passive ankle dorsiflexion ROM, maximum PPT, and absolute passive MTS at 4 joint angles ($\theta_{1\text{-}4}$) were averaged and used in the analysis. We also used the first surface interface temperature measure during each application phase in the analysis. **RESULTS:** Ice bag application did not influence ROM, PPT, or MTS $\theta_{1\text{-}4}$ (Tukey-Kramer; $P>.73$). There were significant interactions for 3 of the 4 MTS angles ($\theta_{1\text{-}3}$) between treatment and day (Tukey-Kramer; $P<.03$). There was no time or day difference for ROM, PPT, or MTS $\theta_{1\text{-}4}$ (Tukey-Kramer; $P>.05$). When filtering the data by gender, there was a gender difference in ROM ($F_{1,189}=7.36$, $P<.01$), PPT ($F_{1,189}=388.01$, $P<.01$), and passive MTS $\theta_{1\text{-}4}$ (Tukey-Kramer; $P<.001$) with and without ice bag application. **CONCLUSION:** Decreasing plantarflexion muscle temperature with a 20-minute crushed ice bag does not appear to influence passive ankle dorsiflexion ROM, maximum PPT, or passive MTS $\theta_{1\text{-}4}$. Regardless of cryotherapy application, when data were filtered by gender males had great passive ankle dorsiflexion ROM, PPT, and passive MTS $\theta_{1\text{-}4}$.

#2

VALIDATION OF ACSM METABOLIC EQAUTION AS ACCURATE PREDICTOR OF VO2 IN DIVISION II CROSS-COUNTRY ATHLETES

N.L. Arnold and S. Burns.

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The American College of Sports and Medicine (ACSM) Metabolic Equation is used to predict steady state VO_2 levels of runners and is said to be accurate up to 13 mph. **Purpose:** The purpose of this study was to determine if the ACSM running equation is an accurate predictor of steady state exercise at high running speeds of cross country runners. **Methods:** Sixteen (8 male, 8 female) Division II cross country runners (19.5 ± 1.1 yrs, 15.08 ± 6.19% body fat, VO_2max 61.3 ± 8.27 ml/kg/min) performed two separate treadmill exercise tests. First their height and body weight was measured using an Inbody 120 (BioSpace Tachnologies). The first test was a maximal VO_2 measurement in which subjects ran on the treadmill while expired gases were collected and analyzed (ParvoMedics Inc). The initial speed was 8 mph and grade was 0.0%. Speed increased every two minutes and the grade began to increase once the subject reached 12 mph until the subject reached volitional exhaustion. VO_{2max} was determined by subjects reaching two of four thresholds; RER ≥1.0, RPE ≥ 17, HR within 11 BPM of age predicted HR, or VO_2 plateau. From the VO_{2max} assessment ventilatory thresholds for each subject were determined along with their heart rate at that threshold. The goal of the second treadmill test was to achieve a steady state heart rate within 10 bpm below the ventilatory threshold. Participants then ran at that speed while VO_2 was measured for the actual VO_2 consumption. The speed and grade were then entered into the ACSM running equation to determine if the value predicted by this equation was equal to the actual VO_2 measured. **Results:** Based on the data collected VO_2 measured was 49.9 ± 6.9 ml/kg/min at an average speed of 244 m/min. VO_2 estimated at the same speed using the ACSM running equation was 52.4 ± 6.6 ml/kg/min. Statistical analysis was conducted on the data to determine if the values were significantly different. A paired t-test revealed $t(1,14) = -1.44$ $p = 0.16$. **Conclusion:** These results indicate the ACSM Metabolic Equation is able to predict steady state VO_2 at a speed of 244 meters per minute in Division II cross country runners, thus confirming the validity of the prediction equations at high speeds in highly trained runners.

#3
EXERCISE PERCEPTIONS AND PARTICIPATION AMONG CANCER SURVIVORS AND CAREGIVERS

E.J. Bagley, T.V. Darling, and E.M. Agre.

Department of Exercise and Sport Science, Oklahoma City University, Oklahoma City, Oklahoma; email: ejbagley@my.okcu.edu

The cancer burden is significant. Exercise reduces cancer-related side effects and improves quality of life. Exercise can be added to routine cancer care as part of cancer prevention, treatment, and survivorship. Little is known whether cancer survivors (CS) and caregivers (CG) in southern Georgia are aware of the importance of exercise, its role in cancer care, and the availability of medical and community services. PURPOSE: The purpose of this study was to assess basic exercise knowledge, exercise participation for cancer, and awareness of and interest in available cancer care services among CS and CG in southern Georgia. METHODS: Two hundred and thirty one individuals (145 CS, 86 CG) attending Relay For Life meetings and events participated in the study. Participants completed a 10-statement exercise-cancer survey, consisting of a 6-point Likert scale with responses ranging from "strongly disagree" to "strongly agree." Statements evaluated general exercise perceptions, exercise participation, role of exercise as part of cancer care, knowledge of existing cancer exercise programs, and interest in participating in a cancer exercise program. The survey included demographic data (gender, age, race, education level) and cancer data (cancer type, cancer treatment). RESULTS: Descriptive statistics revealed the following responses to exercise statements: CS (57.3%) and CG (64.0%) strongly agreed that exercise is important to them; CS (33.8%) and CG (39.5%) strongly agreed that exercise helps prevent cancer; CS (39.3%) moderately agreed and CG (38.1%) strongly agreed that it is OK to exercise with cancer even during treatments; CS (31.7%) and CG (45.3%) strongly agreed that they exercised before cancer diagnosis; CS (27.4%) moderately agreed and CG (39.8%) strongly agreed that they exercised during cancer treatments; CS (35.9%) and CG (43.5%) strongly agreed that they exercised after cancer treatments; CS (30.5%) and CG (38.8%) strongly agreed that their doctor explained the importance of exercise; CS (25.2%) and CG (23.8%) strongly disagreed that exercise was part of cancer treatments; CS (26.8%) and CG (35.7%) strongly agreed that they know that cancer exercise programs exist; CS (31.2%) moderately agreed and CG (33.3%) strongly agreed that they are interested in participating in a cancer exercise program. CONCLUSION: CS and CG agreed to 90% of the exercise statements, indicating positive exercise perceptions and participation for cancer. CS and CG, however, strongly disagreed that exercise was part of cancer treatments. Further study is needed to determine statistical significance of responses and explore exercise contributions to routine cancer care.

#4

INTERACTIONS BETWEEN THE THERMIC EFFECT OF FOOD AND EXERCISE ON TOTAL ENERGY EXPENDITURE AMONG FEMALES

A. Binns, & M. Gray.

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It is well known that both diet and exercise are key components in overall maintenance of optimal health. Exercise, in both aerobic and anaerobic forms contributes to overall energy expenditure (TEE). Additionally, the thermic effect of food (TEF) has also been recognized to impact energy expenditure. **PURPOSE**: The aim of the present investigation was to determine the interaction between TEF and exercise on total energy expenditure (TEE) based on protein content of a meal in moderately active females. **METHODS**: Twelve active females of normal body composition participated in the study. Preliminary maximal aerobic capacity (VO_{2max}) was determined. Participants returned for three additional randomized testing sessions in which a 30-minute bout of exercise was performed at 60% VO_{2max} after consumption of a high protein (45% total kcal), low protein (15% total kcal), or in the fasted state. **RESULTS**: Repeated measures ANOVA indicated a significant main effect for the feeding protocols ($\alpha = .05$). The TEF of food was 30.39% greater in the high protein meal when compared to the low protein meal ($p = .006$) and 98.15% greater when compared to the fasted state ($p = .000$). Low protein meal consumption resulted in a 94.34% higher TEF when compared to the fasted state ($p = .000$). In combination with exercise, the TEF of food with a high protein meal was significantly greater compared to the fasted state ($p = .010$) but was not different compared to the low protein meal ($p = .122$). No significant differences were found between low protein meal consumption combined with exercise compared to the fasted state ($p = .094$). **CONCLUSION**: Findings of this study suggest an effect between protein content of a meal, moderate-intensity exercise, TEF, and TEE. Acute bouts of high and low protein feedings potentiated significant increases in energy expenditure through TEF. In combination with exercise, a significant increase in TEE was only found with high protein meal consumption when compared to the fasted state. Trends for increased TEF with exercise were present for exercise performed after consumption of a low protein meal compared to the high protein meal and the fasted state, though not statistically significant.

Supported by University of Arkansas Human Performance Laboratory

#5

EFFECTS OF HIGH- AND LOW-VELOCITY RESISTANCE TRAINING ON REGIONAL BODY COMPOSITION MEASURES IN OLDER ADULTS

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INTRODUCTION: With aging, a decrease in fat free mass (FFM) and an increase in fat mass (FM) are typically seen. It is important to find ways to reverse these body composition changes. **PURPOSE**: The purpose of this study was to compare regional body composition changes following high-velocity and low-velocity resistance training. The researchers hypothesized no regional body composition differences would be seen between the two training methods, but that both approaches would improve body composition. **METHODS**: Thirty-eight adults over the age of 75 years completed training for one year. Participants were randomly assigned to either high-velocity, low-intensity (HV) training or low-velocity, high-intensity (LV) training. Regional body composition was measured using the iDXA total body scan which analyzed FM and lean tissue mass (LTM) of the gynoid and android regions. Assessments were taken at baseline, six months, and after one year of training. The analyses were conducted using an ANOVA with repeated measures for each outcome ($\alpha = .05$). **RESULTS**: No significant interaction effects were observed for any variable. A significant decrease in gynoid FM was seen over time ($F = 4.61$, $p = .01$); while the time effect for android FM approached significance ($F = 3.03$, $p = .06$). Post hoc tests revealed a significant decrease in gynoid FM from baseline to six months ($p = .05$). **CONCLUSIONS**: Resistance training tends to reduce FM in the gynoid and android regions regardless of intensity and velocity. Future studies should examine intensity and velocity independently of each other.

#6

EFFECT OF SELECTED AUDIO INPUT ON PUTTING ACCURACY IN DIVISION I GOLFERS

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Scientific inquiry into music and its effects on motor behavior dates back to the early 20th century when it was suggested that music acts as a stimulus that promotes the body's natural movement (MacDougal, 1902). Past studies have shown that faster tempo music improves overall exertion in sports such as cycling and volleyball. **Purpose:** The purpose of this study was to compare putting accuracy without listening to music to accuracy while listening to different genres of music. Subjects were men and women Division I (Males N=9, Females N=14, 20.3 yr $\pm$ .8) with at least 8 years of golf experience. Each golfer was equipped with an IPod Touch and Sony headphones. For each of the five music genres data was collected on 5 putts from 4 (20 total/genre) separate, predetermined locations four feet away, 90° around the hole. Putting was done without music and while listening to Classical, Country, Jazz, Rock, or Hip Hop/Rap. Results yielded a 72.05% success rate for Hip Hop/Rap, 72.95% Country and Rock, 74.55% Classical and, 81.82 Jazz. **Results:** Results of an ANOVA analysis yielded significantly better accuracy while listening to Jazz than the other genres and no music. No other significant differences were found. **Conclusion:** Based on these data it was concluded that selected genres of music may enhance putting accuracy. It is recommended that further studies include music preference in an attempt to match genres with performance.

#7

SELECTIVE BREEDING TO CREATE 8TH GENERATION RATS THAT VOLUNTARILY RUN LOW AND HIGH NIGHTLY DISTANCES

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PURPOSE: The objective of this study was to selectively breed Wistar rats into lines that voluntarily run low (LVR) and high (HVR) distances as a model of human Masters athletes and couch potatoes, respectively. We wish to use the lines to determine gene expression differences in the nucleus accumbens. **METHODS**: The selection experiment employed was adapted from Koch and Britton [Physiol Genomics. 2001 Feb 7;5(1):45-52], and this strategy was used by us for LVR and HVR propagation through generations (Gen)1-8. **RESULTS**: Gen8 LVR and Gen8 LVR rats indicate that LVR rats ran 14% of the total distance run by HVR rats on days 5-6 of running. Running distances were halved in HVR with D1-like dopamine receptor antagonist or agonist, but no effect in LVR of generation 4-5 (*Physiol Behavior* 105:661-8, 2012), so we suggest the implication that dopamine D1 signaling differs between our LVR and HVR rats. For Gen8 rats never voluntarily run in wheels, LVR had significantly greater %body fat than HVR animals, despite the similar ages of both lines. Six-days of voluntary running lowered body fat percentages in male and female LVR and HVR 6-day runners so that male and female LVR 6-day runners possessed similar body fat percentages (ranging from 5.1% to 5.5%) compared to their HVR counterparts. The unexpected higher %body fat is now being repeated with more strict controls to verify the pilot data. **CONCLUSION**: It will be of future interest to identify central neural mechanisms, which may help explain running motivation differences that exist between our LVR and HVR lines. These efforts will attempt to further understand the etiology of societal sedentarism and potentially assist in the development of therapies meant to increase physical activity.
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#8

THE IMPACT OF ALTERING PHYSICAL ACTIVITY ON ENDOTHELIAL FUNCTION

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Previous studies have reported impaired endothelial function as a result of bed rest. However, the early effects of transition from high (>10,000 steps/day) to low ambulatory activity (<5,000 steps/day) on endothelial function are unknown. Thus, we sought to examine the time course of change in endothelial function following 5 days of inactivity, and after 1 day return to activity (RA) in young, healthy men. Four recreationally active men (26±3 yrs, 20.4±1.8% body fat) performing > 10,000 steps·day^{-1} underwent 5 days of reduced ambulatory activity (<5,000 steps·day^{-1}), followed immediately by RA (>10,000 steps·day^{-1}). Endothelial function was assessed in the arm (brachial) and leg (popliteal) using flow-mediated dilation (FMD) at baseline, 1, 3, and 5 days following inactivity, and RA. Subjects consumed a standardized diet throughout the study. Brachial FMD normalized to shear stimulus was not significantly altered over 5 days of inactivity or following a 1 day RA. However, popliteal FMD normalized to shear appeared lower following inactivity and was maintained with RA (baseline: 0.52±0.25, inactivity 1: 0.46±0.22, inactivity 3: 0.21±0.09, inactivity 5: 0.10±0.05, RA: 0.17±0.08, p=0.05). These preliminary findings suggest that short term reductions in daily ambulatory activity impairs leg but not arm endothelial function. Furthermore, a 1 day RA did not appear to be sufficient to return endothelial function to pre inactivity levels.
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#9
RELATING FETAL GROWTH TO INFANT BODY COMPOSITION

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Body composition varies among infants, and maternal pre-pregnancy BMI (pre-BMI) and gestational weight gain (GWG) are directly related to infant fat mass. Little research has explored the relationship between fetal growth, maternal pre-BMI and GWG to infant body composition. **PURPOSE:** The purpose of this study was to investigate the relationship between fetal growth and infant body composition. **METHODS:** Twelve mother-infant pairs were used in this analysis. Infant body composition was assessed using air displacement plethysmography. Maternal pre-pregnancy weight was self-reported and height was measured. Fetal growth was assessed by ultrasound using an ultrasound machine with a C60 transducer and internal software at 24, 32 and 36 weeks gestation. Fetal measures of biparietal diameter, head circumference, abdominal circumference and femur length were used to calculate estimated fetal weight (Hadlock equation). We used linear regression to explore the relationship between fetal weight at our three time points to predict infant body composition (percentage body fat (%fat), fat mass (FM) and fat free mass (FFM). Due to the small sample size, the first series of regression models did not include covariates. In the second series of regression models the following maternal covariates were included: pre-BMI, GWG, age and parity and the following infant covariates: gender and change in body mass since birth to study visit. The significance level was set at $p \leq 0.05$. **RESULTS:** These series of results did not include covariates. When predicting infant FM, fetal weight at 24 weeks ($\beta=0.676$; $p=0.082$) was positively related but only approached significance. When predicting infant FFM, fetal weight at 24 weeks ($\beta=1.084$; $p=0.049$) was positively related. The next reported results included covariates. When predicting infant %fat, GWG ($\beta=0.496$; $p=0.001$) and fetal weight at 24 weeks ($\beta=0.009$; $p=0.079$) were related though fetal weight only approached significance. When predicting infant FM, GWG ($\beta=26.208$; $p=0.001$), fetal weight at 32 weeks ($\beta=0.413$; $p=0.016$) and change in infant body mass since birth ($\beta=0.454$; $p=0.032$) were all related. **CONLUSION:** Fetal weights at different weeks were related to infant body composition. Further research with a larger sample size is needed to explore these relationships.
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#10

COCAINE-INDUCED LOCOMOTOR ACTIVITY IN RATS SELECTIVELY-BRED FOR HIGH/LOW MOTIVATION TO VOLUNTARILY RUN

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PURPOSE: The purpose was to further characterize a novel colony of Wistar rats selectively-bred for high (HVR) and low (LVR) motivation to voluntarily run. We aimed to examine any sex differences and line differences (LVR vs. HVR) in novelty-seeking, baseline, and cocaine-induced locomotor activity (LA) levels of young rats without access to a running wheel. **METHODS:** Eighty minutes of LA was measured on 3 successive days to determine novelty-seeking (Day 1), habituation (Day 2), and cocaine-induced (Day 3) LA (distance traveled; cm) in young (32-35d), male and female HVR/LVR rats. Rebred rats of HVR and LVR parents that had already produced offspring exhibiting a 5-fold difference (HVR vs. LVR) in voluntary running were used. On all days, rats were transferred to the facility housing the activity chambers at least 45 min preceding LA monitoring. On novelty-seeking and habituation LA days (Days 1 and 2), rats were allowed to acclimatize in the activity chambers for 20 minutes at which point they were injected (ip) with physiological saline (1 ml/kg), and then returned to the chamber for 60 minutes for activity measurements. On Day 3, the same protocol was followed as Days 1 and 2 with the exception of injecting half with cocaine HCl (10 mg/kg; 1ml/kg; Sigma) and the other half with an equivalent volume (1ml/kg) of saline (Ctrl). Novelty-seeking and habituation LA was determined from the total distance (cm) traveled during the entire 80 minutes while only the time post-injection (final 60 minutes) was used to determine cocaine-induced LA. Values are expressed as averages ± SEM. Cocaine-induced LA is expressed as fold-change from Ctrl. Significance was set at $p \leq 0.05$. **RESULTS:** HVR female (6827 ± 394) demonstrated higher novelty-seeking LA levels than LVR males (5149 ± 401) and females (5033 ±323) but not HVR males (5547 ± 264). Baseline LA was lower than novelty-seeking in all groups and showed the same pattern of significance as novelty-seeking: HVR female: 5775 ± 382; HVR male: 4666 ±381; LVR female: 3950 ± 246; LVR male: 3845 ±270. While cocaine induced a 9.4-fold increase in LVR female LA, it was not significantly different from the 7.1-fold increase in HVR female. However, cocaine-induced LA showed a gender effect in that both female groups were higher than LVR (3.5-fold) and HVR (3.5-fold) males. **CONCLUSION:** Regardless of voluntary running potential (HVR vs. LVR), a gender difference exists in how cocaine, a dopamine transporter inhibitor that increases extracellular dopamine levels, exerts its effects. Sex hormone and/or dopaminergic signaling systems are logical targets for further research to further elucidate the mechanisms underlying these observations.
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#11
SELECTED PREDICTORS OF ROWING PERFORMANCE IN MALE COLLEGIATE ROWERS

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Lower body power is an important variable in rowing performance. Possible indices of lower body power in rowing are the squat jump, vertical jump, and passive ankle dorsiflexion (PAD). **PURPOSE:** The purpose of this study is to examine the relationships for the squat jump (SJ), vertical jump (VJ), and right and left PAD with a rowing coach's rating (CR) of rowing performance. **METHODS:** Six male National Association of Intercollegiate Athletics rowers (age=20±2yrs, height=73.9±2.3in, weight=182±23lbs) volunteered for the study. Proceeding the assessment session, a standardized warm up on a cycle ergometer and a low volume and intensity battery of jumps were performed. The order of assessment was: SJ, VJ, and right (RDF) and left (LDF) PAD. For the SJ, the athletes, with hands on hips, achieved and held a parallel squat for a 4 second count before jumping. For the VJ the athletes did not perform a hold, but were permitted to use a countermovement and arm swing during the jump. The athletes performed as many jump trials as necessary until two successive jumps were no longer higher than the best recorded score. A 30sec rest was observed between all jump assessments and/or attempts. All jump assessments were conducted on a contact mat (Just Jump, Probotics, Huntsville, AL). The assessment of PAD was conducted immediately after the jump assessments utilizing a tape measure placed on the floor perpendicular to a wall. After removing shoes the athlete placed the knee of the selected leg against the wall while sliding the heel away from the wall. The maximum distance from the posterior side of the heel to the wall was measured and recorded for both legs and normalized to the athletes' height. The difference between PAD scores for the right and left leg was calculated to assess asymmetry. Following the assessment session, the CR of the athletes' rowing ability was quantified using a 10pt scale. The rating (10 = superior, 1 = inferior) of rowing ability was provided by the athlete's coach in response to a standardized question. Assessment scores were correlated with the CR using a Spearman's rank correlation (ρ). **RESULTS:** Analyses revealed moderate correlations for the SJ ($\rho = .62$), and VJ ($\rho = 0.46$) with CR. A weak correlation existed between the RDF ($\rho = 0.22$), and LDF ($\rho = 0.12$), and a moderate correlation existed for the difference between LDF and RDF PAD with CR ($\rho = -0.32$). **CONCLUSION:** With longer transitions from the eccentric to concentric phase and limited use of the arms during the leg drive of a rowing stroke, the SJ may be more sport specific than the much faster eccentric-concentric transition and arm involvement of the VJ. Additionally, asymmetry of PAD may limit rowing ability in collegiate rowers.

#12

INFLUENCE OF COLORS ON VO2 CONSUMPTION, HEART RATE, VENTILATION RATE AND R.P.E. WHILE RUNNING

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Psychological factors play a role in exercise. If psychology plays a role in exercise performance then it may affect the physiological responses to exercise. **Purpose:** The purpose of this study is to examine the physiological effects different colors have on active college aged participants running on a treadmill at 6.0 mph for 15 consecutive minutes by measuring VO2 consumption, ventilation rate, heart rate, and rate of perceived exertion (R.P.E.) during exercise. **Methods:** The study consisted of 10 participants (5M, 5F) that were 21.3 ± 1.9 years, 80 ± 9.4 kg, and 174.2 ± 10 cm. Participants ran 15 minutes on a treadmill. Expired gases were collected by a True One Parvomedics Metabolic Cart in the Human Performance Lab at the University of Central Missouri. The participants warmed up for five minutes at 6mph while looking at a white color environment (control). Once the warm-up was completed, the subject was exposed to one of three colors (yellow, blue, or red) each in a random order. **Results:** The difference in VO_2 consumption, ventilation rate, heart rate, and R.P.E. between blue, red, white, and yellow minimal. The data showed no significant difference between the different colors that were presented to the participants. **Conclusion:** According to the current data, while running on a treadmill, color does not influence VO_2 consumption, ventilation rate, heart rate, or R.P.E.

#13

NUTRITIONAL AND PERFORMANCE COMPARISONS BETWEEN BRITISH AND AMERICAN FOOTBALL PLAYERS

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To date there are no published studies which have researched British American football athletes, nor are there any studies comparing them against National Collegiate Athletic Association (NCAA) football athletes. **PURPOSE**: The purpose of this study was to compare performance variables and nutritional knowledge between NCAA Division I and British Universities American Football League (BUAFL) athletes. **METHODS**: NCAA Division I and BUAFL head coaches were contacted to gain approval to recruit volunteers for the study. Subjects consisted of 27 BUAFL (20.0+1.3yrs) and 99 NCAA (20.0+1.4yrs) athletes. Data was collected from the following; body composition, vertical jump, 1 Repetition Maximum (1RM) bench press, 1RM back squat and nutritional knowledge questionnaire. **RESULTS**: From a total of 70 comparisons made, significance was observed in 47, of which 92% was in favour of the NCAA Division I athletes. Body mass, fat free mass and the body mass indexes of the BUAFL athletes were found to be significantly ($p<0.05$) lower than those of the NCAA athletes. BUAFL athletes were significantly ($p<0.05$) outperformed by the NCAA athletes in the vertical jump, 1RM bench press, and 1RM back squat by averages of 24%, 40% and 43% respectively. The BUAFL athletes, however, scored significantly ($p<0.05$) higher than the NCAA athletes in the nutritional knowledge questionnaire. **CONCLUSION**: The differences observed made clear the vast diversity that exists between British and American collegiate football athletes competing respectively at the highest level. The data reported serves as a reference point for coaches in the NCAA, BUAFL and other international leagues. It also acts to raise awareness of the nutritional misconceptions that exist amongst collegiate football athletes.

#14

A COMPARISON OF SOMATOTYPICAL VALUES FROM THE MEMBERS OF TWO SWAT UNITS

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Purpose: The purpose of this study was to investigate the correlation between anthropometric measures and SWAT team performance and requirements. Results from this study can be used to evaluate current SWAT team member's physical ability and composition as well as setting physical requirements for future applicants. **Methods:** Data was taken from two different SWAT teams (mean ± SD); 13 male Local SWAT team 1 (SW1) members (age 38.70 ±4.6) and 14 male Local SWAT team 2 (SW2) members (age 32.2 ± 4.9). Anthropometric measures of height (HT) (SW1: 182.2cm ± 7.60cm), (SW2: 179.8cm ±6.9cm) and weight (WT) (SW1: 106.0kg ± 18.30kg), (SW2: 87.2cm ± 8.4) were recorded. Anthropometric data was used to classify SWAT team members into any of the somatotypes of Ectomorphy, Mesomorphy, and Endomorphy. This data can be used to chart and analyze how both SWAT teams compare to the standard recommendations. **Results:** The Local SWAT team 2 measured had higher levels of physical fitness and composition than did the Local SWAT team 1. Using anthropometric data charts, SW1 members were not within recommended ranges whereas SW2 members were closer to recommended ranges.

Table 1: Comparison of anthropometric somatotypes of two local SWAT units

	Mean ± SD	
	SW1	**SW2**
Endomorphy	6.0 ± 1.7	3.6 ± 1.0*
Mesomorphy	6.4 ± 1.6	6.3 ± 0.9
Ectomorphy	0.6 ± 0.4	1.2 ±0.6*

*$p < 0.05$

Conclusions: Based on these results local SWAT team 1 should consider lowering percent body fat and increasing fat-free mass (FFM) by decreasing body weight and gaining muscle mass. Local SWAT team 2 should only consider decreasing overall body weight as FFM is acceptable.

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#15
EFFECTS OF TWO HIGH INTENSITY RESISTANCE TRAINING PROTOCOLS ON CALORIC EXPENDITURE DURING FREE WEIGHT SQUATS

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Recent studies have revealed that the metabolic cost of resistance training (RT) may increase resting and total daily energy expenditure which may be an effective avenue for preventing or treating metabolic and weight related conditions while improving overall fitness. However, metabolic costs of different high intensity (>75% 1 repetition maximum; 1-RM) training protocols have not previously been investigated. **PURPOSE:** The purpose of this study was to examine the effects of two high intensity training protocols on caloric expenditure during free weight squats. **METHODS:** Twelve resistance trained men (age = 23.08 ± 2.64yrs, stature = 175.87 ± 7.10cm, mass = 79.16 ± 8.39kg) participated in two squat testing sessions separated by seven days. Both sessions included a standardized warm-up prior to subjects being randomly assigned to either a 4 x 9 (4 sets of 9 repetitions at 77% of 1-RM), or 4 x 6 (4 sets of 6 repetitions at 85% 1-RM) RT protocol. All repetitions were performed at a standardized cadence of 2 seconds for both the concentric and eccentric phases, which was regulated by a metronome. A 3 minute rest interval was allowed between sets for both training protocols. Caloric expenditure was derived from oxygen uptake assessed via indirect calorimetry on a calibrated metabolic cart. Oxygen uptake was measured in 5-sec sampling periods, and was averaged at every 30 second increment to measure caloric expenditures. Energy cost in kilocalories was estimated using a constant value of 5.05 kcal $\cdot L^{-1}$ of oxygen. Oxygen measurements were assessed throughout the entire 14 minute testing sessions (protocols were equal in duration). Total work was measured as the product of the total amount of mass (BW + barbell mass) and the distance covered in the eccentric phase of the squat movement. Paired t-tests were used to analyze total work and caloric expenditure. **RESULTS:** The 4 x 9 protocol was significantly greater ($P = 0.041$) in total work performed compared to the 4 x 6 protocol (3667.60 ± 781.95; 2963 ± 448.88 Joules). However, there were no significant differences ($P = 0.349$) in the amount of calories burned between the two training protocols (170.53±21.17; 174.10±18.28 kcal). **CONCLUSIONS:** These findings suggest that among 2 high intensity RT protocols, a higher intensity (85% 1-RM) and lower total work output, may yield similar caloric expenditures compared to a lower intensity (77% 1-RM) RT protocol in free weight squats. Fitness professionals may consider designing RT programs aimed at higher intensities for leg workouts to improve the efficiency of caloric expenditure for a given amount of total work output and enhance the effects of RT on metabolic and weight related conditions.

#16
COMPARISON OF THE SHAKE WEIGHT® MODALITY EXERCISES WHEN COMPARED TO TRADITIONAL DUMBBELLS

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Individuals are continuously looking for faster, more efficient methods with which to develop physical fitness. This has led to the development of products and programs marketed towards increasing physical fitness in minimal time. The Shake Weight® (SW) has been advertised to increase muscular strength among other factors in less time than traditional weightlifting. **PURPOSE:** The purpose of this study was to compare the electromyographic (EMG) muscle activity of the SW to a traditional dumbbell (DB) performing the same exercises. **METHODS:** Twelve men (22.9±1.6 years) and 13 women (23.0±1.9 years) volunteered to participate in this study. Subjects performed the chest shake (CS), biceps shake (BS), and triceps shake (TS) using the SW and DB. Maximal voluntary isometric contractions (MVIC) were exhibited for all muscles. EMG activity was recorded for the pectoralis major (PM), triceps brachii (TB), biceps brachii (BB), anterior deltoid (AD), trapezius (TR), and rectus abdominus (RA) and compared to detect differences between modalities. EMG activity for each muscle group was reported as a percentage of each subject's individual MVIC. **RESULTS:** A repeated measures ANOVA revealed no significant differences between the SW and DB modalities during each exercise for all muscles except the BB ($\alpha < .05$). During the CS exercise muscle activity was significantly greater for DB in the BB muscle when compared to the SW mode (50.8 ± 28.9%; 35.8 ± 30.8%). **CONCLUSIONS:** The SW did not have any advantage over the DB for any exercise, nor for any muscle group. Further, no muscle group during any of the SW trials exhibited an MVIC over 60%, the suggested level necessary to increase muscular strength.

#17
DIFFERENCES IN THE ELECTROMYOGRAPHIC-FORCE RELATIONSHIPS BETWEEN HIGH- AND MODERATE-ACTIVATED INDIVIDUALS

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The electromyographic (EMG) signal represents the concurrent increases in motor unit recruitment and motor unit firing rates that regulate muscle force output. The amplitude of the surface EMG signal reflects muscle activation and is influenced by both the number of active motor units and their firing rates. It is believed that high activation capabilities (> 90 percent voluntary activation [%VA]) is the result of greater motor unit firings in comparison to individuals without high activation capabilities (moderate-activated, < 90% VA). In theory, the EMG amplitude-force relationships may reflect these differences in motor control strategies between high- and moderate-activated subjects. **PURPOSE:** The purpose of the present study was to examine the EMG amplitude (EMG_{RMS})-force relationships for the rectus femoris (RF) and vastus lateralis (VL) in high- and moderate-activated subjects. **METHODS:** Thirteen healthy men (mean ± SD, age = 22 ± 3 yrs, body mass 88 ± 14 kg) volunteered for this investigation. The EMG sensor (EGAS-FS-10-/V05; Measurement Specialties, Inc., Hampton, VA) was placed over the VL and RF at 50% of the distance between the greater trochanter and lateral condyle of the femur. Each participant completed nine submaximal contractions (10-90% maximal voluntary contraction [MVC]) with the interpolated twitch technique performed during a separate contraction at 90% MVC to calculate percent voluntary activation (%VA). Nine participants with > 90% VA were categorized into the high-activated group with the remaining categorized into the moderate-activated group. Slopes (*b* terms) were calculated from the log-transformed EMG amplitude (EMG_{RMS})-force relationships. A two-way mixed factorial ANOVA (group [high- vs. moderate-activated] x muscle [VL vs. RF]) was used to examine possible differences in the *b* terms. **RESULTS:** There was no group x muscle interaction ($P = 0.373$) but there were main effects for group ($P = 0.043$) and for muscle ($P = 0.045$). The *b* terms for the high-activated group (1.29 ± 0.31) were greater than for the moderate-activated group (1.10 ± 0.20) (collapsed across muscles). In addition, the *b* terms for the RF (1.38 ± 0.30) were greater than the VL (1.08 ± 0.19) (collapsed across groups). **CONCLUSION:** The results of the present study would tentatively suggest that there was a greater acceleration in the EMG_{RMS} –force relationships for individuals with the ability to produce high levels of voluntary activation in comparison to moderately-activated. In addition, the greater *b* terms for the RF than the VL may reflect fiber type and/or functional role differences between the muscles.

#18

BAROREFLEX CONTROL OF LEG VASCULAR CONDUCTANCE DURING SIMULATED CAROTID HYPERTENSION IN YOUNG AND OLDER WOMEN

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Recent data indicate that β-adrenergic stimulation offsets α-adrenergic vasoconstriction in young women and this effect is lost in postmenopausal women. These findings suggest that sympathetic control of the vasculature differs with age in women. However, the impact of these age-related vascular changes on baroreflex control of blood pressure remains unknown. **PURPOSE:** The purpose of this study was to examine the effect of baroreflex stimulation on leg vascular conductance (LVC) and mean arterial pressure (MAP). **METHODS:** In 7 young (YW; 25±2 yrs) and 5 older women (OW; 60±5 yrs), femoral artery blood velocity and diameter (duplex Doppler ultrasound), MAP (Finameter) and heart rate (HR; ECG) were continuously measured during 5sec pulses of neck suction (-60 Torr) to simulate carotid hypertension. **RESULTS:** Resting LVC, MAP and HR were similar between groups. In response to neck suction, increases in LVC were significantly less in YW compared to OW (YW, +7±3 vs. OW, +21±4% ml/min/mmHg; $P<0.05$), whereas, YW exhibited greater decreases in HR (YW, -14±2 vs. OW, -8±2 bpm; $P<0.05$). Interestingly, carotid baroreflex-mediated decreases in MAP (YW, -12±1 vs. OW, -11±3 mmHg; $P>0.05$) were similar between groups. **CONCLUSION:** These preliminary findings suggest that older women have a greater reliance on changes in vascular conductance to modulate blood pressure during simulated carotid hypertension, whereas younger women rely more on cardiac responsiveness.

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#19
TREATMENT TYPE AND RACE EFFECTS ON EXERCISE FOR CANCER CARE

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The cancer burden is significant. Exercise reduces cancer-related side effects and improves quality of life. Exercise can be added to routine cancer care as part of cancer prevention, treatment, and survivorship. Little is known whether cancer survivors and caregivers in southern Georgia are aware of the importance of exercise, its role in cancer care, and the availability of medical and community services. **PURPOSE:** The purpose of this study was to assess basic exercise knowledge, exercise participation for cancer, and awareness of and interest in available cancer care services among cancer survivors and caregivers in southern Georgia. **METHODS:** Two hundred and thirty one individuals (145 cancer survivors, 86 caregivers) attending Relay For Life meetings and events participated in the study. Participants completed a 10-statement exercise-cancer survey, consisting of a 6-point Likert scale with responses ranging from "strongly disagree" to "strongly agree." Statements evaluated general exercise perceptions, exercise participation, role of exercise as part of cancer care, knowledge of existing cancer exercise programs, and interest in participating in a cancer exercise program. The survey included demographic data (gender, age, race, education level) and cancer data (cancer type, cancer treatment). **RESULTS:** Chi-square analysis revealed significant differences in responses regarding cancer treatment type and race. Survivors receiving combination treatments were 20.1% more likely to agree to exercise participation prior to cancer diagnosis [FET=.000; Φ=.36] and 16.1% more likely to agree to exercise participation during cancer treatments [FET=.017; Φ=.24] compared to survivors receiving single treatments. Caregivers caring for individuals receiving combination treatments were 31.1% more likely to agree that their doctor explained the importance of exercise compared to caregivers caring for individuals receiving single treatments [X^2=(1, N=67)=8.69, p=.003; Φ=.36]. Non-white survivors were 12.9% more likely to agree that their doctor explained the importance of exercise compared to white survivors [X^2=(1, N=135)=3.87, p=.049; Φ=.17]. **CONCLUSION:** Results indicate that treatment type may be a factor in exercise participation among cancer survivors prior to cancer diagnosis and during cancer treatments. Results also indicate that cancer treatment type (among caregivers) and race (among survivors) may be factors in quality of care, specifically with doctors explaining the importance of exercise for cancer care. Further study is needed to determine the role of exercise and its significance as part of routine cancer care.

#20

DIFFERENCES IN MUSCULOTENDINOUS STIFFNESS OF THE RECTUS FEMORIS FOLLOWING STATIC STRETCHING

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Static stretching is commonly performed before exercise and athletic events. Traditionally, it is believed that static stretching increases flexibility and reduces musculotendinous stiffness (MTS). However, there are no studies that have reported the effects of static stretching on MTS of the leg extensors. **Purpose**: The purpose of this study was to examine the effects of static stretching on the passive range of motion (PROM) and MTS of the leg extensors. **Methods**: Six individuals (mean ± SD; age = 24.5 ± 6.6 yr, height = 134.7 ± 29.8 cm, weight = 66.3 ± 7.3 kg) performed a PROM assessment with the isokinetic dynamometer (Biodex Medical Systems, Inc., Shirley, New York) programed in passive mode, which extended the right leg at an angular velocity of $5^{\circ s^{-1}}$. The hip was hyperextended at an angle of 148° to 152° during all range of motion assessments. The maximal ROM was determined as the point of discomfort but not pain, as acknowledged by the subject. MTS of the leg extensors was quantified using a fourth-order polynomial regression model that was fitted to the passive angle-torque curves for each subject. MTS ($Nm^{\circ^{-1}}$) was calculated for each degree increment in the passive angle-torque relationship. For analysis, MTS was determined at the second to last joint angle for the pre-stretching assessment and the same common joint angle selected during the post-stretching assessment. MTS was calculated offline using a custom-written software (LabVIEW 8.5, National Instruments, Austin, TX), which included a gravity correction of the limb. Surface electromyography (EMG) from a bipolar electrode (Ag-AGCL, Quinton Quik Prep, Quinton Instruments Co., Bothell, WA) configuration was monitored to ensure the movement was passive. If EMG activity was above baseline during the PROM assessment, the trial was removed from further analysis. For the stretching of the right leg extensors, subjects completed four repetitions of four stretches lasting 30 seconds with 10 seconds rest between stretches, which included three assisted stretches and one unassisted stretch. Paired samples t-tests were used to examine possible differences pre- to post-stretching for PROM and MTS. **Results**: There were no significant differences for PROM ($P = 0.099$) or MTS ($P = 0.470$) between pre- and post-stretching. Conclusion: In contrast to previous studies testing other muscle groups, there were no differences between pre- and post-stretching for PROM and MTS. The subject position in the isokinetic dynamometer may have not allowed for an accurate assessment of PROM or MTS. Future studies may want to further hyperextend the hip past the range used in the present study (148° - 152°).

#21

NOREPINEPHRINE INCREASES NADPH OXIDASE-DERIVED SUPEROXIDE PRODUCTION IN PERIPHERAL BLOOD MONONUCLEAR CELLS FROM HEALTHY HUMANS

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Many diseases associated with sympathetic overactivity also exhibit elevated reactive oxygen species (ROS). Although animal studies suggest that exogenous administration of the sympathetic neurotransmitter norepinephrine (NE) increases systemic ROS, the ability of NE to increase ROS in humans is unknown. **PURPOSE:** Thus, we sought to examine the potential contribution of NE via the NADPH oxidase pathway in increasing superoxide production in peripheral blood mononuclear cells (PBMCs) from healthy humans. **METHODS:** PBMCs were isolated from blood samples in 7 healthy males. NADPH oxidase ($gp91^{phox}$ and $p22^{phox}$) mRNA expression was assessed using real time RT-PCR at 1, 6, 12 and 24 hours following NE (50ng/ml and 50pg/ml) or vehicle treatment. In addition, intracellular superoxide production was measured at 1, 6, 12, 24 and 36 hours using dihydroethidium following NE only, NE + diphenylene iodonium (DPI; selective NADPH oxidase blocker) and vehicle. **RESULTS:** At physiological concentrations of NE (50ng/ml and 50pg/ml), expressions of $gp91^{phox}$ and $p22^{phox}$ were increased at 12 and 24 hours (e.g., $gp91^{phox}$; 12±4 and 4±3 fold; NE (50ng/ml) vs. vehicle; $P<0.05$). This was followed by an increase in superoxide production at 36 hours (1.4±0.3 fold; NE (50ng/ml) vs. vehicle; $P<0.05$). Importantly, NE-induced increases in superoxide production were attenuated by DPI. **CONCLUSION:** These findings suggest that NE increases the expression of NADPH oxidase subunit genes and NADPH oxidase-derived superoxide production in human PBMCs.

#22
P-90X® VS. INSANITY®

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Introduction: The purpose of this study was to distinguish which cardiovascular routine from Insanity® or P-90X® would be considered the most intense based upon heart rate. **Purpose**: It was hypothesized that Insanity® would be more intense than P-90X®. **Methods**: There were eight active female subjects on the collegiate bowling team from the University of Central Missouri in the study with an average BMI of 25.4 kg/m². Each participant did the cardiovascular routine for both P-90X® and Insanity®. The participants' average heart was measured and they were asked to rate the perceived exertion (RPE) after each of the routines. **Results:** For the average heart rate measured, P-90X® values were 148±18 BPM while Insanity® had values of 160±15 BPM. When comparing the means, there was a p-value of 0.002 indicating Insanity® had the higher average heart rate when compared to P-90X®. The RPE for Insanity® had an average score of 8.8 and P-90X® average score of 6.0, so Insanity® had a higher ranking in RPE. **Conclusion**: Based on the current data the Insanity® workout was perceived as a higher intensity and elicited a higher heart rate.

#23

SEASONAL CHANGES IN HAMSTRINGS TO QUADRICEPS STRENGTH RATIOS IN DIVISION-1 COLLEGIATE FEMALE SOCCER PLAYERS

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Low hamstring muscle strength relative to quadriceps muscle strength has been proposed to increase risk of non-contact knee joint injury, particularly to the anterior cruciate ligament. The hamstrings to quadriceps strength ratio (H:Q) is used to compare the agonist:antagonist strength relationship between the hamstrings and quadriceps muscles. The conventional H:Q ratio is a measure of concentric leg flexion peak torque relative to concentric leg extension peak torque. The functional H:Q ratio is a measure of eccentric leg flexion peak torque relative to concentric leg extension peak torque. **Purpose**: The purpose of the present study was to assess seasonal changes in the conventional and functional H:Q ratios in female soccer players. **Methods**: Seventeen female soccer players (mean age ± SD = 19.8 ± 1.3 years; body mass = 64.2 ± 6.5 kg; height = 163.0 ± 4.9 cm) participated in the study. Participants performed two maximal isokinetic concentric leg extension, leg flexion, and eccentric leg flexion muscle actions at $60°\cdot sec^{-1}$, $180°\cdot sec^{-1}$, and $300°\cdot sec^{-1}$. The highest peak torque for each velocity and muscle action was analyzed. Participants were pretested at the beginning of the spring season and posttested following a 12-week non-championship spring season that included a 6-week strength and conditioning program followed by springtime development games. **Results**: Repeated measures ANOVA revealed improvements in the H:Q ratio for all six measures however the functional H:Q ratio at $60°\cdot sec^{-1}$ ($p = 0.027$) was the only improvement that reached statistical significance. **Conclusions**: The present findings suggest that the functional H:Q ratio at $60°\cdot sec^{-1}$ in collegiate division-1 female soccer players may increase over the course of a spring soccer season. The conventional H:Q ratio at $60°\cdot sec^{-1}$, $180°\cdot sec^{-1}$, $300°\cdot sec^{-1}$ and the functional H:Q ratio at $180°\cdot sec^{-1}$ and $300°\cdot sec^{-1}$ increased over the course of the season, however, these improvements did not reach statistical significance. The non-championship spring season is considered by coaches to be critical for soccer development. Based on these findings, there was no indication of a deconditioning effect of the H:Q ratio over the course of the spring soccer season, in fact, it may improve the H:Q ratio and reduce the risk of non-contact knee joint injury.

#24

IMPACT OF VOLUNTARY WHEEL RUNNING AND TREADMILL EXERCISE TRAINING ON HEPATIC MITOCHONDRIAL METABOLISM AND FUNCTION

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It is well known that exercise training increases skeletal muscle mitochondrial content and function; however, hepatic mitochondrial adaptations to exercise are largely unknown. **PURPOSE**: Here we sought to determine the effects of various exercise modalities on measures of hepatic mitochondrial function. **METHODS**: Sprague Dawley rats were randomly assigned (n=5-8 per group) to sedentary (SED), voluntary wheel running (VWR), treadmill endurance exercise (EndEx; 30 m/min, 60 min/d, 5 d/wk), or treadmill interval sprint training (IST; 50 m/min, 6x2.5 min bouts, 5 d/wk) groups for a 4 week intervention. **RESULTS**: Preliminary findings indicate that hepatic mitochondrial 1-^{14}C palmitate oxidation to CO_2 tended to be increased only in the VWR group (p=0.15) compared to the sedentary condition. Although, all exercise interventions tended to increase hepatic mitochondrial 2-^{14}C pyruvate oxidation to CO_2 (an index of mitochondrial TCA cycle flux) by 20-40%. Moreover, 1-^{14}C pyruvate oxidation to CO_2 (an index of pyruvate dehydrogenase activity) was increased 10-25% with each exercise intervention. Furthermore, each exercise group also exhibited 25-30% greater maximal uncoupled mitochondrial respiration compared with SED animals. **CONCLUSION**: These preliminary findings suggest that 4 weeks of exercise induces increases in hepatic mitochondrial function and metabolism. These findings need to be confirmed in a larger study cohort.

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#25

THE INFLUENCE OF VISUAL FOCUS ON VERTICAL JUMP HEIGHT AS DETERMINED BY A STANDARD JUMP STATION MEASUREMENT AND MARKER-LESS MOTION CAPTURE

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PURPOSE: The purpose of this study was twofold: to determine if there was a difference between vertical jump measures using different focal points; and to examine if there was a difference in vertical jump measures obtained from a vertical jump test station and motion capture analysis. **METHODS:** Thirty-five college students (15 males, 20 females) volunteered to participate in this study. Subjects reported to a motion capture facility for one testing session. Following a five minute jog warm-up, subjects completed three randomized trials of three different jumps. One jump required the subject to focus on a target they had to reach for on the jump station, another required the subject to look forward as they jumped to the target on jump station, while one jump did not use the jump station. One minute of rest was taken between jumps; two minutes rest was taken between jumping trials. All jumps were initiated from a standard two-legged stance with a countermovement. Each jump was filmed using a 14-camera marker-less motion capture system. **RESULTS:** A repeated measures ANOVA revealed no significant differences in vertical jump measures, $F(4,31)=2.245$, $p=0.08$. Pairwise comparisons revealed significant differences in vertical jump height determined via motion capture between the trials in which subjects used the jump station and the trial in which subjects freely jumped ($p<0.05$). **CONCLUSIONS:** This data reveals visual focus does not significantly impact vertical jump performance. Also, measurements determined from a vertical jump station and a marker-less motion capture system are not significantly different. However, this study also demonstrates significant differences may be seen in vertical jump height when the subject freely jumps without having to reach for a target. This information can provide useful insight for those who test anaerobic performance through various vertical jump testing options.

#26

ACTIVE ISOLATED STRETCHING VERSUS TRADITIONAL STATIC STRETCHING IN RELATION TO MAXIMAL VERTICAL JUMP PERFORMANCE

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Musculoskeletal injuries are amongst the most common in sport, accounting for half of all incidences. Previous research suggests that increasing muscular length and elasticity dynamically prior to competition can result in lower risk for injury. Active Isolated Stretching (AIS) is believed to be beneficial through combining an active component with focus on end range of motion. **PURPOSE:** The aim of the present investigation was to determine the effects of an AIS protocol on performance when compared to Static Stretching (SS) prior to explosive activity. **METHODS:** Subjects consisted of nine males (21.23 ± 3.56yrs, 1.81 ± 0.11m, 74.91 ± 10.30kg) and eleven females (20.03 ± 2.87yrs, 1.60 ± 0.23m, 54.83 ± 5.67kg). This study was approved by the Institutional Review Board at the University of Arkansas. Participants were free of any muscular or joint complications prior to participation. Subjects completed each of the three conditions: SS, AIS, and Control. Maximum vertical jump height was recorded immediately following each stretching protocol with at least one day of rest between trials. Conditions were completed on separate days to account for fatigue. **RESULTS:** A one-way ANOVA with one repeated-measures factor was used to detect differences between the three protocols. Analysis revealed that the AIS stretching protocol resulted in significantly higher vertical jumps when compared to SS protocol (17.91 SS, 18.55 AIS; $p < .0001$). The SS protocol did not yield jumps that were significantly lower than the control group (17.91 SS, 18.283 Control; $p < .0831$). **CONCLUSION:** While control and AIS yielded similar results, control does not allow for a warming of the muscles, which is documented to help prevent injury. The results support the hypothesis that AIS is a beneficial, dynamic choice for improving performance, when completed prior to exercise or competition, especially those that are explosive in nature.

#27

RELIABILITY OF A NOVICE TEST ADMINISTRATOR CONDUCTING ULTRASOUND AND SKINFOLD MEASURES OF SUBCUTANEOUS FAT

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Measures of the subcutaneous fat using skinfold calipers consistently demonstrate good reliability and satisfactory validity for estimating total bodyfat. Reliability of skinfold (SF) measures is influenced by many factors including experience of the test administrator. Novice SF administrators consistently produce less reliable measures than experienced administrators. A simple portable ultrasound (ULS) device for measuring the thickness of the subcutaneous fat layer has recently been developed. ULS does not require the skills associated with properly lifting and measuring the subcutaneous fatfold, and the ULS software algorithm identifies the tissue thickness while coaching the administrator to repeat dissimilar measures. Considering these potential advantages, we propose novice measurement technicians should exhibit more reliable measures using the ULS device than using calipers. **METHODS:** The research participants were volunteers from an undergraduate Health & Human Performance department class. The final sample included 10 males and 11 females. Three standardized anatomical sites were measured for each individual: abdominal, tricep, and suprailiac for females; chest, thigh and abdominal for males. The same novice test administrator measured each individual once using calipers, then repeated the measurements at least 30 minutes later for the reliability retest. The same process was implemented 2 days later for ULS. **RESULTS:** Reliability coefficients and standard error of measurement for sums of 3 sites on the full sample were: r=0.96, SEM=5.11 mm. for SF and r=0.99, SEM=1.64mm for ULS. Gender specific correlation and error values were similar to those for the total sample. **CONCLUSIONS:** Reliability correlations observed in this study were very high for both measurement techniques. The nature of the sample may have contributed to these results. Subjects were relatively fit and lean. Greater measurement variability tends to be associated with larger skinfold values. Even though all test-retest correlation values were very high, they were consistently higher for the ultrasound technique. More importantly, the standard error of measurement was consistently lower for ULS measures. Within the limits of this study, the findings supported the model that ULS measurement was more reliable than SF calipers for identifying subcutaneous fat thickness when testing is performed by a novice test administrator.

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#28

ACETAMINOPHEN HAS NO EFFECT ON PHOSPHORYLATED PROTEINS DOWNSTREAM OF INTEGRINS AFTER 5-WEEKS OF AEROBIC EXERCISE TRAINING IN RAT SOLEUS MUSCLE

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Acetaminophen (APAP) has been demonstrated to increase muscle mass following chronic exercise. The transmission of mechanical loads across the sarcolemma has been shown to be necessary for skeletal muscle hypertrophy. In skeletal muscle, the alpha7beta1 integrin detects these mechanical loads and coordinates protein signaling through the phosphorylation of tyrosine 397 of focal adhesion kinase (FAK). This results in phosphorylation of c-Src and, ultimately, activation of extracellular signal-regulated kinase 1/2 (ERK). Surgical deloading and eccentric exercise can increase integrin signaling in rats and mice. There is no study that has looked at the differences between APAP and aerobic exercise on the phosphorylated concentration of proteins downstream of the alpha7beta1 integrin. PURPOSE: The purpose of this study was to determine if 5 weeks of aerobic exercise would alter the phosphorylation of FAK^{397},c-Src^{416} and $ERK1/2^{202, 204}$ in the soleus of control or acetaminophen-treated rats. METHODS: 10 week old male Wistar rats were randomly assigned to either an exercise group (EX; n=5) or an exercise group + APAP (AP; n=4). Rats ran in progressive volumes (up to 60min/day) at 20m/min with an 8° grade for 5 weeks. Rats assigned to the EX+APAP received 200mg/kg/day of APAP via oral gavage while saline was administered to CON daily. Protein expression was determined using Western immunoblotting and spot densiometry. RESULTS: There were no differences in the phosphorylation of FAK^{397} ($p=.161$), c-Src^{416} ($p=.457$), or $ERK1/2^{202, 204}$ ($p=.955$). CONCLUSION: Consuming acetaminophen has no effect on the phosphorylation of proteins downstream of integrins following five weeks of aerobic exercise in the rat soleus.

#29

PERCEPTIONS OF DOPING IN MALE COMPETITIVE CYCLISTS USING THE PERFORMANCE ENHANCEMENT ATTITUDES SURVEY

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According to Steve Johnson, CEO of USA Cycling, the United States Cycling Federation (USCF) maintains a zero tolerance policy on doping (2010). The monitoring and testing of doping among cyclists is controlled and monitored under the United States Anti-Doping Association (USADA) (2011). Petroczi reports efforts for drug free sport include developing a better understanding of the behavioral determinants that underline doping with an increased interest in developing anti-doping prevention and intervention programs (2011). Empirical testing of both is dominated by self-report questionnaires, which is the most widely used method in psychological assessments and sociology polls (Kayser et al., 2007; Uvacske et al., 2009). The USCF maintains a position for all racers to govern themselves according to USADA standards. According to USCF, it is the responsibility of any athlete with firsthand knowledge of doping to report it directly to USADA (2010). A correlation exists between athletes' attitudes and personal experience with performance enhancing drugs (PED) (Petroczi & Aidman, 2008). Assessing perceptions of doping among cyclists can lead to an understanding of underlying motives for using PED's (Dodge and Jaccard, 2008). The purpose of this study was to determine if an association exists between level competition (Category 1-5, Masters) and perceptions of doping (composite PEAS scores). **Methods:** The United States Cycling Federation (USCF) racing categories are stratified based on ability/level of racing with Category 1 being the most skillful and Category 5 being the most amateur. Athletes over the age of 40 can compete as Masters racers. Texas USCF racers were solicited for survey participation through a link contained on the Texas Bicycle Racing Association (TXBRA) website. Seventy-six (n = 76) competitive male cyclists (mean age = 39) provided valid responses on the Performance Enhancement Attitude Survey (PEAS), a unidimensional 17-item self-reported questionnaire. Internal consistency of the PEAS has been reported from .71-.91 (Petroczi et al., 2011) and for this sample was .87. **Results:** Equal group membership was determined prior to statistical analysis ($x^2 = 3.4$; $p = .639$). Composite mean PEAS score differences ($p = .02$) were detected across groups (cat 1 = 39.7; cat 2 = 41.71; cat 3 = 43; cat 4 = 46; cat 5 = 36.23; Masters = 34.25). Post Hoc analyses indicated differences between all groups except Category 1 and 2 racers (HSD = 2.06). **Conclusion:** Cyclists who race within a less competitive/skillful (specifically cat 3 and 4) had higher scores on the PEAS than those racing in the more elite categories (1-2; and Masters) with the exception of cat 5. Therefore, perceptions of doping do not increase linearly with increased level of competition.

#30

EFFECT OF WHOLE BODY VIBRATION EXERCISE ON MUSCLE ACTIVITY WHEN USING ELASTIC RESISTANCE BANDS

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PURPOSE: Whole-body vibration (WBV) has been shown to increase muscle fiber recruitment during isotonic contractions. No prior published studies have used elastic resistance. The main purpose of this study is to investigate the acute effects of a single bout of WBV on electromyography (EMG) activity during exercise when using elastic resistance. **METHOD:** 30 participants (14 male; 16 female) aged 18-30 were recruited for this study. Surface electromyography (sEMG) activity was then determined while participants performed the arm curl and squat using elastic resistance under three conditions: no vibration exposure, during acute vibration exposure, and immediately following acute vibration exposure. Seven muscles of interest were chosen: gastrocnemius, vastus lateralis, vastus medialis, biceps femoris biceps brachii, triceps brachii, and lateral deltoid. Vibration was administered using a vibration platform (Wave®; ProElite, Windsor, ON Canada) at a frequency of 35Hz at 2mm displacement amplitude. **RESULTS:** Results indicate significant increases (.05) in sEMG in all seven muscles of interest between the pre-vibration (control) trial and the vibration trial. Additionally, the vastus medialis, gastrocnemius, biceps brachii and lateral deltoid yielded increased sEMG activity immediately following vibration. **CONCLUSION:** These data suggest sEMG activity is significantly increased during WBV. These data also suggest sEMG activity is significantly increased immediately following WBV in all prime-movers of the arm curl and the squat with the exception of the vastus lateralis.
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#31

POWER OUTPUT COMPARISON BETWEEN DIFFERENT AGE GROUPS FOR FEMALE YOUTH SOCCER PLAYERS

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INTRODUCTION: Physiological differences among youth soccer players may be an indication of successful performance with power playing an important role in the definition of that success. Recent evidence has suggested measurements of power during a countermovement vertical jump (CMJ) test could differentiate players of varying skill level. However, growth spurt and maturational trends may effect differences in power output and anthropometry, thus differences in age need to be considered when analyzing power in youth players. **PURPOSE**: To examine the effect of age on height, body mass, CMJ height, and power output of female youth soccer players. **METHODS**: Thirty-seven 12 yr-olds (height = 156.62 ± 5.5cm, mass = 48.36 ± 8.7kg), twenty-six 13 yr-olds (height = 160.52 ± 7.6cm, mass = 55.58 ± 9.7kg), and thirty-six 14 yr-olds (height = 161.29 ± 4.8cm, mass = 57.67 ± 6.9kg), were given parental consent to participate. Following a general warm-up, participants performed 3 CMJs. For each jump, CMJ height and average power were measured using a jump mat and fitrodyne analyzer Mean average power and CMJ height of the three jumps was used for subsequent analyses. A one-way ANOVA was used to determine differences between age. When appropriate, independent samples t-tests were used for pair-wise comparison. An alpha level of $p \leq 0.05$ was used to determine statistical significance. **RESULTS**: For height and body mass, 12 yr-olds were shorter and weighed less than the 13 and 14 yr-olds (range of p-values). Average power increased (range of p-values) with age (12yr<13yr<14yr) and 14 yr-olds had greater (p-value) CMJ height than 12 yr-olds. **CONCLUSIONS**: Coaches should be aware of the differences in height and body mass between age-groups and how that can affect jump height and power measurements. Training should be reflective of individual differences during the maturation phase and individualized to promote optimal performance.

#32

MECHANOMYOGRAPHIC-FORCE RELATIONSHIPS FOR HIGH- AND MODERATE-ACTIVATED INDIVIDUALS

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The mechanomyographic (MMG) signal represents a summation of the mechanical activity from individual motor units. During voluntary ramp contractions, it has been suggested that the amplitude may be able to distinguish between motor unit recruitment and rate coding as the primary mechanism to increase force. In addition, it is believed that high activation capabilities (> 90 percent voluntary activation [%VA]) is the result of greater motor unit firings in comparison to individuals without high activation capabilities (moderate-activated, < 90% VA). In theory, the MMG amplitude-force relationships may reflect these differences in motor control strategies between high- and moderate-activated subjects. **PURPOSE:** The purpose of the present study was to examine the MMG amplitude (MMG_{RMS})-force relationships of the rectus femoris (RF) and vastus lateralis (VL) of high- and moderate-activated subjects. **METHODS:** Thirteen healthy men (mean ± SD, age = 22 ± 3 yrs, body mass 88 ± 14 kg) volunteered for this investigation. The MMG sensor (EGAS-FS-10-/V05; Measurement Specialties, Inc., Hampton, VA) was placed over the VL and RF at 50% of the distance between the greater trochanter and lateral condyle of the femur. Each participant completed nine submaximal contractions (10-90% maximal voluntary contraction [MVC]) with the interpolated twitch technique performed during a separate contraction at 90% MVC to calculate percent voluntary activation (%VA). Nine participants with > 90% VA were categorized into the high-activated group with the remaining categorized into the moderate-activated group. Slopes (*b* terms) were calculated from the log-transformed MMG amplitude (MMG_{RMS})-force relationships. A two-way mixed factorial ANOVA (group [high- vs. moderate-activated] x muscle [VL vs. RF]) was used to examine possible differences in the *b* terms. **RESULTS:** There was no group x muscle interaction ($P = 0.137$) or main effect for group ($P = 0.558$), but there was a main effect for muscle ($P = 0.002$). The *b* terms from the MMG_{RMS}-force relationships were greater for the RF (0.79 ± 0.20) than the VL (0.60 ± 0.13). **CONCLUSION:** It has been hypothesized that high voluntary activation is achievable with increases in motor unit firings rates, however, the MMG_{RMS}-force relationship was not influenced by activation capabilities. Thus, high activation capabilities may not be solely the result of greater motor unit firings rate in comparison to individuals that don't possess high activation capabilities. In addition, the greater *b* terms for the RF than the VL from the MMG_{RMS}-force relationships may reflect fiber type and/or functional role differences between the muscles.

#33

RELATIONSHIP BETWEEN POWER CLEAN AND A SPORT-SPECIFIC TASK IN DIVISION I COLLEGIATE FOOTBALL LINEMEN

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It is common practice for strength and conditioning professionals to train collegiate football players explosively for the purpose of enhancing explosive ability. The power clean (PC) is one such power-based exercise that is performed throughout the off-season by these athletes, however little is known about the relationship between PC performance and tasks specific to the sport of football. **PURPOSE:** The purpose of this study was to determine the relationship between 1-RM PC strength and the performance of a sport-specific task on an automated football sled device (FSD) in collegiate linemen. **METHODS:** Twenty-six NCAA Division I linemen (age 20.11± 1.49yrs) offensive linemen (n=12) and defensive linemen (n=14) performed ten "fire-and-drive" repetitions on a FSD. Prior to testing all subjects performed a standardized 5 min dynamic warm-up. Subjects started the test at a standardized distance (12 in) in a three point stance, upon an auditory signal rendered from the FSD subjects drove out of their stance into the breast plate region of the dummy as forcefully as possible. After each repetition subjects reset themselves in a three point stance for a time-frame of 6 to 10 sec that was randomly selected by the FSD. The FSD measured the force of each repetition in a non-standard unit of force with average Force (AVG_F) and peak force (P_F) across the ten repetitions being recorded. 1-RM PC testing was performed by the team's strength and conditioning staff and collected as secondary data. Test-retest reliability was analyzed using intraclass correlation coefficients (ICC) and standard error of measurement (SEM) by performing two testing sessions separated by 48 hours one week prior to data collection. **RESULTS:** There was a moderate ($r = 0.65$), but non-significant correlation between 1-RM PC strength and AVG_F. However, there was a strong ($r = .094$) correlation between 1-RM PC strength and P_F. Test-retest reliability analysis revealed strong reliability with the device (ICC, SEM) .813, 93.4. **CONCLUSIONS:** These results suggest that 1-RM PC performance is a predictor of explosive ability on a sport-specific task in collegiate linemen. Furthermore, although a moderate relationship is present, strength and conditioning professionals might consider using 1-RM PC performance as a part of their evaluative process in identifying explosive ability from the line of scrimmage in collegiate linemen.

#34

SPONTANEOUS BAROREFLEX CONTROL OF MUSCLE SYMPATHETIC NERVE ACTIVITY: IMPACT OF BASELINE DURATION

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The relationship between spontaneously occurring changes in muscle sympathetic nerve activity (MSNA) and diastolic blood pressure (DBP) is increasingly being used to estimate baroreflex MSNA sensitivity. Although spontaneous measures have been shown to correlate with MSNA baroreflex sensitivity derived using the modified Oxford, standardized analyses procedures have not been established. **PURPOSE**: The purpose of this study was to determine if the reliability of spontaneous baroreflex measures is impacted by the period of data (e.g., 5 vs. 2min) and bin size used for this analysis. **METHODS**: In 8 subjects weighted linear regression analysis between MSNA and DBP was used to determine baroreflex MSNA sensitivity. Intraclass correlation coefficients (ICC) for each bin size (1, 2, and 3 mmHg) were calculated to examine reliability of spontaneous MSNA sensitivity over segment durations of 2-, 5-, and 10-minutes. **RESULTS**: Overall ICC for burst incidence was high (0.884; $P<0.05$) indicating an acceptable reliability. Importantly, the reliability over different segment durations was unaffected by bin size (e.g., 3 mmHg bins: ICC=0.875, $P<0.05$). Similar results were found for burst strength. **CONCLUSION**: These preliminary findings suggest that the duration of baseline and bin size does not affect spontaneous MSNA baroreflex estimates at rest.

#35
FLEXIBILITY PROGRAM MAY INCREASE SHOULDER FLEXION IN OLDER ADULTS

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The guidelines of the American College of Sports Medicine recommend that older adults regularly participate in flexibility training; however, strong evidence is lacking to support this recommendation. **PURPOSE:** The purpose of this study was to determine if resistance and flexibility training combined provided greater impact on upper body flexibility when compared to resistance training alone. **METHODS:** This 16-week study included a control group and experimental group. A total of 39 subjects participated in the training ($M = 79.67 \pm 6.29$ years; range 66 to 92 years). Both groups completed the same total body resistance training program. The experimental group also participated in flexibility training of all major muscle groups. The control group and experimental group trained two days per week for approximately one hour. Flexibility was assessed with the back-scratch test and goniometer testing of shoulder flexion. Assessments were taken at baseline, eight weeks, and 16 weeks. **RESULTS:** An ANOVA with repeated measures revealed a significant interaction effect for both right and left shoulder flexion ($p < 0.001$). Right shoulder flexion increased in the experimental group ($M = 21.03°$ from baseline to post-test) and decreased in the control group ($M = -14°$ from baseline to post-test). No significant effects were observed for the back-scratch test. **CONCLUSION:** The results of this study indicate that resistance training combined with flexibility training improves shoulder flexion, however, these improvements did not translate to functional flexibility (i.e., back-scratch test). We recommend that future studies incorporate additional measures of shoulder flexibility and functional outcomes.

#36

LONGITUDINAL MORPHOLOGICAL AND PERFORMANCE PROFILES FOR AMERICAN, NCAA DIVISION I FOOTBALL PLAYERS

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Division I football players represent elite athletes who, at the time of arrival to the university, are engaged in multifaceted, physical training protocols to attempt to produce strength, power, and speed. **Purpose:** The aim of this study was to examine the anthropometric and performance changes over four years of eligibility in the careers of American Division I football players. **Methods:** A total of 92 offensive and defensive linemen and 64 skill (wide receivers and defensive backs) player observations were included in the analysis. Data from pre-season testing over a seven year period were compiled, sorted and analyzed by players' year in school. Assessments of strength included 1RM bench press, squat, power clean and a 225 lb. maximum repetition muscle endurance test. Power and speed measures included the vertical jump (VJ) and 40 yd (36.6m) sprint. **Results:** All strength measures improved significantly ($p<0.05$) over the years of training. Skill players demonstrated a significant increase in power (W) between years 1 and 2, but at no other time. Linemen did not demonstrate significant changes in VJ. Speed did not change significantly for either group over the four years of training. **Conclusion:** These data provide an example of physical changes occurring in elite college football player over a four-year period. By having an example of longitudinal assessment of physical changes it may be possible for strength training personnel to determine those who do not progress similarly in order to provide adjusted training protocols that may contribute to better gains. Additionally, it is suggested that elite athletes may possess genetically superior attributes and therefore, when selecting athletes particular attention should be paid to the selection of those who have previously demonstrated superior speed and power.

#37

DIFFERENTIAL INSULIN EFFECTS ON GASTROCNEMIUS AND SOLEUS FEED ARTERIES IN OLETF RATS: ROLE OF ENDOTHELIN-1

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The vascular actions of insulin are complex as it can stimulate both nitric oxide (NO)-mediated dilation and endothelin (ET)-1-mediated constriction. A portion of the skeletal muscle insulin-resistant phenotype associated with the pathogenesis of type 2 diabetes mellitus (T2DM) is thought to be due to pathway-selective downregulation of the NO branch of the endothelial cell insulin signaling pathway, resulting in a net balance of insulin-induced ET-1 activation. **PURPOSE:** We examined vasoreactivity to insulin in isolated feed arteries of the gastrocnemius (GFA) and soleus (SFA) muscles of 32 wk-old Long Evans Tokushima Otsuka (LETO) and Otsuka Long Evans Tokushima Fatty (OLETF) rats, a hyperphagic rodent model of obesity and insulin resistance. **METHODS and RESULTS:** There were minimal differences between LETO (healthy) and OLETF (obese/insulin resistant) rats in insulin-induced vasoreactivity in either vessel. However, examination of between-vessel effects revealed a number of novel insights into the heterogeneous vascular effects of insulin. SFA dilated more than GFA in LETO at 100 and 1000 μIU/mL (23% vs 6% and 28% vs. 0%, respectively; $P < 0.05$ for between-vessel differences). Similarly, in OLETF rats there was significantly greater dilation in SFA than GFA at 10, 100, and 1000 μIU/mL (13% vs. 3%, 28% vs. 0%, and 34% vs. 0%, respectively; all $P < 0.05$. In the presence of 3 μM tezosentan, a non-specific ET-1 receptor blocker, insulin-induced dilation of the GFA was enhanced such that differences between vessels were largely abolished in both groups. **CONCLUSION:** Thus, the insulin/ET-1 vasoconstrictor pathway is more active in GFA than in SFA, independent of obesity in the OLETF rat model. Our data generate the hypothesis that this phenomenon is related, in part, to between-muscle differences in resting recruitment patterns and the associated between-vessel differences in blood flow and presumably vascular wall shear stress.

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#38

EFFECTS OF STATIN TREATMENT WITH OR WITHOUT EXERCISE ON BONE TURNOVER IN OBESE MIDDLE-AGED ADULTS

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Statins, which inhibit HMG-CoA reductase, are widely used clinically to lower cholesterol. However, the effects of statins on bone health are unclear. **PURPOSE**: The purpose of this study was to determine the effects of 12 weeks of simvastatin treatment alone or in combination with aerobic exercise on bone turnover in overweight or obese middle-aged men and women. **METHODS**: 47 participants (age 43±1.6y) were randomly assigned into one of three treatment groups: statin (STAT, simvastatin 40mg/day); exercise (EX, brisk walking and/or slow jogging 45min/day, 5 days/week, at 60% VO2max); or statin plus exercise (STAT+EX). Body composition and bone mineral density (BMD) were measured using a dual X-ray absorptiometry scan of the whole body. Serum markers of bone formation (bone specific alkaline phosphatase, BAP; osteocalcin, OC) and resorption (C-terminal peptide of type I collagen, CTX) were measured using ELISA, and total cholesterol was determined using an enzymatic assay. A two-factor (time, treatment-repeated measures) ANOVA was used to test for significant time or treatment main effects and time-by-treatment interactions. **RESULTS**: All groups remained weight stable during the intervention. Statin treatment significantly lowered total cholesterol in the STAT and STAT+EX groups, while the EX group did not change. Whole body and regional BMD remained constant. CTX increased significantly in all treatment groups ($P<0.05$), while BAP and OC were unchanged. **CONCLUSION**: A relatively short period of statin treatment with or without exercise effectively lowers serum cholesterol but may have negative effects on bone metabolism in obese middle-aged adults.

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#39

INVESTIGATING THE RELATIONSHIP BETWEEN MATERNAL FAT INTAKE AND INFANT FAT MASS LOCATION

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Despite the vast research on fat intake, little is known about the relationship between maternal trans fat and saturated fat intake during pregnancy and infant body composition. **PURPOSE**: This project specifically examined the relationship between maternal trans fat and saturate fat intake and infant fat mass (FM) location (central versus peripheral). **METHODS**: Maternal trans fat and saturated fat intake was measured using the National Institutes of Health Diet History Questionnaire (DHQ; version 2007). Mother's completed the DHQ at 32 weeks and all questions were phrased, "during this pregnancy…" to capture nutritional data only during the current pregnancy. Mother's self-reported pre-pregnancy body weight while maternal body weight and height were measured at 32 weeks. At the infant visit, mother's self-reported highest weight reached in pregnancy and this was used to calculate late gestational weight gain (GWG). Self-reported pre-pregnancy weight and measured weight at 32 weeks was used to calculate weight gain up to 32 weeks. Infant skinfolds (SKF) were taken 2-3 weeks after birth. Central FM was represented by the following skinfolds: (subscapular +flank)/2, while peripheral FM was represented by the following skinfolds: (thigh + triceps)/2. Multiple linear regression was used to evaluate the relationship between maternal trans fat and saturated fat intake and infant FM location. Infant covariates included gestational age (wks), gender, and change in infant body mass from birth to study visit. The maternal covariates included GWG through 32 weeks, weight gain from 32 weeks to delivery, and pre-pregnancy BMI. Dietary covariates included total kcal intake. Only significant covariates were retained in the model and significance was set at $p \leq 0.05$. **RESULTS**: Thirty-four mother-infant pairs were included in this analysis. Infant characteristics included the mean gestational age and infant age at test of 39.7 ± 1.3 weeks 2.9 ± 0.6 weeks, respectively. Maternal estimated daily dietary characteristics included 1752.2 ± 716.2 total kcals, 4.0 ± 2.3 grams trans fat and 23.7 ± 14.1 grams saturated fat. Based on regression modeling, maternal trans fat intake was inversely related to central FM (ß= -0.605; $p=0.011$). The only significant variable predicting infant peripheral FM was maternal GWG through 32 weeks (ß= 13.938; $p<0.001$). **CONCLUSION**: Maternal trans fat intake was inversely related to infant central FM while maternal trans fat intake was not related to infant peripheral FM. Further research is needed to evaluate these relationships.

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#40

VOLUNTARY WHEEL-RUNNING IMPROVES METABOLIC FLEXIBILITY IN THE LIVER

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Hepatic metabolic flexibility, the capacity to change substrate utilization, may be important for protection against hepatic steatosis. **PURPOSE:** The purpose of this study was to examine whether increased physical activity improves substrate switching in liver mitochondria. **METHODS:** Age-matched male Sprague-Dawley rats underwent 4 weeks of voluntary wheel-running (WR; n=4) or remained sedentary (SED; n=4) prior to sacrifice at 16 weeks. Isolated hepatic mitochondria were analyzed for fatty acid oxidation (FAO) with and without addition of 1 mM pyruvate, and pyruvate oxidation (PyvOx) with and without addition of 200 μM palmitate. **RESULTS:** At sacrifice, there was a trend towards lower body weight in WR compared to SED, but food intake and intake per body weight were not different between groups over the 4 weeks. Complete FAO (^{14}C palmitate to $^{14}CO_2$) was higher in WR compared to SED (4.29 ± 0.05 vs. 3.01 ± 0.11 nmol/g/h; $p < 0.05$), and the amount of FAO inhibited by pyruvate was 2 fold higher in WR vs. SED (1.74 ± 0.19 vs.0.82 ± 0.23 nmol/g/h; $p < 0.05$). Furthermore, the amount of complete PyvOx (^{14}C pyruvate to $^{14}CO_2$) inhibited by palmitate in mitochondria was 25% higher in WR compared to SED (41.57 ± 0.04 vs. 31.24 ± 0.09 nmol/g/h; $p < 0.05$). **CONCLUSION:** This study shows that higher daily physical activity results in greater substrate-switching and metabolic flexibility in hepatic mitochondria.Support: NIH R01DK088940; NIH T32; This work was also supported with resources and the use of facilities at the Harry S Truman Memorial Veterans Hospital.

#41
A COMPARISON OF THREE BICYCLE PEDAL TYPES AND POWER OUTPUT

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PURPOSE: The purpose of this study was to evaluate power output over a 30-second maximum effort bicycle sprint with three different pedal types (clipless, toe-strap, and flat) in experienced cyclists using their own competition bikes. **METHODS:** Eight (7 males and 1 female) experienced mountain bikers between age 20 and 55 ($\bar{x}$ Age = 40) from the Central Kansas Mountain Bike Club participated in this study. Each participant provided his or her own bicycle and the researchers provided the cycling stand, Saris CycleOps PowerTap rear wheel, and Garmin Edge 500 cycling computer for data collection. Testing consisted of: a standardized warm-up, a 30-second maximal sprint with one pedal type followed by 20-minutes of passive recovery, another second 30-second sprint with a second pedal type followed by 20-minutes of passive recovery, and a final 30-second sprint with the remaining pedal type. Pedal sequence was randomized for each individual. **RESULTS:** Mean 30 second power output was higher using clipless pedals ($\bar{x}$ = 617 watts, SD = 112) than toe-strap ($\bar{x}$ = 572 watts, SD = 77), and flat ($\bar{x}$ = 566 watts, SD = 83). Pedal comparison ANOVA results indicated significant differences in power output for clipless pedals compared to toe-strap pedals ($p < .001$) and clipless pedals compared to flat pedals ($p < .000$), but not between toe-strap pedals and flat pedals ($p < .644$). Tukey LSD test analysis of power for time intervals showed significant decreases from 5-second compared to 30-second ($p < .008$), and 10-second compared to 30-second ($p < .03$), but no significance at other intervals. Peak power was higher for both clipless and toe-strap pedals compared to flat pedals, although mean toe-strap power output was not significantly different from flat. Similar to Wingate Anaerobic Test results from Coleman and Hale (1998), peak power was always evident during the first five second interval, regardless of pedal type. Although fatigue was not directly analyzed in this study, power appeared to decrease more rapidly over the last 10 seconds when using clipless pedals. **CONCLUSIONS:** Results of this study are similar to studies performed on cycle ergometers which have generally found a performance advantage for clipless pedals.

#42

VALIDATION OF A 3-DIMENSIONAL VIDEO MOTION CAPTURE SYSTEM FOR DETERMINING WEIGHT TRAINING KINETICS AND KINEMATICS

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Modern strength training facilities often employ various types of external dynamometers to determine barbell velocity and power. **Purpose:** To determine the validity of kinetic and kinematic data obtained using a 3-dimensional (3-D) video motion capture system during resistance exercise. **Methods:** A half-rack free weight lifting station was outfitted with two overhead mounted 3-D video cameras sampling at 30 fps (30 Hz), interfaced with a self-contained computer and software system, and operated with a touch screen (EliteForm, Lincoln, NE). For comparison purposes, a 3'x8' uni-axial force plate (Rough Deck, Rice Lake, WI) was placed directly under the half-rack, and a ceiling–mounted linear position transducer (Unimeasure, Corvallis, OR) was attached via a tether to the barbell. Data from the force plate and position transducer were sampled at 1000 Hz using a BioPac data acquisition system (Goleta, CA). Velocity ($m \cdot s^{-1}$) and power (W) were derived using LabView software (National Instruments, Austin, TX). One weight-trained male subject (age = 28 yrs, hgt. = 1.78 m, wgt. = 97.1 kg, barbell squat 1 repetition maximum [1 RM] = 226.8 kg) performed parallel high-bar back squats for 10 sets x 1 repetition at 30, 40, 50, 60, 70 and 80% 1 RM loads using maximal acceleration during the concentric phase. Dependent variables included peak (PP) and mean power (MP) and peak (PV) and mean velocity (MV). Linear regressions between lab-derived and 3-D video-derived data provided correlation coefficients, regression slopes (b), and standard errors of estimate (SEE). Data (X±SD) for each testing system were compared using independent t-tests with Bonferroni corrections ($p \leq 0.00625$). **Results:** Lab-derived dependent variables were as follows; PP = 2755.1±520.5 W, MP = 1550.2±338.5 W, PV = 1.346±0.423 $m \cdot s^{-1}$, MV = 0.762±0.264 $m \cdot s^{-1}$. Correlation coefficients for all dependent variables ranged from r = 0.94 – 0.99, while regression slopes ranged from b = 0.88 – 1.05. No significant differences between testing devices were observed for any variable. SEE were as follows; PP = 110.9 W, MP = 28.3 W, PV = 0.069 $m \cdot s^{-1}$, and MV = 0.016 $m \cdot s^{-1}$. **Conclusion:** These data support the use of the 3-D video motion capture system for assessing power and velocity during free weight resistance exercise. Not only were the values obtained from both testing modalities similar, their relationships with each other were extremely high. Finally, the SEE clearly indicate that the expected error when using the 3-D video motion capture system were well within acceptable ranges when considering the magnitude of the variables measured in the present study.

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#43

GLENOHUMERAL INTERNAL ROTATION DEFICIT TRENDS IN A DIVISION I BASEBALL PITCHING STAFF

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The throwing motion of the elite baseball pitcher produces over 14,000 inch pounds of torque and reaches speeds of over 7,000 degrees per second. Shoulder range of motion alterations have been examined in overhead athletes and have been linked to bony and soft tissue alterations that often lead to glenohumeral internal rotation deficit (GIRD). **PURPOSE:** To determine the prevalence of GIRD in pitchers at a NCAA Division I university. **METHODS:** Nine participants signed an informed consent, completed a health history questionnaire, and were assessed bilaterally in passive internal and external glenohumeral rotation using a standard goniometer. A paired samples t-test was conducted between right internal rotation (RIR) and left internal rotation (LIR) for all cases. **RESULTS:** No significant difference was found between the internal rotation readings of the dominant and non-dominant shoulders of the pitching staff ($p=.11$). **CONCLUSIONS:** While not statistically significant, differences in LIR and RIR were found individually in the entire group. Three cases did show a large enough deficit between dominant shoulder IR and non-dominant shoulder IR to indicate GIRD. Likely, the low number of participants contributed to finding no significance in the present study. These findings suggest more research should be done in this area involving a larger cohort of participants to validate claims of the prevalence of GIRD in the elite baseball pitcher.

#44

AN EXAMINATION OF STUDENT PHYSICAL ACTIVITY AND EXERCISE HABITS ON A SMALL URBAN CAMPUS

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PURPOSE: The purpose of this study was to investigate the exercise and physical activity habits of Rockhurst University undergraduate students prior to the implementation of strategies associated with Exercise is Medicine on Campus. This campus is comprised of approximately 1800 undergraduate students, 61% female, 39% male, and 15% RU athletes. **METHODS:** In order to examine student exercise and physical activity habits, 200 surveys were administered in classes, club meetings, and in the university cafeteria. A total of 131 individuals (70% female, 30% male, 20% RU athletes) returned completed surveys. Three main variables were analyzed in this study: sedentary time, physical activity, and exercise habits. Sedentary time was recorded as sedentary time/day. Physical activity and exercise were each rated on a 0-5 scale using the Stanford Physical Activity Survey (SPAS). Exercise was additionally categorized as cardiovascular, strength, or flexibility training and scored as either sufficiently meeting, or failing to meet current ACSM guidelines. **RESULTS:** Analysis of this self-reported data revealed subjects reported an average of 10.77±3.6 hours of sedentary time/day independent of sleeping time. 48.8% of students met ACSM recommendations for cardiovascular activity per week, 30.5% met strength training recommendations, and 29% met flexibility training recommendations. Pearson's correlation revealed significant but moderate correlations for RU athletes and their self report of exercise habits (r=0.418, p>0.01). A significant yet weak correlation was also found between physical activity and exercise levels as determined by the SPAS (r=0.298, p<0.01). No significant relationships between campus or off-campus living and physical activity or exercise habits were revealed. **CONCLUSIONS:** This information will aid the RU Exercise and Sport Science Department and Exercise Science Club in the development of programs aimed at reducing sedentary time, and improving physical activity and exercise habits of undergraduate students.

#45
MATERNAL FAT PATTERNING IN RELATION TO INFANT BODY COMPOSITION

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Maternal obesity is known to effect offspring obesity development. Studies have shown that maternal pre-pregnancy BMI (pre-BMI) and gestational weight gain (GWG) are positively related to infant birth weight and body composition. In addition, maternal fat patterning (central vs peripheral) before pregnancy is directly related to infant birth weight. However, no study has examined the correlation between quantified maternal fat mass location (central vs. peripheral) and infant body composition. **Purpose:** The purpose of this study was to investigate whether maternal central vs peripheral fat mass (FM) was related to infant body composition (percent body fat (%fat), FM and fat free mass (FFM)). **Methods:** Fifteen mother–infant pairs were included in this analysis. Maternal central and peripheral FM was measured by dual-energy-x-ray absorptiometry (DEXA) at 2 weeks postpartum. Maternal central FM was represented by trunk FM and maternal peripheral FM was represented by the sum of arm and leg FM. Infant body composition was measured by air displacement plethysmography (Pea Pod®) at 1-3 days after birth. Due to the small sample size, first simple linear regression was completed to assess the relationship between infant body composition (dependent variable) and maternal peripheral and central FM (independent variables). Next, multiple linear regression models repeated that analysis and included the following maternal covariates: GWG and infant covariates; gender, age at test and gestational age. **Results:** No significant results were found in the simple linear regression analysis. The next series of results reported the findings when including covariates. When predicting infant %fat, only a gender difference was detected (β=6.75; p=0.014). When predicting infant FM, maternal GWG (β=18.37, p=0.046) and maternal peripheral FM (β=18.77, p=0.044) were positively related. When predicting infant FFM, only maternal GWG (β=29.83, p=0.04) was positively related. **Conclusions:** When predicting infant FM, maternal peripheral FM and GWG were positively related. Further studies with a larger sample size are needed to understand these relationships.
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#46

RELATING MATERNAL BODY COMPOSITION AND INFANT BODY COMPOSITION AT BIRTH

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The intrauterine environment is critical for fetal growth. Maternal obesity may alter the *in utero* environment and have long-term ramifications on offspring obesity development and future risk of chronic diseases. Infant body composition is used to assess fetal growth and provides more detailed information than birth weight. **PURPOSE:** The purpose of this study was to examine the relationship between maternal body composition and infant body composition at birth. **METHODS:** Healthy pregnant women with a normal weight or obese pre-pregnancy BMI (pre-BMI) without any complications were enrolled at 28 to 39 weeks. Maternal body composition was measured using dual energy x-ray absorptiometry (DXA) at 2 weeks postpartum. Infant body composition was measured using air displacement plethymography (Pea Pod®) within 72 hours after birth. Infant body composition was expressed as percentage body fat (% fat) and the absolute weight of fat mass (FM) and fat free mass (FFM). Maternal body composition was expressed as % fat, absolute weight of FM and non-bone lean body mass (LBM). Multiple linear regression models were used to assess the relationship between maternal body composition and infant body composition. Infant body composition (%fat, FM, FFM) was used as the dependent variables and maternal body composition (%fat, FM, non-bone LBM) was used as the independent variables. Due the small sample size, we first ran regression models including no covariates. In a second set of regression models, we included the following maternal covariates: gestational weight gain (GWG) and age and infant covariates: gestational age, gender and infant age at test. Non-significant covariates were removed in a stepwise manner and only significant variables were retained in the final model. Significance level was $p \leq 0.05$. **RESULTS:** Fifteen mother-infant pairs were included in this analysis. Nine of the mothers had a normal pre-BMI (22.18 $\pm$ 2.05 kg/m^2) and 6 had an obese pre-BMI (33.39 $\pm$ 2.73 kg/m^2). The mean gestational weight gain and infant birth weight were 14.14 $\pm$ 5.88 kg and 3.51 $\pm$ 0.52 kg, respectively. The results of simple linear regression found maternal non-bone LBM was positively related to infant FM (β=0.023; p=0.041) and also positively related to infant FFM (β=0.034; p=0.033). The next results report the findings when including covariates. When predicting infant FFM the inclusion of covariates did not change the relationship, maternal non-bone LBM (β=0.034; p=0.033) was the only variable related. **CONCLUSION:** These results suggest that maternal non-bone LBM but not FM is related to infant FFM.

Supported by Department of Dietetics and Nutrition, KU Medical Center.

#47

A RETURN TO AD LIBITUM FEEDING FOLLOWING CALORIC RESTRICTION ON HEPATIC STEATOSIS IN OLETF RATS.

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Hyperphagic, Otsuka Long-Evans Tokushima Fatty (OLETF) rats develop obesity, insulin resistance and nonalcoholic fatty liver disease (NAFLD); however, lifestyle modifications such as exercise training or caloric restriction (CR) can prevent the development of obesity, NAFLD, and metabolic complications in this animal model. **PURPOSE:** Here we sought to determine if prior CR had protective effects on metabolic health and NAFLD development following a 4 week return to ad libitum feeding. **METHODS:** Four-week old male OLETF rats (n=4-8/group) were ad-lib fed for 16 weeks (O-AL), caloric restricted for 16 weeks (O-CR; 70% of O-AL), or caloric restricted for 12 weeks and then fed ad libitum (ad-lib) for 4 weeks (O-AL4wk) prior to sacrifice. Long-Evans Tokushima Otsuka (LETO) rats served as non-hyperphagic controls. **RESULTS:** Preliminary findings indicate that CR induced prevention of hepatic steatosis and hepatic triacylglyceride accumulation were partially lost with 4 weeks of ad-lib feeding, but values remained suppressed compared with O-AL rats. These findings occurred in conjunction with a partial loss in CR induced benefits on obesity prevention and serum TAG suppression seen in O-AL4wk rats. Increases in hepatic mitochondria β-hydroxyacyl-CoA dehydrogenase (β-HAD) activity in O-CR rats were lost with 4 weeks of ad-lib feeding; whereas, increases in hepatic mitochondrial respiration remained significantly elevated ($p<0.01$) in O-AL4wk rats compared with O-AL rats. **CONCLUSION:** The beneficial effects of chronic caloric restriction on hepatic steatosis development and metabolic health were partially lost with 4 weeks of ad-lib feeding in this hyperphagic rodent model, highlighting the importance of maintaining energy balance either through reducing energy intake or increasing physical activity.
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#48

EFFECT OF A VERY LOW-CALORIE DIET ON WEIGHT LOSS AND SELECTED MEASURES OF PHYSICAL HEALTH

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American obesity rates have dramatically risen with multiple theories and factors considered to contribute to this epidemic. Research indicates that controlled caloric restriction can lead to weight loss and improved physical health, but limited data is available on the effect of a very low-calorie diet (VLCD) on body mass loss and standard health measures. **PURPOSE:** The purpose of this study was to determine the effect of a physician supervised VLCD on weight loss and selected measures of physical health. **METHODS**: Twenty-one males (47±13 years, 158.1±6.6 cm) and forty-five females (44±13 years, 144.1±4.7 cm) participated in a meal replacement VLCD program (1,000 and 600 kcal/day, respectively). Prior to starting the VLCD, subjects were evaluated on body mass, percent body fat (BF; bioelectrical impedance analysis), triglycerides (TRY), cholesterol (CHOL), and blood glucose (BG) levels. Follow-up measures were taken after 12 and 24 weeks of being on the VLCD. Due to scheduling, not all subjects participated at all time-points. Repeated measures analysis of variance (ANOVA) tests were performed to compare changes from base line to 12 weeks and from 12 to 24 weeks. . **RESULTS:** Significant reductions in body mass (112.3±4.3 vs 94.05±3.5 kg, n =24), BF (36.2±1.0 vs 29.6±1.2 %, n =23), TRY (161.7±27.5 vs 77.4±8.0mg/dL, n =12), and CHOL (191.2±18.1 vs 152.7±12.2 mg/dL, n=12) occurred from baseline to 12 weeks, respectively (all $p<0.05$). Significant changes were also found from 12 weeks to 24 weeks in body mass (94.05±3.5 vs 87.2±3.2 kg, n=24) and CHOL (152.7.±12.2 vs 167.3±14.3 mg/dL, n=12). **CONCLUSIONS:** Based on these results, a very low-calorie diet is effective for improving health and initiating weight loss especially in the first 12 weeks. After 12 weeks there was a plateau in improvements observed for most of the health measures (i.e., body fat, triglycerides, cholesterol). That is, there were relatively few changes from 12 to 24 weeks of being on a VLCD.

#49
EFFECT OF HYPOHYDRATION ON NEUROCOGNITIVE TEST PERFORMANCE

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Neurocognitive testing is commonly utilized for baseline scoring and to document recovery following traumatic brain injury in sports medicine. Modest amounts of hypohydration have recently demonstrated cognitive impairments. **PURPOSE**: The purpose of this study was to determine if modest hypohydration has a deleterious effect on neurocognitive test performance. **METHODS**: Seventeen males (22 ± 2 y, 147 ± 38 cm height, 85.1 ± 15.6 kg body mass) participated in two trials. Participants were hypohydrated (HY) by 20-hour fluid restriction or euhydrated (EU), in a counterbalanced random order, for trials. The day preceding trials included an identical 30min workout to match fatigue, and 48-hr diet logs were used to confirm consistent macronutrient intake prior to each trial. Hydration status was assessed via comparison of trial day body mass compared to 3-day baseline hydrated mass (separate for each trial) and urine specific gravity (USG) and osmolality (U_{osm}). Subjects reported to a quiet computer lab and completed a commonly used neurocognitive test battery for both trials. Trials were separated by at least 4 weeks to remove a potential learning effect on test battery. Dependent t-tests were performed on all output variables to determine significant differences at $\alpha<.05$. **RESULTS**: Nutrition intake analysis revealed no significant macronutrient consumption differences between trials ($p\geq.122$). Body mass was significantly reduced during the HY trial versus EU (86.3 ± 15.4 kg vs. 84.3 ± 15.6 kg; $p<.001$) to demonstrate a mean of -1.88% body mass deficit ($p<.001$). USG (HY: 1.027 ± .005 and EU: 1.009 ± .006; $p<.001$) and U_{osm} (HY: 944 ± 142$m_{osm}{\cdot}L^{-1}$ and EU: 344 ± 229$m_{osm}{\cdot}L^{-1}$; $p<.001$) were significantly increased during HY trial. A significant increase in pre-trial symptoms (8.25 ± 7.91 vs. 2.19 ± 4.58; $p=.002$) and post-trial symptom scores (10.63 ± 11.16 vs. 1.88 ± 3.24; $p=.003$) were identified during HY compared with EU trial. Immediate word memory score (HY: 11.19 ± 1.11 vs. EU: 11.81 ± 0.54; $p=.046$) and delayed word memory scores (HY: 9.94 ± 1.57 vs. EU: 11.06 ± 1.0; $p=.001$) were significantly decreased in HY trial. All other output variables showed consistent scores between HY and EU trials. **CONCLUSION**: Neurocognitive test performance is negatively affected at hypohydration levels commonly seen in athletics. Sports medicine professionals should exercise caution in their reliance on neurocognitive test results and clinical decision-making if hydration status is ignored. Further, symptoms of short-term hypohydration mimic symptoms typical during recovery from traumatic brain injury.

#50
RELATIONSHIP BETWEEN FATIGUE AND BODY MASS

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Maximal performance is limited by fatigue and it has been stated that morphology may influence both. The onset of fatigue and declining capacity during exercise is an important training variable and has been estimated indirectly by calculating the difference between peak and minimal power output (fatigue index). **PURPOSE:** This research sought to find if body morphology, determined using the Ponderal Index had any correlation to fatigue index obtained from anaerobic cycling. **METHODS:** Ten participants (7 women, 3 men; age range 21-32 years) enrolled in an undergraduate exercise physiology course completed one trial of the Wingate Anaerobic Bike Test (WAnT) and had their body mass and standing height using a balance beam scale and stadiometer, respectively. No training interventions were employed and all tests were completed as part of an academic laboratory period with a formal informed consent process employed. The participants completed the 30-second WAnT to find fatigue index while the Ponderal Index was determined using a nomogram from anthropometric measurements to determine body mass. **RESULTS:** It was discovered that there was no significant correlation ($p<=.05$) between Ponderal index and fatigue among the ten participants. However, there was a significant, inverse correlation ($r = ^{-}.995$; $p=.05$) within male subset only. **CONCLUSIONS:** The small scale results indicate that body morphology may play a significant role in high intensity, short duration cycling performance. Additional morphological information such as body mass index, body composition, fat free mass, or thigh circumference could be used in determining a workload for exercise that may provide a better method to indirectly study fatigue curves and training loads for performance enhancement.

#51

MAXIMAL OXYGEN UPTAKE TESTING IN RECREATIONALLY ACTIVE VS. SEDENTARY FEMALES

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Individuals who are recreationally active but not regular exercisers may achieve greater maximal oxygen uptake, than individuals who do not participate in recreational activity. **PURPOSE:** The purpose of this study was to determine if sedentary females have a lower aerobic capacity than recreationally active females. **METHOD:** Seventeen female college students (8 sedentary, 9 recreationally active) at the University of Central Missouri completed a maximal effort bicycle ergometer test to determine their maximum aerobic capacity. Criterion for maximal effort was determined by meeting 2 of the following 4 cirteria; ± 11bpm of age-predicted maximum heart rate, 17 on the Borg scale rating of perceived exertion, RER >1.10 and increase < 150 ml oxygen consumed in one minute. **RESULTS:** Recreationally active females achieved 35.2 ± 3.4 ml/kg/min and the sedentary group achieved 30.1 ± 5.7 ml/kg/min. **CONCLUSION:** The hypothesis was supported by the data collected. As a whole the subjects proved that recreational activity improves maximum aerobic capacity.

#52

THE USE OF CORTISOL AND HbA1c AS BIOMARKERS OF STRESS IN UNIVERSITY ADMINISTRATORS

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PURPOSE: The purpose of this study was to explore the impact of perceived stress and cardiorespiratory fitness on cortisol and HbA1c, biomarkers of stress, in a group of select university administrators. The impact of gender on these relationships was of special concern. **METHODS:** University administrators with job titles of Chancellor, Provost, Vice Chancellors and Vice Provosts of the university, and Deans and Associate Deans at the college level were recruited. Twenty-five administrators (15 males and 10 females) participated and completed a battery of assessments that included the University Administrative Concerns Questionnaire, a finger-stick blood test for HbA1c, estimation of cardiorespiratory fitness, and analysis of salivary cortisol over the course of two days. Data were analyzed using a series of unpaired *t*-tests to examine gender differences. The relationships between variables were examined separately for the genders using multiple regression analyses. **RESULTS:** The results of the gender comparisons revealed that men and women scored similarly on the variables of perceived administrative stress, $t\ (23) = 0.50\ p = .62$, cardiorespiratory fitness, $t\ (23) = -1.28\ p = .21$, and HbA1c, $t\ (23) = -0.57\ p = .57$. However there was a significant difference for cortisol AUC, $t\ (23) = -3.00\ p = .0064$, with males having significantly greater cortisol concentrations. The effect sizes for these analyses were small to moderate, except for cortisol AUC, where a large ($d = 1.22$) effect was found. The results of the multiple regression analyses indicated that neither cortisol AUC or HbA1c were significantly predicted by perceived stress and cardiorespiratory fitness in either gender. However, prediction of HbA1c for females did account for a promising 42% of the variance, with fitness accounting for more of variability than perceived stress. **CONCLUSION:** Despite the lack of predictive power, the analyses revealed several gender differences in the magnitude and direction of the correlations between variables. This indicates that despite similar mean values for stress and fitness related variables, the relationships between the variables may be different for men and women, warranting further research.

#53

PASSIVE STIFFNESS COMPARISON BETWEEN NCAA DIVISION I FEMALE SOCCER PLAYERS AND RECREATIONALLY ACTIVE COLLEGE-AGED FEMALES

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Passive stiffness measures a muscle's passive lengthening characteristics and is determined as the slope of the curvilinear relationship between passive torque (PT, Nm) and joint angle (°) displacement. **PURPOSE:** To compare NCAA Division I female soccer players and recreationally active college-aged females for passive stiffness, PT, range of motion (ROM), and electromyography (EMG) of the biceps femoris (BF) muscle during a bout of instrumented passive straight-leg raises (SLR). **METHODS:** 21 NCAA Division I female soccer players (mean ± SD age = 19 ± 1 yr; mass = 63 ± 6 kg; height = 164 ± 5 cm) and 21 recreationally active college females (age = 20 ± 2 yr; mass = 68 ± 10 kg; height = 164 ± 7 cm) completed two passive SLR assessments using a calibrated isokinetic dynamometer programmed in passive mode to move the foot toward the head at $5°\cdot s^{-1}$. With the subject lying supine, the knee- and ankle-joints were immobilized with a custom-built stabilizing apparatus. All stretches were performed on the right leg, while the left thigh and ankle were secured with restraining straps. Each passive stretch was taken to its maximal ROM (i.e., the point of discomfort, but not pain as indicated by the subject) and immediately returned to the baseline position once maximal ROM was achieved. Bipolar surface EMG of the BF was sampled during each stretch. Passive stiffness was defined as the change in torque from 20-50° ($Nm\cdot°^{-1}$). Maximal ROM and PT were determined at 20° ($PT_{20°}$), 50° ($PT_{50°}$), and at the final common ROM for each subject. Mean EMG amplitude values were recorded from 20-50°. After checking for the normality of data distribution (Kolmogorov-Smirnov test), independent samples t-tests and Mann-Whitney U tests were used (where appropriate) for comparisons between the two groups. An alpha value of $p \leq 0.05$ was used to determine statistical significance. **RESULTS:** No differences ($p = 0.943$) were observed in passive stiffness between the two groups. ROM was greater ($p = 0.005$) for the soccer (112 ± 15°) than the recreationally active group (95 ± 21°). No differences were observed in $PT_{20°}$ and $PT_{50°}$ ($PT_{20°}$, $p = 0.119$; $PT_{50°}$, $p = 0.587$); however, PT at final ROM was greater ($p = 0.004$) for the soccer group (50.55 ± 21.24 Nm) than the recreationally active group (32.14 ± 17.05 Nm). EMG was not different ($p = 0.061$) between groups. **CONCLUSION**: These findings revealed that Division I NCAA soccer players had greater ROM and final PT than recreationally active females. There were no differences in passive stiffness and EMG activity, which suggests that differences in ROM between the two groups are a consequence of differences in stretch tolerance rather than differences in the viscoelastic properties of the muscle.

#54

CORRELATION OF ACUTE AEROBIC EXERCISE AND SHORT TERM VISUAL MEMORY

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Introduction: The benefits of aerobic exercise of cognitive functioning are well known and widespread but little is known about the effects it has on short term memory. **Purpose**: The purpose of this study was to determine the effects of an acute bout of aerobic exercise on short term visual memory. **Methods**: Ten University of Central Missouri students (8male; 2 female) who exercise aerobically three times a week for at least thirty minutes each session were enlisted to take three memory tests. Two of the memory tests were after bouts of exercise (moderate and exhaustive). The memory tests consisted of ten shapes on a slide show. Subjects recorded what they remembered in order directly after finishing the slide show. **Results**: A significant effect was found, $F(2,18)=11.841$, $p<.05$. Subjects scored higher in the pretest ($m=4.7$, $sd=3.01$) than on the post exhaustive exercise test ($m=1.3$, $sd=1.76$). Post moderate exercise subject scores ($m=3.5$, $sd=4.22$) were not significantly different than the pretest, but were significantly higher than post exhaustive exercise subject scores ($m=1.3$, $sd=1.76$). **Conclusion**: The hypothesis that post moderate exercise visual memory test scores would be significantly higher than the pretest scores was not supported; however, existing literature that states exhaustive exercise decreases cognitive function was supported by the experiment.

#55

SERUM METABOLOMIC RESPONSES TO NUTRITIONAL SUPPLEMENTS CONTAINING EITHER WHEY CONCENTRATE OR WHEY HYDROLYSATE IN RATS

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Limited evidence suggests that the ingestion of whey protein hydrolysate (WPH) exhibits differential amino acid absorption kinetics compared to native whey protein forms. Metabolomics is an unbiased approach to systematically study how drugs or physiological stressors affect the biochemical milieu of biological fluids/tissues. **PURPOSE**: To compare how gavage feeding WPH versus its native whey protein concentrate (WPC) in 8-h fasted rats transiently affected serum metabolomic profiles. **METHODS**: Male rats (~300 g) were fed an isonitrogenous amounts of WPH or WPC and sacrificed 15 min-, 30 min- and 60 min post-gavage for serum extraction. Rats fasted for 8-9 h were used as controls (CTL). Serum biochemicals were detected using gas chromatography/mass spectrometry (MS) and liquid chromatography/MS/MS platforms. Welch's two-sample *t*-tests were used to identify biochemicals that differed significantly between experimental groups. **RESULTS**: 333 serum metabolites were detected amongst the experimental and control groups. Both WPH and WPC generally increased amino acids (1.2-2.8-fold), branched chain amino acids (BCAAs, 1.2-1.7-fold), and serum peptides (1.1-2.7-fold) over the 60 min time course compared to CTL rats ($p < 0.05$). However, WPH feeding rapidly (at 15-min post) increased select amino acids (including BCAAs) and peptides compared to WPC and CTL feedings ($p < 0.05$). Circulating 3-methylhistidine levels were also lower following WPH feedings at 30- and 60-min post gavage versus WPC feedings ($p < 0.05$) suggesting that WPH feeding may initiate anti-catabolic signaling during fasting states compared to WPC. While both protein sources led to a dramatic increase in free fatty acids (FFAs) over the post-feeding time course compared to CTL rats (up to 6-fold increases, $p < 0.05$), WPH feeding also uniquely resulted in a 30-min post-feeding elevation in FFAs compared to WPC feeding ($p < 0.05$); an effect which may be due: a) the suppression of lipolysis or tissue uptake of FFAs caused by WPC 30 min post-ingestion, or b) the WPH-induced increase in circulating epinephrine (2-fold vs. CTL and 4.3-fold vs. WPC, $p < 0.05$). Finally, unique metabolomic pathway signatures were evident following WPH versus WPC feedings (i.e., glutathione synthesis, xanthine oxidase-catalyzed breakdown of nucleotides, amino acid entry into the Krebs cycle, and bile acid metabolism). **CONCLUSION**: these data provide a unique post-prandial time-course perspective as to how WPH versus WPC feedings affect circulating biochemicals. These data also provide future directions in regards to studying novel long-term effects of WPH supplementation.

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#56
EPIDEMIOLOGY OF STUNT-RELATED INJURIES AMONG COLLEGIATE MALE CHEERLEADERS

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Injuries in cheerleading have been identified as a significant problem; however, very little information has been collected about male cheer injuries. The main difference in skills performed by male and female cheerleaders at the collegiate level occurs during stunting. **PURPOSE:** The purpose of this study was to describe the epidemiology of stunt-related injuries of collegiate male cheerleaders. This study identifies the cause of injury, the type of resulting injury and body part injured. The sample consisted of a random and snowball sample of 89 male collegiate cheerleaders from the United States. **METHODS:** Participants voluntarily completed an online questionnaire regarding their cheerleading injury history. The self-report questionnaire collected data about the individual, the team, and the circumstances of injuries occurring between February 2010 and 2011. Statistical analyses included descriptive statistics and frequencies for categorical variables. **RESULTS:** Just over half (48/89) of the participants reported at least one injury occurring within the last year. Due to multiple injuries to some participants, a total of 97 injury incidents were reported. Forty two percent (41/97) of the injuries reported occurred while stunting. Upper extremity injuries occurred in 51% (21/41) of the injuries. Shoulder (9) and hand/finger (7) injuries were the most common type of upper extremity injury. Core injuries were the second most prevalent type of injuries accounting for 10 (24.4%; 10/41) of the injuries. The type of injury reported most often was a strain or sprain (23/41). Most of the injuries occurred during practice (83%; 34/41) and occurred due to their role as a base or spotter of the stunt (75%; 31/41). **CONCLUSION:** Overall, the results indicate that stunting is a major contributor to injuries among male cheerleaders. Furthermore, collegiate male cheerleaders appear at a greater risk for upper extremity and core injuries when stunting compared to females and when performing other skills involved in cheerleading. Additional research should be conducted to compare the prevalence and type of injuries incurred by male and female cheerleaders depending on the type of stunt performed.

#57

REDUCED HEPATIC eNOS PHOSPHORYLATION IN SEDENTARY HYPERPHAGIC OLETF RATS IS PREVENTED BY VOLUNTARY WHEEL RUNNING

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Reduced endothelial nitric oxide synthase (eNOS) activity and endothelial dysfunction is present in skeletal muscle under conditions of insulin resistance, but can be largely alleviated by increasing physical activity. However, whether hepatic vascular impairment is seen in nonalcoholic fatty liver disease (NAFLD) and can be modulated by increasing physical activity remains unknown. **PURPOSE:** We tested the hypothesis that hepatic eNOS and its activation status via phosphorylation (p-eNOS) are decreased in NAFLD and that physical activity can restore p-eNOS/eNOS balance. **METHODS:** We used the hyperphagic Otsuka Long-Evans Tokushima Fatty (OLETF) rat model of obesity, insulin resistance and NAFLD and a normophagic control (Long-Evans Tokushima Otsuka, LETO) to assess total hepatic eNOS and p-eNOS protein content via western blot analysis. **RESULTS:** Our results reveal that while hepatic eNOS or p-eNOS protein content did not differ prior to NAFLD development (5 wks old) or with just simple steatosis present (8 wks old), the p-eNOS/eNOS ratio was 50-60% lower at 40 weeks in OLETF compared with LETO rats ($p<0.01$), an age where advanced liver disease is present in OLETF rats. The decreased ratio occurred in the absence of increased caveolin-1 protein content, a negative regulator of eNOS phosphorylation previously implicated in other chronic liver diseases. Additionally, voluntary wheel running in OLETF rats completely normalized the p-eNOS/eNOS ratio to LETO levels, which occurred in conjunction with prevention of NAFLD development and progression. **CONCLUSION:** Collectively, these findings suggest that liver endothelial dysfunction is likely present in NAFLD and highlights a potential role for enhanced hepatic endothelial function with increased physical activity. Further investigation is needed to determine the functional implications of these findings.

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#58

CALMING MUSIC HAS SIMILAR EFFECT ON MUSCULAR ENDURANCE AND ANAEROBIC PERFORMANCE COMPARED TO ENERGIZING MUSIC

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It has long been believed that music is a performance enhancer if listened to during an exercise bout and thus for many individuals, music is a staple of every workout. **Purpose:** The purpose of this study was to determine if energizing music would have a positive effect on muscular endurance and anaerobic test performance as compared to calming music when listened to before the activity. **Methods:** A total of 19 volunteers were recruited to participate in in the back squat (n = 14; age 21 ± 1.1), bench press (n = 16; age = 21.4 ± 1.9), and Wingate (n = 14; age = 20.9 ± 1.03). Participants had previous resistance training experience. A one repetition-max (1RM) was calculated using a weight that could be performed between 3-15 repetitions (reps). Trial 1 had participants perform a light warm-up followed by 30sec of listening to energizing ("Gonna Fly Now" by Bill Conti) or calming music ("Angel" by Sarah McClachlan) then performing as many full reps as possible using 75% of their 1RM. Or participants listened to the music and then perfomed a Wingate cycle test on a Monarch cycle ergometer. After 48-72hrs recovery, subjects performed the second trial which consisted of the same procedure utilizing the other genre of music. **Results:** There was no significant difference in bench press repetitions between energizing (11.1 ± 2.4) compared to calm (11.0 ± 2.3). There was also no significant difference in back squat repetitions between energizing (10.8 ± 3.9) and calm (13.6 ± 8.5). For the Wingate there was no significant difference with peak power for energizing (853.3 ±126.0) and calm (848.1 ±133.7) or mean power between energizing (646.9 ± 80.8) and calm (645.8 ± 77.8). Relative mean power showed no significant difference (p=.921) for energizing (8.3 ± .5) or calm (8.3 ± .5). **Conclusion:** These results indicate that there are no performance differences between calming and energizing music when listened to before anaerobic or muscular endurance activities.

#59

METHODS COMPARISON: ASSESSING AGREEMENT OF PHYSIOLOGICAL PARAMETERS OBTAINED FROM EXERCISE ON TWO DIFFERENT CYCLE ERGOMETERS

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One consistent measure for providing feedback to athletes in lab and field conditions is power output (PO). Associating physiological parameters with PO measured by a mobile ergometer allows for collection of data similar to that provided by laboratory exercise testing. **PURPOSE:** The purpose of this study was to determine the limits of agreement (LOA) of physiological parameters measured during exercise testing on two devices at established PO. **METHODS:** 10 trained male cyclists (age 25.9 ±3.75y, body mass 78.69 ± 11.9kg, height 180.72 ± 8.99cm) were recruited. The two devices used for comparison were the Lode stationary bicycle ergometer (SBE) (Lode Excalibur, Netherlands) as the standard and the PowerTap Pro+ (BPT) (Saris Cycling Group, Madison, WI) mobile ergometer. The physiological parameters recorded at established PO were: heart rate (HR), absolute VO_2, V_E, blood lactate, and ratings of perceived exertion (RPE). Subjects were randomly assigned once to the SBE and three times to a bicycle equipped with a BPT. Following a 15-min warm up of unloaded pedaling on the ergometer, the trial began with five min of cycling at 50W. Intensity increased by 50W every five min until reaching a limit of 250W. At each PO HR, absolute VO2, V_E, lactate, and RPE were recorded. . Bland-Altman statistical analyses were performed along with the Pearson product-moment correlation coefficients. **RESULTS:** Good agreement was found at PO 50-250W for HR (95% CI of LOA: -13.67-19.2bpm,r=0.741; -21.95-28.02bpm, r=0.2693; -14.32-18.99bpm, r=0.7032; -14.12-16.39bpm, r=0.8172; -10.53-9.6bpm, r=0.9325), absolute VO_2 (95% CI of LOA: -0.24-0.34L/min, r=0.5363; -0.26-0.21L/min, r=0.614; -0.31-0.39L/min, r=0.5099; -0.32-0.49L/min, r=0.5641; -0.41-0.43L/min, r=0.668), and RPE (95% CI of LOA: -2.08-3.48, r=0.4786; -1.63-4.23, r=0.427; -1.45-3.25, r=0.7092; -1.88-3.08, r=0.7241; -2.25-3.05, r=0.7703; -2.06-4.06, r=0.6868; -1.51-2.71, r=0.8138; -1.05, 2.25, r=0.9078; -1.9-2.7, r=0.7836; -2.23-3.63, r=0.6883). V_E did not show good agreement (95% CI of LOA: -7.38-10.93L/min, r=0.2945; -8.78-8.01L/min, r=0.2786; -9.5-12.79L/min, r=0.2289; -12.17-17.85L/min, r=0.4379. -12.24-18.79L/min, r=0.6187) neither did lactate (95% CI of LOA: -1.7-1.38mmol/L, r=-0.033; -1.32-1mmol/L, r=0.4158; -1.7-1.9mmol/L, r=0.2755; -1.74-1.72mmol/L, r=0.2586; -6.11-7.33mmol/L, r=-0.178; -2.73-5.23mmol/L, r=0.8127). **CONCLUSION:** While V_E and lactate measures did not show good agreement; the level of agreement between methods for HR, absolute VO_2, and RPE is sufficient to utilize the PowerTap Pro+ as a tool for estimating these physiologic parameters in the field.

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#60

CARDIORESPIRATORY RESPONSE DURING PEAK EXERCISE TESTING IN SUBACUTE STROKE

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People with chronic stroke (> 6 months) have low VO_2 peak values when compared to age and sex-matched normative data. Very little information is known regarding exercise testing performance in people in the subacute stage of stroke recovery. **PURPOSE:** The purpose of this study was to determine cardiopulmonary responses during a peak exercise test in healthy adults and people in the subacute stage of stroke (range 15 -123 days post-event). **METHODS:** Ten individuals (mean ± SD: age = 61.2 ± 4.7 years; height =167.8 ± 11.6 cm; weight = 79.5 ± 11.0 kg) with subacute stroke and 10 gender matched, age-similar years (age = 60.3 ± 1.8; height = 178.7 ± 12.7 cm; weight = 83.1 ± 12.0 kg) participated in a peak exercise test. We obtained values from the peak exercise test for heart rate (HR), respiratory exchange ratio (RER), oxygen uptake (VO_2: $ml*kg^{-1}*min^{-1}$), volume of carbon dioxide (VCO_2: $L*min^{-1}$), minute ventilation (VE: $L*min^{-1}$), respiratory rate (RR), and tidal volume (VT: L). We also obtained the oxygen uptake efficiency slope (OUES) at 50% of peak and at peak effort. **RESULTS:** Independent t-tests revealed that age-matched controls had significantly higher values of VO_2 $ml*kg^{-1}*min^{-1}$ (mean difference = 14.4, p = 0.001), VCO_2 $L*min^{-1}$ (mean difference = 1.6, p = 0.00), VE $L*min^{-1}$ (mean difference = 43.5; p = 0.003), RR (mean difference = 6.8, p = 0.032), VT L (mean difference = 0.8, p= 0.005) and HR (mean difference = 48.4, p= 0.001). No significant differences were found in RER (mean difference = 6.7, p > 0.05). Age-matched controls also had higher OUES (mean difference =1.1, p=0.003), OUES at 50% of peak (mean difference = 1.1, p= 0.002). **CONCLUSION:** Our findings demonstrate that cardiopulmonary response during an exercise test is already impaired during the subacute stage of stroke. These data suggest that the pulmonary system may have a larger role in limiting exercise performance.

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#61

MONOCARBOXYLATE TRANSPORTER-1 EXPRESSION AT THE ONSET OF SKELETAL MUSCLE REGENERATION

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Skeletal muscle is extremely plastic and has the remarkable ability to recover from injury. In diseases, such as muscular dystrophy, regeneration of skeletal muscle is impaired. Monocarboxylate transporters, or MCTs, are involved with lactate transport across the cell membrane. This transport has important implications for the energetic efficiency of skeletal muscle. MCT expression is known to be affected by skeletal muscle hypertrophy, chronic electrical stimuli, and voluntary wheel running. However, the cellular regulation of MCT1 protein expression at the onset of skeletal muscle regeneration has not been determined. **PURPOSE:** To determine the protein and gene expression of MCT1 at the onset of skeletal muscle regeneration. **METHODS:** Twelve male C57/BL6 mice (12 weeks old) were randomly assigned to either a control (uninjured) or bupivacaine (injured) group. Bupivacaine was injected into the tibialis anterior (TA) of the injured group ($n = 4$-6), and phosphate buffered saline (PBS) was injected into the TA of the uninjured group ($n = 4$-6). 3 days post-bupivacaine injection the TA was extracted. MCT1 protein and gene expression were determined. **RESULTS:** A 12% decrease in TA muscle mass to tibia length (2.43 ± 0.12 mg/mm vs. 2.14 ± 0.19 mg/mm, $p < 0.02$) was observed 3 days post-bupivacaine injection. IGF-1 gene expression increased 5.0-fold ($p < 0.05$) 3 days post-bupivacaine injection. MyoD gene expression increased 3.5-fold ($p < 0.05$) 3 days post-bupivacaine injection. MCT-1 gene expression was not altered 3 days post-bupivacaine injection. However, MCT-1 protein was decreased 32% ($p < 0.03$) 3 days post-bupivacaine injection. **Conclusion:** In conclusion, at the onset of skeletal muscle regeneration MCT1 protein is decreased and this appears to be regulated at the post-transcriptional level.

#62

A COMPARISON OF THE ACTIVITY SURVEY BETWEEN LOCAL SWAT AND LAW ENFORCEMENT UNITS

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Law enforcement units partake in grueling work-related activities every day. With this in mind, the assessment of each unit's physical capabilities and physical fitness is valuable information to evaluate. PURPOSE: The purpose of this study was to observe and compare the physical challenges and activities reported by local SWAT teams. METHODS: Twenty-six participants who were police officers as well as SWAT team members were given a survey to compare differences in routine activities performed by police officers versus SWAT team members. The survey was specifically designed for each agency to document the physical requirements of the job based upon their daily activities and responsibilities. The survey included 26 items scored on a likert scale. After participants completed the survey, T-tests were conducted and data were analyzed to examine differences between police officer and SWAT responsibilities and activities. RESULTS: Results indicated significant differences ($p < 0.05$) between certain routine tasks performed by local SWAT teams and police officers on 15 of 26 items. Activities such as running over short distances, sprinting, jumping over obstacles, using firearms, and aggressively pursuing subjects were some of the activities exercised more frequently within the SWAT units. Results indicated that there are differences in the activities performed by police officers and SWAT teams – with SWAT team activities being more physically demanding. CONCLUSION: These results indicate that SWAT team members may partake in certain activities that are more physically demanding than that of police officers. These results may be due to 1) differences in job duties and demands 2) differences in emphasis on physical activity within the unit 3) differences in what leisure-time activities are performed by each unit or 4) differing internal motivational drive between units. This information is important when establishing training programs for the different law enforcement units.

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#63

ESTROGEN AND EXERCISE AFFECT HEDGEHOG PATHWAY EXPRESSION IN ADULT SKELETAL MUSCLE

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Estrogen (E2) affects skeletal muscle pathway activation; however, the mechanisms by which E2 regulates skeletal muscle are not yet fully known. There is increasing evidence that (1) Sonic hedgehog (Shh) pathway is involved in myogenesis and hypertrophy, and (2) estrogenic compounds affect Shh pathway *in vivo*. **PURPOSE**: The purpose of this study was to examine the potential relationship between E2, physical activity, and Shh pathway in adult skeletal muscle. In this study, we tested the hypothesis that both E2 and physical activity would increase expression of Shh pathway signaling molecules in mature adult muscle. **METHOD**: Female C57/BL6 mice (4 mos) were divided into 4 groups: Intact sedentary, Intact run, Ovariectomy (Ovx) sedentary, and Ovx run. Mice were on running wheels for 6 weeks. Ovx was performed prior to wheel running. Shh pathway activation was measured in gastrocnemius muscle by mRNA expression of Shh signaling proteins, *Gli1* and *Ptch1* and protein expression of *Gli1*. **RESULTS**: *Gli1*and *Ptch1* mRNA expression was significantly increased in the Ovx run group compared to Ovx sedentary, however exercise did not affect expression in the intact mice. A similar trend was observed between *Gli1* protein expression and muscle mass. *Gli1* protein expression was significantly decreased in Intact run group compared to Intact sedentary ($p<0.05$). Muscle mass was decreased by running in both groups. However, muscle force/area (Po/mass) was significantly higher in Intact run compared to Intact sedentary ($p<0.05$) whereas no difference was found in the Ovx groups. Ovx mice ran 35% the distance of Intact run. **CONCLUSION**: Our results indicate that Shh pathway is up-regulated in adult skeletal muscle when E2-deficient animals undergo voluntary exercise; however, it is down-regulated when Intact animals undergo exercise and experience a decrease in muscle mass. Supported by the University of Missouri Research Board

#64
EFFECT OF CONCURRENT TRAINING ON THE OCTANE TRAINER VERSUS TRADITIONAL CARDIOVASCULAR TRAINING

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Strength and conditioning, as well as, cardiovascular equipment are numerous in selection; however, to have one piece of equipment which allows the participant to do both is a new concept. **PURPOSE:** The purpose of this study was to determine if the use of the Octane Fitness 4700 Cross Circuit PRO Elliptical Trainer Touch in conjunction with concurrent training is as effective when compared to traditional cardiorespiratory training in untrained individuals. **METHODS:** Twelve individuals (six women and six men) were randomly placed in one of two groups, a concurrent group (CON) (n=6; age= 41.5 yrs; sd = 9.7) or a cardiorespiratory group (CARDIO) (n=6; age = 36.8 yrs; sd = 13.7). A t-test was used to see if ages between the groups were different and no significant difference was found. One male participant from the cardiorespiratory was unable to finish the study. During the exercise sessions (15 min, 2 non-consecutive days wk^{-1} for 12 wk), the participants used the Octane Fitness 4700 Cross Circuit PRO Elliptical Trainer Touch to either perform 15 min of a 30/30 training session which included 30 seconds of cardiovascular training, stepping off and doing 30 seconds of strength training repeating this cycle for 15 min or staying on the Octane Fitness 4700 Cross Circuit PRO Elliptical Trainer Touch for the entire 15 min. In order to increase the difficulty of the exercise session, the CON group was allowed to increase their weights and the CARDIO group was allowed to increase their intensity as they desired during the 12-wk program. Prior to the first exercise session, the research team assessed the following anthropometric measurements: height, weight, body mass index (BMI) and percentage of body fat using the OMRON Fat Loss Monitor, Model #HBF-306c, and girth measurements including arm, waist, and thigh using the Certified Strength and Conditioning Specialist (CSCS) guidelines. Anthropometric measurements of weight, BMI and percentage of body fat were taken every 4 weeks. Baseline heart rate; exercise heart rate at 5, 10, and 15 min; baseline blood pressure; post exercise blood pressure; rate of perceived exertion at 5, 10 and 15 min; and recovery heart rate (after stretching) were taken at every workout. **RESULTS:** The study did not show any significant differences in any of the above categories when comparing the Octane Trainer in conjunction with concurrent training to traditional cardiorespiratory training. A test of the differences between measures for the two groups showed signs of possible differences but were not significant: body fat, pre-exercise blood pressure diastolic, and rate of perceived exertion at the 5, 10, and 15 min times. A paired t-test was used to analyze the pre-post change with the Octane Trainer in conjunction with concurrent training and found significant differences in the following measures: BMI (2% decrease, $p<0.04$), pre-exercise blood pressure systolic (7% decrease, $p>0.05$), post-exercise blood pressure systolic (14% decrease, $p<0.01$), post-exercise blood pressure diastolic (11% decrease, $p<0.01$), shoulder press (92% increase, $p<0.01$), bicep curl (50% increase, $p<0.02$), and lateral raise (89% increase, $p<0.01$). A paired t-test was used to analyze the pre-post change for traditional cardiorespiratory and found significant difference in the following measures: pre-exercise blood pressure systolic (10% decrease, $p<0.01$), pre-exercise blood pressure diastolic (12% decrease, $p<0.04$), post-exercise blood pressure systolic (17% decrease, $p<0.02$), post-exercise blood pressure diastolic (13% decrease, $p<0.01$), and at all 3 recorded measurements of intensity at the time intervals of 5 min (70% increase), 10 min (70% increase), and 15 min (86% increase) and all were significant at $p<0.01$. **CONCLUSION:** The results of the study did not show any significant differences in any of the above categories when comparing the Octane Trainer in conjunction with concurrent training to traditional cardiorespiratory training.
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#65

THE USE OF HEART RATE MONITORS TO DETERMINE THE MOST EFFECTIVE CARDIOVASCULAR WORKOUT

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Introduction: There is constant debate about which cardiovascular exercise is the most beneficial in maintaining an individual in the target heart rate zone (60-85% of max HR based on Karvonen formula). **Purpose:** The primary purpose of this study is to determine the mode of exercise that gets an individual into their predetermined target heart rate (THR) zone for the longest period of time on both the bike and treadmill, . **Methods:** Participants were 5 males and 4 females ranging from 20 to 27 years of age. All participants are regularly active adults. Each subject underwent 2-20 minute exercise bouts (bike and treadmill) on separate days. During each exercise bout the subject wore a heart rate monitor and his/her heart rate was recorded each minute. Participants were instructed to set a pace that they felt was of moderate intensity and maintain that same pace throughout the testing. **Results:** The results show that between 9 tested subjects the average time spent in the THR zone was about 1.67 min on the bike ergometer and 5 min on the treadmill. The difference in average heart rate between the bike and treadmill was 21.27 beats per minute (bpm); the mean average HR on the treadmill was 140.20 bpm and the bike the mean average HR was 118.93 bpm. The average rate of perceived exertion on the bike was a 5 and on the treadmill it was a 7; using "The Borg's Modified 10-Point Scale".
Conclusions: These results suggest that the treadmill is a more intense cardiovascular workout. The reasoning for this is that it has the longest time spent in the subjects THR zone, the highest average heart rate, and higher average rate of perceived exertion.

#66
INSANITY VS. P90X

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Insanity and P90x are both popular workout programs among individuals who lack the time to go to the gym and perform a traditional time-consuming workout. This research project consisted of comparing the P90x and Insanity workout programs. **PURPOSE:** The purpose of this study was to see which workout produced a higher intensity. **METHODS:** Intensity was measured by taking average heart rate, RPE, and blood lactate levels during each exercise. Each subject wore a heart rate monitor from the beginning of the warm-up until the conclusion of the cool down. The average heart rate was recorded from the entire workout. Each subject was asked his/her RPE of the entire workout immediately following the cool down. Blood lactate levels were measured at five intervals throughout each workout. The subjects in this study consisted of 5 males and 4 females who completed two workouts for each of the workout programs that best represented the entire workout program as a whole. Each subject was of college age and engaged in an active lifestyle. **RESULTS:** The average heart rate of the two P90x workouts was 130.2 +/- 10.6. The average heart rate for the two Insanity workouts was 158.5 +/- 7.8. The RPE for the two P90x workouts was 12.5 +/- 1.8. The RPE for the two Insanity workouts was 15.8 +/- 1.6. The average lactic acid level for the two P90x workouts was 8.6 +/- 3.1. The average lactic acid level for the two Insanity workouts was 11.4 +/- 1.2. **CONCLUSION:** based on the data collected Insanity was a higher intensity workout than P90x. Insanity produced a higher average heart rate, higher RPE, and higher blood lactate levels.

#67

INFLUENCE OF AGING ON MAXIMAL AND RAPID TORQUE CHARACTERISTICS OF THE LEG EXTENSORS AND FLEXORS

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The decline in maximal and rapid isometric torque characteristics may compromise functional living abilities in aging adults while loco-motor muscle groups, such as the leg extensors and flexors, may exhibit different torque-time age related decreases. **PURPOSE:** The purpose of the present study was to examine the age-related differences in maximal and rapid torque characteristics of the leg extensor and flexor muscle groups in young, middle, and old men. **METHODS:** Sixty-five healthy men were categorized by age as young (n=25; mean±SD age=24.88 ± 3.03 yrs), middle (n=22; age=50.64±3.98 yrs;), and old (n=18; age=66.78±4.48 yrs). Participants performed maximal voluntary contractions (MVCs) of the leg extensors and flexors and an estimated thigh cross sectional area (eThighCSA) assessment. Peak torque (PT), peak rate of torque development (RTDpeak), absolute RTD and the contractile impulse (IMPULSE) were calculated at time intervals of 30, 50, 100 and 200ms from the torque-time curve. Relative RTD was calculated at 10, 20, 30, 40 and 50% of MVC from the normalized torque-time curves. **RESULTS:** PT, RTDpeak and later rapid torque variables (RTD100, RTD200, and IMPULSE200) were greater ($P \leq 0.05$) in the young and middle when compared to the old men for both muscle groups. Early (RTD 30,50; IMPULSE30,50) and late (IMPULSE100) rapid torque variables were greater ($P \leq 0.05$) for the young and middle than the old men for the leg extensors but not the leg flexors, except for RTD30, in which there was no difference between young and old. There were no differences for all relative RTD variables between age groups ($P > 0.05$). eThighCSA was lower ($P = 0.016 - 0.001$) in the old compared to the young and middle aged men. **CONCLUSIONS:** Maximal and rapid torque characteristics were preserved in middle aged men but greatly reduced in older men with differential effects at early and late portions of the torque-time curve between the leg extensors and flexors. Significant decreases in absolute maximal and rapid torque production with no change in relative RTD across age groups and lower eThighCSA in old men may suggest that the loss of rapid torque producing capacities observed in older men may be largely a function of mechanisms associated with loss of muscle strength and muscle mass.

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BARRIERS TO PARENTS DECREASING CHILDREN'S TELEVISION VIEWING

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TV viewing is a prevalent sedentary behavior of children. Sedentary behavior, and TV viewing specifically, is linked to increased risk of chronic disease. Parents are a primary authority in the household, and determine amount of TV viewing. **PURPOSE:** Therefore, the purpose of this study was to examine barriers that parents report regarding decreasing the amount of TV viewing in their children. **METHODS:** Parents (n=52) with children in grades 1-5 were recruited from two afterschool programs in the OKC area. Parents completed a survey regarding Leisure Time Sedentary Behaviors where barriers for decreasing TV viewing time, and children's time spent watching TV were reported. Responses for the six questions pertaining to barriers of decreasing children's TV viewing included: strongly disagree, disagree, agree, and strongly agree. Those negative and affirmative responses were collapsed into two categories for analysis. Frequencies, means, and standard deviations were calculated. **RESULTS:** The mean age of the children was 9.1 ± 1.6 years and 55.6% were male. The majority (59.6%) of children had a TV in their bedrooms. Analyses showed males and females spent 18.6 ± 14.6 and 17.4 ± 12.0 hours/week viewing TV, respectively. When identifying barriers, 36% of parents agree that TV keeps children out of trouble. Additionally 20% and 28% of parents feel that TV decreases fighting between children, and decreases fighting between children and parents. A small percentage (4%) of parents agree their children do not have anything else to do; 21% of parents feel children need to stay inside to be safe. **CONCLUSION:** Past literature has largely focused on intervention strategies to decreasing TV viewing in children. Understanding barriers would prove beneficial in order to directly target ways to overcome barriers when designing intervention strategies. Prior studies also showed many parents would like to decrease TV viewing time in children but are often uncertain how. Tailored intervention strategies specifically targeting identified barriers may prove beneficial for these parents.

#69

GENDER-RELATED CHANGES IN BODYCOMPOSITION IN OLDER ADULTS

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Older adults experience several physiological changes as they age. The effects of aging on body composition can vary greatly from person to person. **PURPOSE**: The purpose of the present study was to determine the gender-related differences in changes in body composition in older adults. **METHODS**: One hundred fifty-four men and women (men: n=68; mean±SD age: 70.8±6.4 yrs; height: 176.0±6.4 cm; weight: 82.5±10.2 kg; women: n=86; mean±SD age: 68.5±8.1 yrs; height: 162.3±6.5 cm; weight: 65.0±11.0 kg) completed a whole-body dual-energy x-ray absorptiometry (DEXA) scan for body mass (BM), total body lean mass (LM), total body fat mass (FM), percent body fat (BF), total leg LM (TLLM), total arm lean mass (TALM), and appendicular lean mass (ALM). Total body lean mass (TBLM) was estimated using an equation by Kim et al., 2002 (TBLM = (1.13 x ALM) – (0.02 x age) + (0.61 x gender) +0.97), where men=1 and female=0. Sixteen separate simple linear regression analyses were conducted to determine the relationships between the dependent variables (BM, ALM, TBLM, LM, TALM, TLLM, FM, BF) and age for both men and women. Eight separate slope coefficient comparisons (t-tests) were calculated to determine if the rate of change over age for each of the dependent variables differed between men and women (Pedhazur & Schmelkin, 1991). **RESULTS**: Men and women decreased proportionally as age increased for ALM ($p<0.01$ and $p<0.001$), TBSM ($p<0.01$ and $p<0.001$), LM ($p<0.01$ and $p<0.001$), TALM ($p<0.001$ and $p<0.001$), and TLLM ($p<0.01$ and $p<0.001$) for men and women, respectively. BM did not change over age for men ($p=0.069$), however, for women BM decreased with age ($p<0.01$). The relationship between age and FM did not significantly change across age ($p=0.480$ and $p=0.123$), nor did BF change with age ($p=0.270$ and $p=0.352$) for men and women, respectively. Additionally, there were no significant differences in the slopes of the respective changes between men and women ($p>0.05$) for all eight variables. **CONCLUSION**: The results of the present study indicate that although the body composition of men and women changes with age, the rate of change is similar between genders. Previous research has reported that men tend to lose more muscle mass than women with aging, and women gain more fat mass. There was, however, no change in FM or BF in either gender, in contrast with previous studies that have reported increases in both variables in men and women with aging.

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LOWER BODY FLEXIBILITY AMONG OLDER ADULTS

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Flexibility is one of the key components in health. As adults age, there is a decline in the range of motion (ROM) in their joints. **PURPOSE:** The purpose of this study was to observe the impact of static stretching added to a resistance training program on ROM and functional flexibility of the lower body in an older population. **METHODS:** Thirty-five adults over the age of 65 years previously involved in a resistance training program participated in the 16 week flexibility study. The participants were divided into the resistance training (R) or flexibility (RF) group which included resistance training and static stretching. The participants were tested at baseline, eight weeks, and 16 weeks. Measurements of hip flexion and hip extension were taken with a goniometer while seated sit-and-reach (SNR) was measured using the Senior Fitness Test protocol. Repeated measures ANOVAs were used to analyze the results. **RESULTS:** There was a significant interaction effect ($p<0.05$) for hip flexion. The RF group increased, while the R group decreased hip flexion. Left hip extension significantly decreased ($p>0.05$). Both groups had a significant decrease in SNR ($p>0.05$). **CONCLUSION:** Static stretching combined with resistance training improves hip flexion. It is not clear why hip extension decreased; however, the stretching exercises were not targeted to improve hip extension. Exercise effects on flexibility in older adults needs to be examined in order to improve their ROM and physical function.

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