



**FALL 2007 Annual Meeting
October 18 & 19**

**American College of
Sports Medicine
CENTRAL STATES
CHAPTER**

**Springfield MO
Clarion Hotel &
Convention Center**

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American College of Sports Medicine Central States Chapter Annual Meeting



Clarion Hotel and Convention Center; Springfield, Missouri

October 18 & 19, 2007

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WELCOME to Springfield and to the Annual Meeting of the Central States Chapter of the American College of Sports Medicine. I am excited to present a superb schedule of speakers for our annual meeting. Keynote lectures by Dr. Griesemer and Dr. Ledger will provide attendees with current perspectives on research with young athletes and individuals with diabetes. Another special guest speaker, former CSC student member, is Clay Worthington, currently a Sports Science Coach with USA Cycling. Clay will be presenting a lecture on sprint track vs. endurance track training as well as an inspirational talk at the student meeting (note: some drawings for "prizes" will occur at this session!). I am also excited to have Lindsay Baker, a Senior Scientist with Gatorade with us to discuss fluid balance and thermoregulation. In addition to these presentations, we have a wonderful line-up of concurrent lectures on Friday including issues related to the fitness industry, effects of stress, a community physical activity project, immune function, autoregulation in strength training, accreditation possibilities, and muscle adaptations to exercise. Highlighting our student-focus will be the student oral presentations on Thursday afternoon followed by the poster presentations and social. I hope that you have a wonderful time in Springfield and enjoy the topics included in the program as well as the opportunities for networking. Finally, I want to draw your attention to the financial sponsors listed below. Without the financial support of these organizations, we would not be able to offer such a wide-ranging and exciting line-up of speakers.

Barbara Bushman, Ph.D., FACSM
Past-President CSC ACSM

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Central States Chapter
of the
American College of Sports Medicine
FALL 2007 MEETING SCHEDULE

THURSDAY, October 18, 2007

- 1-1:15 PM WELCOME
Barbara Bushman, Ph.D., FACSM, Past-President CSC ACSM
- 1:15-2:15 KEYNOTE
New Concerns in Performance Enhancement in Young Athletes
Bernard Griesemer, M.D., Health Tracks St. Johns
SPONSORED BY MIDWEST DAIRY COUNCIL
- 2:15-2:30 REFRESHMENT BREAK
- 2:30-3:15 SESSION I: Sprint Track Training vs Endurance Track Training
Clay Worthington, M.S., USA Cycling
SPONSORED BY AEI TECHNOLOGIES, INC.
- 3:15-4:00 SESSION II: Fluid Balance and Thermoregulation during Exercise.
Lindsay Baker, Senior Scientist, Gatorade Sports Science Institute
SPONSORED BY GATORADE
- 4:15-5:30 STUDENT ORAL PRESENTATIONS
Ryan (page 8) - 4:15 p.m.
Amick (page 9) - 4:30 p.m.
Loethen (page 10) - 4:45 p.m.
Roberts (page 11) - 5:00 p.m.
Warner (page 12) - 5:15 p.m.
- 5:30-6:30 POSTER PRESENTATIONS & SOCIAL
- | | |
|-----------------------|-----------------------|
| 1. Bannon (p13) | 2. Bean (p14) |
| 3. Bollinger (p15) | 4. Boolani (p16) |
| 5. Borengasser (p17) | 6. Burris (p18) |
| 7. Dalbo (p19) | 8. Dillon (p20) |
| 9. Farias (p21) | 10. Fedick (p22) |
| 11. Fiddler (p23) | 12. Fry (p24) |
| 13. Glasgow (p25) | 14. Hassell (p26) |
| 15. House (p27) | 16. Jacobsen (p28) |
| 17. Kline (p29) | 18. Konz (p30) |
| 19. Mann (p31) | 20. Powers (p32) |
| 21. Prewitt (p33) | 22. Reams (p34) |
| 23. Rogers (p35) | 24. Smith (p36) |
| 25. Touchberry (p37) | 26. Warren (p38) |
| 27. Wheeler, A. (p39) | 28. Wheeler, R. (p40) |
| 29. Young (p41) | |

FRIDAY, October 19, 2007

- 8:45-9AM WELCOME
Barbara Bushman, Ph.D., FACSM, Past-President CSC ACSM
- 9:00-10:00 KEYNOTE
Diabetes and Exercise
Gregory A. Ledger M.D., FACP, FACE; Dept. of Endocrinology, St. John's
Physicians and Clinic
SPONSORED BY HANS RUDOLPH
- 10:15-11:00 SESSION III-A: Everything but the kitchen sink: opportunities, challenges
and fun things to think about in the fitness industry.
Daniel Gwartney, M.D.
- SESSION III-B: Stress: What You Don't Know Will Kill You
Ro DiBrezza, Ph.D., University of Arkansas
- 11:00-11:45 SESSION IV-A: Physical activity in the community: The PedNet project in
Columbia, MO
Stephen Sayers, Ph.D., University of Missouri
- SESSION IV-B: Immune System and Exercise
Kathy Carroll, Ph.D., Drury University
- 12:00-1:30 LUNCH/SPEAKER
"Effects of Dehydration on Basketball Skill Performance"
Lindsay Baker, Gatorade Sports Science Institute
Speaker SPONSORED BY GATORADE
- 1:30-2:15 BUSINESS MEETING (Professional Members)
STUDENT MEETING (Student Members) – Speaker Clay Worthington
"A Career Path leading to the OTC"
- 2:15-3:00 SESSION V-A: Autoregulation in Strength Training
Bryan Mann, M.Ed., University of Missouri
- SESSION I-B: Accreditation of Academic Programs in the Exercise
Sciences
Walt Thompson, Ph.D., Immediate Past Chair, Committee on Accreditation
for the Exercise Sciences (CoAES), Commission on Accreditation of Allied
Health Education Programs (CAAHEP)
- 3:15-4:00 FINAL SESSION: Response of the extracellular matrix of muscle to
exercise
Scott Zimmerman, Ph.D., Missouri State University
- 4:00-4:15 CLOSING REMARKS
Barbara Bushman, Ph.D., FACSM, Missouri State University

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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 conference, 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 sport-specific training and physiological adaptations to training in athletes.
- Recognize the importance of research in understanding problems related to physical inactivity.
- Explain the relationship between exercise and various parameters such as immune function, thermoregulation, and stress.

CEC Credit

The American College of Sports Medicine's Professional Education Committee certifies that this Continuing Education offering meets the criteria for 10.25 credit hours of ACSM Continuing Education Credit. Individuals who wish to receive CEC's must complete an application form available at the registration table and submit the form directly to ACSM along with payment (\$15 for ACSM members and \$20 for non-members).

Sponsors

Financial sponsors include Gatorade Sports Science Institute, Midwest Dairy Council, Hans Rudolph, AEI Technologies, New Lifestyles, and St. John's Sports Medicine. Additional support was provided by Human Kinetics (textbook donation), Missouri State University College of Health and Human Services (rent-free use of poster board stands), and Bass Pro Shops (merchandise donation).

STUDENT AWARD CANDIDATE – ORAL PRESENTATION

Presentation Time (4:15 p.m.)

TIME COURSE FOR THE EFFECTS OF PASSIVE STRETCHING ON MUSCULOTENDINOUS STIFFNESS: A DOSE-RESPONSE STUDY

Eric D. Ryan¹, Trent J. Herda¹, Holly R. Hull², Michael J. Hartman³, Travis W. Beck¹, Jeffery R. Stout¹, and Joel T. Cramer¹.

¹University of Oklahoma, Norman, Oklahoma; ²Columbia University, New York, NY; and ³Florida Atlantic University, Davie, FL.

PURPOSE: To examine the time course for the acute effects of 2, 4, and 8 min of passive stretching (PS) on musculotendinous stiffness (MTS) of the plantar flexor muscles. **METHODS:** Seven men (mean age \pm SD = 24 ± 4 yrs; stature = 178 ± 7 cm; mass = 82 ± 12 kg) and 5 women (21 ± 1 yrs; stature = 157 ± 5 cm; mass = 56 ± 7 kg) performed the MTS assessments on a calibrated Biodex System 3 dynamometer before (pre), after (post), and at 10, 20, and 30 min following the PS treatment. There were 4 separate, randomly-ordered experimental trials each separated by 3-7 days: (a) control (CON), (b) 2 min of PS, (c) 4 min of PS, and (d) 8 min of PS. For the PS trials, several 30 s consecutive passive stretches of the plantar flexors were completed in the dynamometer where the lever arm passively dorsiflexed the foot to the point of discomfort, but not pain. Each 30-s PS was separated by 20 s of rest until the total time under stretch for each trial was completed (i.e., there were 4 stretches for the 2 min trial, 8 stretches for the 4-min trial, etc.). The CON trial consisted of quiet resting for 15 min. To assess MTS, the dynamometer lever arm passively dorsiflexed the foot at $5^\circ \cdot s^{-1}$ until the maximum tolerable stretch was achieved and held for 5 s. Position ($^\circ$) and torque (Nm) values were sampled at 1 KHz from the dynamometer during the MTS assessments, which provided passive angle-torque curves. MTS was quantified every 4th degree for the last 12 degrees of the range of motion of dorsiflexion using the standard forth-order polynomial regression model that was fit to the angle-torque curves (Nordez et al. 2006, Clin Biomech, 21:755-760). A four-way mixed factorial ANOVA [time \times condition \times angle \times gender; $5 \times 4 \times 4 \times 2$] was used to analyze the MTS data. **RESULTS:** There were decreases in MTS from pre- to post-stretching for the 2 min (12%, $P=0.002$), 4 min (22%, $P<0.001$), and 8 min (20%, $P=0.005$) trials, but there were no changes ($P>0.05$) from pre- to 10 min, 20 min, and 30 min post-stretching for any of the stretching durations (2, 4, and 8 min). For the CON trial, there was no change in MTS ($P>0.05$) over all time periods. However, MTS remained depressed at 10 min post-stretching for the 4 min (8%, $P=0.005$) and 8 min (11%, $P=0.005$) trials when compared to the CON. In addition, MTS was greater for the men than the women across all joint angles, with MTS increasing at each larger joint angle. **CONCLUSIONS:** These findings indicated that 2, 4, and 8 min of PS resulted in decreases in MTS immediately following stretching. The decrease in MTS persisted for only 10 min after stretching for the 4 min and 8 min trials. Therefore, the physiological benefits of decreased MTS as a result of practical stretching durations (up to 8 min) appear to be relatively short lived (up to 10 min). These findings suggested that the decreases in MTS are stretching dose-dependent and may need to be completed within 10 minutes prior to exercise and/or athletic performance events in order to benefit from the MTS changes.

ORAL PRESENTATIONS

Presentation Time (4:30 p.m.)

ASSESSMENT OF EXERCISE CAPACITY IN AN INDIVIDUAL WITH LVAD EXPLANTATION WITHOUT HEART TRANSPLANTATION

R.Z. Amick, J.A. Patterson. *Department of Kinesiology and Sport Studies, Wichita State University, Wichita, KS; email: rzamick@wichita.edu*

Left Ventricular Assist Device's (LVAD) have become a viable treatment alternative to heart transplantation. While under LVAD support, some patients have shown significant recovery of native heart function allowing for the removal of the device without undergoing heart transplantation. **METHOD:** The patient in this study was a 47 year old male diagnosed with idiopathic dilated cardiomyopathy. The patient had previously been hospitalized with decompensated heart failure (HF) and was New York Heart Association functional class IV, Weber Class D. The patient underwent implantation of a LVAD and was supported for a period of 9 months. Four months post explantation the patient underwent a maximal graded exercise test to assess exercise response and peak oxygen consumption (VO_{2peak}). Peak oxygen consumption (VO_{2peak}) was determined during a symptom-limited graded exercise test on an electronically-braked cycle ergometer commencing at zero Watts and increasing by 25 Watts every 3 minutes. Heart rate (HR) and ECG were measured by 12-lead electrocardiographic monitoring throughout exercise and recovery. Cycling continued until the patient was no longer able to maintain at least 50 rev/min, or cardiovascular signs or symptoms intervened. **RESULTS:** The patient showed improvement in peak aerobic capacity when compared to pre LVAD cardiopulmonary stress tests. VO_2 increased from pre LVAD measures of $11.8 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ to post explantation measures of $17.0 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. Time to maximal exertion improved from 5 minutes 27 seconds to 15 minutes. Weber classification improved from D to B-C. **CONCLUSION:** The results from this case study indicate that a significant improvement in exercise capacity is possible in HF patients with a period of mechanical unloading through LVAD support.

ORAL PRESENTATIONS

Presentation Time (4:45 p.m.)

EFFECTS OF WEIGHT-BEARING AND NON-WEIGHT BEARING EXERCISE ON SERUM MARKERS OF BONE TURNOVER DURING SHORT-TERM WEIGHT LOSS IN OVERWEIGHT ADULT WOMEN

J. V. Loethen, R. S. Rector, M. L. Ruebel, T. R. Thomas, and P. S. Hinton. *Department of Nutritional Sciences, University of Missouri-Columbia, Columbia, MO* email: jvltxf@mizzou.edu

Weight reduction in overweight and obese individuals reduces morbidity and mortality from chronic diseases associated with excess adiposity. Weight loss, however, negatively affects bone health by increasing bone turnover such that, over time, bone loss occurs.

PURPOSE: The purpose of this study was to examine the effects of short-term weight loss with and without non-weight bearing aerobic exercise on serum markers of bone formation and breakdown in overweight premenopausal females. **METHODS:** Thirty-seven overweight to class I obese, sedentary, non-smoking women (18-35 y) were randomized to one of three treatments designed to achieve a 5% reduction in body weight in 6 wk: caloric restriction (DIET, n=11), caloric restriction plus regular non-weight bearing aerobic exercise (CYCLE, n=13), or caloric restriction plus regular weight-bearing aerobic exercise (RUN, n=13). Primary outcome measures were markers of bone formation (osteocalcin, OC; bone-specific alkaline phosphatase, BAP) and bone resorption (C-terminal cross-links of type I collagen, CTX). Repeated measures two-way ANOVA was used to test for significant time and group effects, as well as for group by time interactions. Variables that were not normally distributed were transformed.

RESULTS: DIET, CYCLE, and RUN groups did not differ at baseline in age, body weight, BMI, percent body fat, or VO_{2max} . Body weight and BMI decreased significantly similarly in all groups from baseline to post-weight loss ($p < 0.05$). The RUN and CYCLE groups exhibited a significant reduction in percent body fat (5.1% and 7.4%), while the DIET group showed no significant change. As expected, VO_{2max} increased significantly in the CYCLE and RUN groups ($p < 0.05$), confirming compliance with the exercise training. OC and CTX increased significantly with weight loss in all subjects, regardless of the method of weight loss ($p \leq 0.05$). BAP did not change in any of the groups.

Changes in serum OC, BAP, and CTX were not significantly different among groups.

CONCLUSIONS: Markers of bone turnover increase in response to weight loss and regular aerobic exercise may not be sufficient to override the acute effects of weight loss on bone. Thus, longer term interventions may be necessary to exhibit the positive role of weight-bearing aerobic exercise on bone during weight loss.

Supported by Margaret Mangel Research Catalyst Fund

ORAL PRESENTATIONS

Presentation Time (5:00 p.m.)

EFFICACY AND SAFETY OF A THERMOGENIC ENERGY DRINK AFTER 28 DAYS OF INGESTION

M. D. Roberts, V. J. Dalbo, S. Hassell, J. Moon, C. Baker, P. House, J. R. Stout, FACSM and C. M. Kerksick*. *Department of Health and Exercise Science, University of Oklahoma, Norman, OK.* Email: Chad_Kerksick@ou.edu

Recent data has demonstrated that consuming a thermogenic energy drink (ED) acutely increases resting energy metabolism and serum markers of lipolysis in healthy, college-aged individuals. **PURPOSE:** The purpose of this study was to determine if consuming ED over 28 d affects its acute thermogenic and lipolytic effects as well as body composition and clinical chemistry safety markers. **METHODS:** Sixty healthy, college-aged males (23.2 ± 4.0 yrs, 177.2 ± 6.1 cm, 81.7 ± 11.3 kg, 22.8 ± 7.3 % body fat; $n=30$) and females (23.4 ± 3.1 yrs, 165.6 ± 8.7 cm, 62.1 ± 9.9 kg, 28.3 ± 7.4 % body fat; $n=30$) reported to the lab on day 0 for determination of resting energy expenditure (REE) before and after ingesting either 336 ml of ED or a non-caloric, non-caffeinated placebo (PLA) drink. Fasting blood samples were provided before and after drink ingestion to determine changes in glycerol and free fatty acid (FFA) concentrations. Following day 0, participants supplemented daily with 336 ml•d⁻¹ of either ED or PLA and repeated identical testing procedures on day 29. Day 29 pre and post-ingestion REE as well as FFA, and glycerol values were compared between groups using separate 2 x 4 (group x time) and 2 x 5 repeated measures ANOVA, respectively. **RESULTS:** Additionally, within-groups comparisons of pre- and post-supplementation REE, FFA, and glycerol values on days 0 and 29 were analyzed using dependent samples t-tests, whereas body composition parameters and all whole blood and serum safety markers were analyzed using 2 x 2 (group x test) repeated measures ANOVA. No significant group x time interactions ($p = 0.39$) concerning Δ REE were found on day 29, however, paired t-tests revealed no differences ($p > 0.05$) in each respective Δ REE value at day 29 when compared to day 0. There was a significant group x time interaction concerning Δ FFAs on day 29 ($p = 0.003$). Additional one-way ANOVAs revealed significantly greater Δ FFAs at 30 min (0.14 ± 0.02 vs. 0.01 ± 0.01 mM; $p = 0.001$) and 60 min (0.17 ± 0.01 vs. 0.02 ± 0.01 mM; $p < 0.001$) in the ED group. A statistical trend concerning increases in Δ glycerol levels within the ED group existed on day 29 ($p = 0.06$). Additionally, the ED group experienced a significant decrease in %BF compared to the PLA group ($p = 0.02$). There were no significant differences between groups concerning whole blood and clinical safety markers. **CONCLUSIONS:** Our results indicate that the lipolytic effects of ED are sustained following prolonged supplementation which may contribute to the observed decrements in %BF. Future studies should examine the impact of prolonged ED ingestion in combination with an exercise program at promoting and sustaining weight loss as well as changes in body composition.

Supported by Celsius, Inc. (Delray Beach, FL).

ORAL PRESENTATIONS

Presentation Time (5:15 p.m.)

ALTERATIONS IN ABDOMINAL ADIPOSE TISSUE DISTRIBUTION WITH EXERCISE DURING WEIGHT REGAIN

S.O. Warner, R.S. Rector, Y. Liu, P.S. Hinton, D.R. Huyette, and T.R. Thomas.
University of Missouri-Columbia, Columbia, MO email: swn66@mizzou.edu

Metabolic syndrome risk factors, especially abdominal obesity, are reduced with weight loss; however, many individuals regain the weight. The ability of exercise, in the face of weight regain, to maintain metabolic benefits gained from a lifestyle modification may provide the needed incentive to continue an active lifestyle even during a period of weight gain. **Purpose:** The purpose of this study was to determine whether exercise training effectively maintains beneficial alterations in abdominal adipose tissue (AT) distribution during weight regain. **Methods:** Twenty-three sedentary and overweight to class II obese (body mass index = $32.5 \pm 0.8 \text{ kg/m}^2$) individuals (8 males, and 15 females, age = 41 ± 2 y) with components of the metabolic syndrome, lost ~10% of their initial body weight during a 4-7 mo diet- and exercise-induced weight loss phase (WL phase). After weight loss, each subject was randomly assigned to either an exercise or non-exercise group for the 4-6 mo weight regain phase (WR phase) to regain 50% of the initial weight lost. The diet consisted of modest caloric restriction (reduced by ~600 kcal/d) during the WL phase and a slight increase in consumption (~450-500 kcal/d compared to WL) during the WR phase. All subjects during the WL phase and subjects assigned to the exercise group during the WR phase performed 45 minutes of aerobic exercise 5 d/wk at 60% of VO_2max , expending approximately 375 kcal/session. Abdominal AT depots were measured using computed tomography (CT). Anthropometric and cardiovascular fitness measurements and CT scans were completed at baseline (BL), post weight loss (post WL), and post weight regain (post WR). **Results:** Following weight loss ($9.2 \pm 0.8\%$), body weight, body mass index (BMI), % body fat, waist circumference (WC), and waist-to-hip ratio (WHR) were significantly reduced. All abdominal adipose tissue (AT) depots [total AT (TAT), total subcutaneous AT (TSAT), superficial SAT (sSAT), deep SAT (dSAT), and visceral AT (VAT)] also were significantly reduced. During weight regain, anthropometric variables (with the exception of WHR) and abdominal AT depots (with the exception of sSAT) increased significantly in both groups, with no differences between the groups. Improvements in cardiovascular fitness were maintained during weight regain in the exercise group only. **Conclusion:** Exercise training was not able to preserve the beneficial reduction in abdominal adiposity during weight regain; however, it was sufficient to maintain cardiovascular fitness.

Supported by NIH ROI DK67036

POSTER PRESENTATIONS (5:30-6:30 p.m.)

1.

WHEELCHAIR TRANSFER TESTING AS AN ALTERNATIVE PROTOCOL TO DETERMINE AEROBIC CAPACITY IN AN INDIVIDUAL WITH ARTHROGRYPOSIS

H.M. Bannon, K.C. Young, J.A. Patterson. *Department of Kinesiology and Sport Studies, Wichita State University, Wichita, KS; email: hmbannon@wichita.edu*

Traditional exercise testing for wheelchair confined subjects are arm crank ergometry tests, however many of these individuals may have limited arm mobility. We present a unique case study of a 26 year-old, world-ranked wheelchair quad tennis player with arthrogyrosis that has multiple joint contractures of his upper extremities. To determine maximal aerobic capacity in this individual, a chair-to-chair transfer test was developed as an alternative protocol. Once the subject was stable and confident enough, an established rowing test was completed for comparison. **Purpose:** The purpose of this study was to assess the reliability and validity of a maximal aerobic capacity transfer test performed on an individual confined to a wheelchair living with arthrogyrosis. **Methods:** The participant underwent 3 identical multi-stage wheelchair transfer tests, 3 days apart, to measure maximal oxygen consumption (VO_{2max}). The individual performed transfers between chairs at an increasing tempo until exhaustion. Max heart rate and a plateau in VO_2 were used as indices of metabolic stress at the end of the VO_{2max} test. One week after the third transfer test, an established maximal aerobic capacity rowing protocol (Progressive Ergometer Test) was performed with subject specific modifications to the rowing ergometer. A second rowing test was completed one week later. **Results:** VO_{2max} testing of the three transfer tests showed marginal differences between tests (22.1, 23.0, 21.8; respectively, units are $ml^{-1}\cdot kg^{-1}\cdot min$). Additionally, statistical analysis using T-tests reported no significant differences ($p < 0.05$) between the mean of the three transfer tests ($22.3 \pm 0.62 ml^{-1}\cdot kg^{-1}\cdot min$) and those measured with the follow-up rowing test ($21.05 \pm 0.35 ml^{-1}\cdot kg^{-1}\cdot min$). **Conclusions:** These data suggest that arthrogyrosis patients with limited upper limb mobility can safely perform a maximal graded exercise test by means of transferring and the developed testing protocol appears to be reliable and valid, but further research is needed with greater numbers.

2.

ANALYSIS OF HR RESPONSE TO THE VALSALVA MANEUVER DURING DUMBBELL VERSUS ELASTIC BAND LIFTS

M. L. Bean, J. A. Patterson. *Department of Kinesiology and Sport Studies, Wichita State University, Wichita, KS*; email: mlbean@wichita.edu

Heart rate (HR) responses to exercise have been extensively researched, however specific HR changes comparing weighted dumbbells versus similarly resistive elastic bands has not been reported. We previously showed that the Valsalva Maneuver (VM) is triggered by poor lifting mechanics regardless of the weight lifted, and thus hypothesize that the VM would also be apparent with elastic band resistance with the potential to have a VM shift to a later lifting phase due to the resistive properties of elastic bands. **METHOD:** Individuals had physiological parameters assessed during a functional movement while performing a lift at ~40% of their bodyweight. ECGs were recorded during the study. All subjects performed two lifts, one with Elastic Bands and one with Dumbbells. Subjects were randomized to have their first lift with the Elastic Band (Trial 1) or using hand weights (Trial 2). Participants performed the movement with no instruction during both trials. Approximately 40% of ones own body weight was determined and matched with a similar resistive band (color and length). Each lift was assessed at four different phases: 1) from standing to squat, 2) lifting weight or resistance to standing, 3) standing to squat returning weight to floor, 4) return to standing. Monitoring continued and was carefully observed throughout the lifting movement to record any changes that occurred during the functional activity. **RESULTS:** Statistical analyses were run on absolute HR values, and significance was observed between Phases 3-4 of the lift when comparing Trials 1 and 2 (92.84 ± 11.82 vs. 96 ± 13.33 ; 99.42 ± 10.30 vs. 105.13 ± 9.68 ; respectively, units are bpm). **CONCLUSION:** Based on HR responses our results suggest that VM occurred during the Dumbbell lift, but does not seem apparent during the elastic band lift. Peak HR's during Phase's 3 and 4 of the Dumbbell lift were significantly higher than the elastic band lift (<0.05), suggesting that at similar workloads the Dumbbell lift may cause greater stress to the heart than elastic bands during the same movement.

3.

EFFECTS OF EXERCISE ON PLASMINOGEN ACTIVATOR INHIBITOR-1 DURING WEIGHT LOSS AND WEIGHT REGAIN

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Elevated plasminogen activator inhibitor-1 (PAI-1) may indicate impaired fibrinolysis and has been associated with the metabolic syndrome. **PURPOSE:** The current study sought to identify whether exercise training and diet induced weight loss would lower PAI-1 concentration and whether the maintenance of exercise training during a regain of body weight would maintain PAI-1 levels. **METHODS:** Subjects (N=23) were overweight (BMI 32.53±0.81) sedentary adults (18-50 y) with at least 2 characteristics for metabolic syndrome according to NCEP third report criteria. The cohort included 8 males and 15 females. Subjects lost 10% of initial body weight over 4-7 months through energy restriction and moderate intensity (60% of VO₂ max) exercise. Subjects then were randomized into either an exercise (n=13) or non-exercise (n=10) group and regained 50% of their lost weight. Measurements of body composition, insulin resistance, and PAI-1 concentration were collected at baseline, post weight loss, and post weight regain. **RESULTS:** The current study showed no decreases in PAI-1 as a result of weight loss. However, there was a significant difference (p=0.02) in PAI-1 concentration between the exercise and non-exercise groups following weight regain (27.36±5.43 and 48.49±6.53ng/ml, respectively). At baseline and post weight loss, no significant correlations were observed between PAI-1 and any other variable. However, during weight regain, combined data from the exercise and non-exercise groups showed PAI-1 change to be significantly (p<0.05) inversely correlated with change in HOMA (r=-0.45) and positively correlated to body weight changes (r=0.48) after removing two outliers. Examining the exercise group alone revealed no significant correlations between change in PAI-1 and any other variable; however, increases in insulin (r=-0.68) and HOMA (r=-0.68) were significantly (p<0.05) correlated to decreases in PAI-1 in the non-exercise group. **CONCLUSION:** The results indicate that exercise may be beneficial in maintaining fibrinolytic function during weight regain. Additionally, the current correlations suggest an inverse relationship between increases in insulin resistance and decreases in PAI-1 during weight regain particularly for sedentary individuals.

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4.

EFFECTS OF SKELETAL STRUCTURES ON VERTICAL JUMP

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PURPOSE: The purpose of this study was to determine whether skeletal structures affect vertical jump. **METHODS:** Fifty-eight college age males and females (Mean Age= 21.9 +/- 2.07 years, Mean Ht= 167.77 +/- 8.76 cm, Mean Weight= 72.21 +/- 19.46 kgs) volunteered for this study. Skeletal structures such as leg length and Q-Angle were measured three times on all subjects and the average of those measures was used. The subjects were then asked to perform 2 maximal effort vertical jumps, and the average vertical jump measured was used. A one-way ANOVA and Newman-Keuls post hoc test were used to determine significance of Q-Angle and leg length and their effects on vertical jump. **RESULTS:** There was no statistical significance for leg length and vertical jump for either sex. There was also no statistical significance in Q-Angle and vertical jump amongst males, but there was statistical significance in Q-Angle and vertical jump amongst females ($p < 0.03$). The post-hoc analysis determined that females with Q-Angles 3.3-6.3 degrees had significantly higher vertical jumps than females with Q-Angles 6.4-9.0 degrees ($p < 0.03$) and Q-Angles > 9.1 degrees ($p < 0.18$). There was no significant difference between females in the groups 6.4-9.0 degrees and > 9.1 degrees ($p < 0.08$). **CONCLUSION:** There was a statistical significance in Q-Angle and vertical jump. The smaller the Q-Angle the greater the vertical jump was measured. There was no significance in leg length and vertical jump.

5.

A HIGH FAT DIET INCREASES METABOLIC RISK IN RATS SELECTIVELY BRED FOR LOW-AEROBIC CAPACITY

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Low aerobic capacity is the best predictor of early death and is associated with an increased risk for obesity and the metabolic syndrome. We previously reported a novel model in which rats were artificially selected for high (HCR) and low (LCR) exercise endurance capacity despite having never exercise trained. Earlier reports showed that male HCR rats were protected against the high fat diet (HFD) induced obesity and insulin resistance observed in the LCR rats. However, similar responses have not been examined in female HCR/LCR rats. In addition, the effects of a HFD on the development of hepatic steatosis in these animals are unknown. **PURPOSE:** To determine the effects of a HFD on metabolic syndrome risk factors including body weight, adiposity, liver fat, and whole body insulin sensitivity in female rats with intrinsically high or low aerobic exercise capacity. **METHODS:** Female HCR and LCR rats (age=24 wks; max running distance during graded exercise test: ~1800 m vs. ~350 m, respectively ($p < 0.0001$)) were fed either a 60% HFD or a normal chow (NC) diet for 7 weeks. Food intake and body weights were measured weekly; an interperitoneal glucose tolerance tests (IPGTT) was performed prior to sacrifice; omental and periovarian fat pad weights and triglyceride (TG) content of the liver were measured at sacrifice. **RESULTS:** Weight gain was similar for both strains of animals on both the HFD and NC diets. Interestingly, the HFD caused a 126% ($p=0.025$) increase of periovarian and a 39% ($p=0.230$) non-significant increase of omental fat pad weights compared to NC fed controls in the LCR rats only. Similarly, only the LCR rats showed a suppression in insulin sensitivity on the HFD as demonstrated by a significant 30% ($p=0.05$) increase in the insulin AUC during the IPGTT. However, both groups showed an increase in hepatic TG storage following the HFD, and the hepatic fatty acid oxidation enzymes B-hydroxy acyl-CoA dehydrogenase (B-had) and citrate synthase (CS) showed decreased activity after the HFD in both groups. **CONCLUSION:** These results suggest that intrinsically high levels of aerobic exercise capacity in female rats protects against increased adiposity and insulin resistance, but do not protect against the accumulation of TG in the liver caused by a HFD.

6.

A COMPARISON OF THREE TYPES OF ATHLETIC TAPE IN THE STABILITY OF THE ANKLE JOINT

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In the field of athletic training, practitioners use various types of athletic tape to provide support to the ankle joint. Many clinicians often use combinations of different tape materials to provide better joint support. There is on-going discussion in the field about which type of tape, or which combination of tape provides the best support for patients.

PURPOSE: The purpose of this research is to examine differences in the range of motion among three taping and underwrap combinations of commonly used athletic tape to determine which type of tape, or combination of types of tape and underwrap material provide the greatest support to the ankle joint.

METHODS: Nine males ($n = 9$; age 20.77 ± 2.5 yrs; height 179.33 ± 6.83 cm; weight 90.31 ± 15.93 kg) each had their right ankle taped on three separate occasions using each of three taping combinations; foam underwrap with linen tape (ULT), self-adherent flexible underwrap with linen tape (FLT), and self-adherent flexible underwrap with a self-adherent cohesive tape (FCT). The order in which the subjects received a specific taping combination was counterbalanced.

Subjects were first measured for ankle range of motion prior to tape application to establish baseline movement about the joint. Measurements included inversion, eversion, dorsiflexion, and plantarflexion using an electricgoniometer (BIOPAC Systems, TSD130B, Goleta, CA). Each movement was measured passively three times by the same examiner, and all taping techniques were completed by the same individual following the taping protocol by Perrin (Athletic Taping and Bracing; Human Kinetics: Champaign, IL). Analysis consisted of paired t-tests and independent t-tests to observe within group and between group differences. An alpha level of $p \leq 0.05$ was considered statistically significant for all analyses. **RESULTS:** We found a significant decrease in inversion of the ankle for all tape combinations (ULT mean change -9.45° , $p = .003$; FLT mean change -9.73° , $p = .027$; FCT mean change -10.21° , $p = .017$). All other motions analyzed revealed decreases in motion from pre-tape to post-tape measurements, but no significant within group differences were noted. We also observed no significant differences in motions between the taping combination groups.

CONCLUSIONS: Our findings agree with other research that prophylactic taping can be used to limit ankle inversion and prevent injury. A unique aspect of this study is that it is the first known study to compare traditional and contemporary taping materials often used for injury prevention. We conclude that effective restriction of ankle inversion can be accomplished using any of the materials utilized in this study.

7.

EFFECTS OF A COMMERCIAL ENERGY DRINK ON ACUTE CHANGES IN ENERGY

EXPENDITURE AND LIPOLYSIS

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The increased prevalence of obesity and lack of adherence to weight loss programs has created a need for weight loss supplements to aid in weight reduction. **PURPOSE:** To determine the acute impact of ingesting a thermogenic energy drink (ED) on changes in energy expenditure and lipolysis. **METHODS:** Healthy college-aged male (23.2 ± 4.0 y, 177.2 ± 6.1 cm, 81.7 ± 11.3 kg, 22.8 ± 7.3 % fat; $n=30$) and female (23.4 ± 3.1 y, 165.6 ± 8.7 cm, 62.1 ± 9.9 kg, 28.3 ± 7.4 % fat; $n=30$) participants were matched according to height and weight to consume 336 ml of ED or 336 ml of a non-caloric, non-caffeinated placebo (PLA). After a 12 h fast, participants reported for pre-consumption measures of height, weight, heart rate, blood pressure, resting energy expenditure (REE), respiratory exchange ratio (RER), glycerol and free-fatty acid (FFA) concentrations. REE and RER were determined 60, 120, and 180 min post-consumption. Serum glycerol and FFA concentrations were determined at 30, 60, 120 and 180 min postconsumption.

Separate univariate 2 x 4 (group x time) and 2 x 5 repeated measures ANOVA were completed for changes in resting energy expenditure and serum values, respectively.

One-way ANOVA was used to determine within-group differences. REE data is express as means \pm SD while glycerol and FFA concentrations are expressed as means \pm SE.

RESULTS: Significant group x time interactions ($p=0.001$) revealed higher relative REE values for ED at 60 (2.3 ± 1.9 vs. 1.0 ± 1.4 kcal \cdot kg \cdot 1 \cdot d \cdot 1), 120 (2.6 ± 2.6 vs. 0.8 ± 2.2 kcal \cdot kg \cdot 1 \cdot d \cdot 1) and 180 min (2.5 ± 2.4 vs. 0.9 ± 1.6 kcal \cdot kg \cdot 1 \cdot d \cdot 1) and FFA concentrations at 30 (0.37 ± 0.20 vs. 0.23 ± 0.21 mM), 60 (0.44 ± 0.19 vs. 0.27 ± 0.18 mM), 120 (0.47 ± 0.17 vs. 0.32 ± 0.20 mM) and 180 (0.43 ± 0.19 vs. 0.33 ± 0.21 mM) min postsupplementation ($p < 0.05$) when compared to PLA. No significant differences ($p > 0.05$) were found between groups for glycerol concentrations pre- (1.28 ± 0.80 vs. 1.10 ± 0.74 mM) or at 30 (1.54 ± 0.85 vs. 1.20 ± 0.90 mM), 60 (1.52 ± 0.91 vs. 1.18 ± 0.93 mM), 120 (1.47 ± 0.89 vs. 1.31 ± 0.94 mM) or 180 (1.56 ± 0.83 vs. 1.35 ± 1.00 mM) min post-supplementation. Furthermore, no significant differences were found for RER during the course of the study. **CONCLUSIONS:** Acute ED ingestion significantly increased REE and FFA appearance, but did not influence changes in glycerol. Longer studies need to be conducted to determine the overall safety and efficacy of daily ED ingestion and their potential role in weight loss and maintenance programs.

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8.

A PHYSIOLOGICAL COMPARISON OF ELITE AND RECREATIONAL FEMALE RUNNERS

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PURPOSE: The purpose of this study was to describe differences a variety of physiological variables between elite and recreational female runners. **METHODS:** After signing an informed consent approved by the University of Central Missouri Institutional Review Board, 9 female runners were divided into 2 groups based on personal competitive objectives, elite (E) n=5, or recreational (REC) n=4. Elite runners were (21.6 yrs, 165.1 cm, 52.5 kg) and recreational runners (21.8 yrs, 162.8 cm, 55.2 kg). The E group consisted of collegiate and professional runners and the REC group consisted of competitive runners who run at least 30 min/d most days of the week. All participants performed a maximal treadmill test to determine VO₂max. An Individual 3 min stage running protocol for each group was designed to elicit maximum oxygen uptake within 12-13 min. During the test, blood was analyzed using a Lactate Scout analyzer for lactate concentration at approximately 1.5 min. intervals. The participant's perceived exertion using the Borg ratings of perceived exertion scale (RPE) values was recorded at the time of each blood draw. **RESULTS:** Significance was set at $p < 0.05$. Means were compared between groups and no differences were noted for heart rate maximum (E =197 bpm, REC=193 bpm), lactate threshold (LT) expressed as a percent of VO₂max (E=86%, REC= 86%), lactate concentration (mMol/L) at LT (E=4.4, REC=4.1), RPE at LT (E=16, REC=14), or VO₂max (ml/kg/min) (E=57.5, REC=49.4). Differences were observed in body fat percent (E=15, REC=24) and heart rate at LT (TR=191bpm, REC=183bpm). **CONCLUSION:** These results indicate that of the variables observed in this study, the only physiological differences between elite and recreational female runners are body composition and heart rate at LT. However, a larger sample size may have revealed other statistically significant differences as trends in some of the variables approached the point of significance.

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9.

11 β - HYDROXYSTEROID DEHYDROGENASE ACTIVITY IN FELINE ADIPOSE TISSUE

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The role of 11 β -Hydroxysteroid dehydrogenase (11 β HSD) type 1 is to amplify intracellular glucocorticoid action in adipose tissue. Transgenic mice that over-express 11 β HSD1 in adipose tissue exhibit visceral obesity and the hallmarks of metabolic syndrome. In contrast, mice lacking 11 β HSD1 activity in adipose tissues exhibit a protective metabolic phenotype. Within the last decade, obesity has become a problem in humans, and household pets have been caught up in this struggle to avoid obesity. Industry experts now agree that obesity has become the most common nutritional disorder in cats. Feline obesity increases risk for development of diabetes mellitus, urinary tract disease, lameness, cancer, and diseases of skin and oral cavity. **PURPOSE:** The purpose of this study was to determine if 11 β HSD1 is present in feline adipose tissue, and if present to quantitate its activity in multiple adipose depots and correlate the activity with adipocyte size. The study hypothesis was that cats exhibit human-like regional adipose differences in 11 β HSD1 activity, thereby presenting cats as a useful animal model for study of obesity. **METHODS:** Adipose was collected from six, young, sexually intact male cats with healthy body weights from five adipose depots: subcutaneous midline (SQM), subcutaneous inguinal (SQI), omental (OM), falciform (FAL), and retro-peritoneal (RP). Portions of samples were fixed, sectioned, and immunohistochemically stained using an antibody specific for 11 β HSD1. Using the stained sections, average adipose cell volume was estimated and the cellular location of 11 β HSD1 was determined. Also, aliquots of the samples were subjected to radiometric assay procedures to reaffirm the presence and radiometrically quantitate the activity of 11 β HSD1 in the adipose depots. Data were analyzed using ANOVA and PROC GLM, with a threshold value of $P < 0.05$ to denote significance. **RESULTS:** Positive staining for 11 β HSD1 was found in all sections. Adipose SQM had greater 11 β -HSD1 activity ($P < 0.05$) compared to SQI, RP, and OM. Significant between-animal differences in activity were observed; a cat had greater 11 β -HSD1 activity ($P < 0.05$) than two cats with the lowest activities. There were significant differences ($P < 0.05$) in adipocyte diameter among depots and cats; SQI had greater adipocyte diameters than FAL or OM, whereas RP had greater adipocyte diameters than FAL, OM, or SQM. Within and across all adipose depots, 11 β HSD1 activity was not correlated with adipocyte size. **CONCLUSION:** These data provide evidence that 11 β HSD1 activity is present in cat adipose tissue and that depot differences occur. While adipocyte size does not significantly affect 11 β HSD1 activity.

10.

THE EFFECTS OF HYDRATION ON LACTIC ACID ACCUMULATION IN COLLEGE AGE MALE AND FEMALE STUDENTS

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PURPOSE: The purpose of the present study was to investigate the effects of increasing the Recommended Daily Allowance (RDA) of hydration on lactate levels in college age males and females. **METHODS:** College age males and females volunteered for participation in this study. Age, height, body weight, RPE, run time, blood lactate, and specific gravity and osmolality of urine was recorded during pre and post hydration tests. Blood lactate was measured by Accusport/ Accutrend Lactate Portable Lactate Analyzer. Subjects ran a pre-hydration 5k test on the track at 'tempo' pace and immediately following urine and lactate samples were collected. The subjects were randomly assigned to one of three RDA groups: 1) RDA intake of water (control), 2) 1.5 x RDA of water, or 3) 2 x RDA of water. Intake lasted a total of 7 days. After a week of hydrating, subjects completed a second 5k run on the track at 'tempo' pace and gave urine and blood lactate samples. The blood lactate, specific gravity and osmolality were recorded and used for SPSS analysis of different RDA hydration levels on lactic acid accumulation.

RESULTS: The results of the present study indicated that there was not a significant ($p>0.05$) change in different RDA hydration levels on lactic acid accumulation.

CONCLUSION: During aerobic activity, mild dehydration impairs performance. Additionally, because thirst is not perceived until water deficiency reaches 2% of body mass, many athletes are mildly dehydrated before they begin exercising. Current research suggests that dehydration can lead to an accumulation of lactic acid in the blood. It is recommended by the RDA that individuals need to consume no less than 64 fluid ounces of water a day. It is possible that running at different levels of RDA hydration may lead to different levels of lactic acid accumulation; however, in the present study the lactate accumulations were not significantly different at different RDA hydration levels.

11.

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

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PURPOSE: The purpose of the study was to examine the effects of LifeWave® energy patches on substrate utilization during graded exercise test methods.

METHODS: Nineteen Division I collegiate cross country runners volunteered for participation in this study. Age, height, body weight, time to exhaustion, and respiratory exchange ratio (RER) was recorded during a pre-test (without the patch) and then in a post-test with the patch. The post-test included a placebo group and an active patch group. The RER was recorded using a TrueMax 2400 Metabolic Measurement System. The Bruce Protocol was used to achieve maximal exertion. The RER was recorded and used to determine if the LifeWave® patches claim of increasing the ability to utilize fat following application had significance.

RESULTS: The results of the present study indicated that there was no significant ($p>0.05$) change in RER and therefore no change in substrate contribution in the active patch group. However, the results indicated there was significance in the inactive patch (placebo) group during the 2nd stage from pre to post test, with a higher percentage of carbohydrate contributing during the posttest.

CONCLUSION: According to the manufacturers, the LifeWave® patches incorporate organic nanoscale biomolecular antennas into two separate patches that resonate at frequencies in unison with biomolecules in the cells and signal specific metabolic pathways to beta oxidation, using fat as a primary fuel source. It is possible that the LifeWave® patch may increase beta oxidation with a larger subject number; however, in the present study the runners had no significant shift toward fat utilization in subjects given the active patch.

12.

CREATINE LOADING DOES NOT ALTER INTRACELLULAR CONCENTRATIONS OF INORGANIC PHOSPHATE

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Dietary supplementation with creatine has become extremely popular among many athletes and exercisers. Among its most touted ergogenic effects are increasing fatigue resistance and enhancing skeletal muscle growth, although the physiological mechanisms responsible for these effects are not currently known. Since creatine preferentially binds inorganic phosphate (P_i), it has been hypothesized that altering inorganic phosphate concentrations may influence several intracellular regulatory systems responsible for fatigue resistance and muscle growth. **Purpose:** To determine the effect 5 d of creatine loading on skeletal muscle P_i concentrations. **Methods:** Seventeen healthy men ($X \pm SE$; age[yrs] = 23.5 ± 1.0 ; hgt.[cm] = 176.1 ± 2.2 ; wgt.[kg] = 84.8 ± 4.0 ; % fat = 17.4 ± 2.5) volunteered to ingest creatine over a 5 day period. Pre and post biopsies were obtained from the vastus lateralis m., and were fluorometrically analyzed for P_i content using the methods of Lowry et al. (1974). Additionally, relative expression of myosin heavy chain (MHC) isoforms were analyzed using SDS-PAGE to quantify the contractile tissue characteristics of the muscle. Dietary records were collected for the 5 d period preceding each biopsy. **Results:** It has been previously reported that the creatine loading significantly ($p < .05$) increased intracellular concentrations of free creatine (+61%) and total creatine (+32%) (Fry et al. 2007). Similar patterns were evident when concentrations were adjusted for ATP concentrations. Despite the significant increase in intracellular creatine, no significant changes ($p > .05$) were observed for P_i concentrations ($\square M \cdot g_{ww}^{-1}$; pre = 9.4 ± 1.4 , post = 9.5 ± 0.9). Myosin heavy chain isoform expression was comparable to other reports for similar subjects (%; MHC I = 48.0 ± 5.6 , MHC IIa = 42.5 ± 4.6 , MHC IIb/x = 9.5 ± 2.2). No differences were reported for dietary intakes prior to either biopsy for total Kcal, or grams of protein, carbohydrate or fat. **Conclusions:** It has been suggested that decreasing the P_i pool could attenuate the onset of fatigue during exercise. Additionally, increasing the creatine phosphate pool could conceivably alter the availability of P_i necessary to regulate numerous regulatory pathways necessary for metabolism, growth and the cellular stress response. The present data indicate that intracellular P_i concentrations are not influenced by dietary creatine ingestion. The existing cellular P_i uptake mechanisms are robust enough to counter any effect of increased intracellular creatine concentrations. As such, further study is warranted to understand the physiological mechanisms underlying the ergogenic effects of creatine ingestion.

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13.

A COMPARISON OF SHOULDER RANGE OF MOTION IN COLLEGIATE BASEBALL AND SOFTBALL PLAYERS

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Range of motion plays a key in athletic injury prevention. Research has shown that a lack of shoulder range of motion leads to increased risk of injury in overhead sports whereas an increased total arc of motion can lead to increased speed and accuracy in pitching. Past investigation has also shown that there is a significant difference in range of motion when comparing dominant versus non-dominant upper extremities in overhead athletics.

PURPOSE: To determine what, if any, differences exist between shoulder internal and external rotation range of motion of collegiate baseball players as compared to collegiate softball players; as well as to compare the range of motion of the dominant versus non-dominant shoulder range of motion in college overhead athletes. **METHODS:** Shoulder range of motion of dominant versus non-dominant extremities was assessed using a standard goniometer during pre-season for 12 softball athletes and 16 baseball athletes. Paired t-tests were run to determine if any significant difference existed between extremities and between genders. **RESULTS:** There was no significant difference in shoulder range of motion between genders. There was also no significant difference found between dominant versus non-dominant arms collectively. Baseball players' external rotation of dominant versus non-dominant extremities was found to be significant ($p=0.013$). **CONCLUSIONS:** Our findings suggest that more research should be done to look at total arc of motion increases and decreases as there was no difference in dominant versus non-dominant range of motion collectively. Further research should be conducted to determine incidence of injury as compared to pre-season range of motion in overhead sports.

14.

VALIDITY OF NON-EXERCISE VO₂ MAX PREDICTION EQUATIONS IN MALES AND FEMALES

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Valid non-exercise means to predict VO₂ max may help to reduce the time, cost and equipment associated with direct VO₂ assessment. Furthermore, non-exercise prediction equations can be performed on high risk populations, unable to complete a max cardiorespiratory test. **PURPOSE:** To validate existing non-exercise VO₂ max prediction equations against direct measurement of VO₂ max using treadmill testing. **METHODS:** Sixty-two participants completed the study however, 14 were excluded due to inability to attain VO₂max. For the remaining 48 participants, validated VO₂max prediction equations were grouped into male specific (n = 23, 30.9 ± 6.1 y, 179.0 ± 4.3 cm, 94.1 ± 20.0 kg, 30.0 ± 9.2%fat), female specific (n = 25, 32.1 ± 6.1 y, 164.0 ± 20.6 cm, 72.0 ± 10.0 kg, 40.0 ± 8.9%fat) and gender independent (N = 48, 31.5 ± 6.0 y, 171.1 ± 16.9 cm, 82.6 ± 18.1 kg, 35.0 ± 10.2%fat) equations. Prior to testing, each subject avoided the consumption of alcohol, caffeine or nicotine the day of testing and refrained from heavy exertion for 48 hours. Subjects were also asked to consume 2 liters of water the day before testing to promote normohydration. Participants completed a PAR-Q prior to having their height, weight and body composition (DEXA) determined. Participants then lied in a supine position for 10 minutes to stabilize body fluids before bioelectrical impedance analysis using a tetrapolar electrode arrangement was completed. Standard validity measures (e.g., total error [TE], constant error [CE], validity coefficient [r] and standard error of estimate [SEE]) were used to statistically compare the actual and predicted VO₂max. **RESULTS:** Table 1 below summarizes validity statistics for all prediction equations used. **CONCLUSIONS:** Gender specific VO₂ max prediction equations appear to be more accurate than gender independent prediction equations, particularly for males.

Gender Independent Equations (n=48)

Method	VO ₂ Max (x ± SD)	CE	r	Slope	Y-intercept	SEE	TE
Direct VO ₂	34.6 (7.7)						
Jackson et al. 1990	47.7 (8.1)	-12.0	.25	.24	23.64	7.5	15.4
Stahn et al. 2006	29.3 (10.1)	5.3	.62	.47	20.91	6.1	9.6
Stahn et al. 2006	27.6 (9.3)	7.0	.69	.57	19.00	5.6	9.8

Male Specific Equations (n=23)

Method	VO ₂ Max (x ± SD)	CE	r	Slope	Y-intercept	SEE	TE
Direct VO ₂	38.0 (7.6)						
Jackson et al. 1990	41.1 (6.5)	-3.2*	.68	.80	18.8	5.9	6.3
Jackson et al. 1990	41.1 (6.5)	-3.2*	.68	.80	18.8	5.9	6.3
Stahn et al. 2006	36.5 (8.3)	1.4*	.51	.47	20.76	6.7	7.6
Stahn et al. 2006	34.6 (7.5)	3.4*	.61	.62	16.56	6.2	7.2

Females Specific Equations (n = 25)

Method	VO ₂ Max (x ± SD)	CE	r	Slope	Y-intercept	SEE	TE
Direct VO ₂	31.7 (6.6)						
Jackson et al. 1990	23.4 (7.0)	2.1*	.83	.93	4.21	3.8	4.2
Jackson et al. 1990	51.6 (5.8)	-19.9	.83	.93	-16.21	3.8	20.2
Williford et al. 1996	29.6 (5.8)	2.1*	.83	.93	4.21	3.8	4.2
Stahn et al. 2006	23.0 (6.9)	8.7	.5	.48	20.71	5.8	10.9
Stahn et al. 2006	21.6 (5.9)	10.2	.63	.7	16.69	5.2	11.5

* Male and Female Specific < Gender Independent (p<0.05).

15.

BETWEEN GENDER EFFECTS OF A COMMERCIAL ENERGY DRINK ON MARKERS OF METABOLISM AND LIPOLYSIS

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PURPOSE: The purpose of this study was to investigate the acute and chronic effects of energy drink (ED) consumption (336 ml) on resting energy expenditure (REE), serum concentrations of free fatty acids (FFA) and glycerol, as well as changes in body fat percentage (%BF) between males and females. **METHODS:** Healthy college-aged male (mean \pm SD: 23.7 \pm 4.5 y, 177.3 \pm 6.2 cm, 81.3 \pm 11.8 kg, 23.7 \pm 7.9 % fat; n=15) and female (22.9 \pm 2.1 y, 167.0 \pm 10.6 cm, 63.9 \pm 10.8 kg, 27.6 \pm 7.1 % fat; n=15) participants reported to the laboratory following a 12 h fast on days 0 and 29 for body composition (BODPOD) and REE assessments. REE was determined before, 60, 120, and 180 min after ingesting ED. Participants also donated blood prior to and 30, 60, 120, and 180 min following ED ingestion. Statistical analyses for days 0 and 29 included 2 x 4 and 2 x 5 (group x time point) repeated measures ANOVA's to assess pre and post ingestion alterations in REE, glycerol and free fatty acids (FFA), respectively. Changes in body composition were assessed using an independent sample t-test. **RESULTS:** There were no significant differences in mean changes in FFA concentrations between genders at day 0. During day 29 females had greater (p=0.016) mean increase in FFA concentration from pre to 30 min post ED ingestion when compared to males. However, no significant differences in glycerol changes were observed between sexes during both testing sessions. There were also no significant differences between genders for changes in REE during both testing sessions. Interestingly, males did experience a significantly greater decrease in %BF over the 28 d study compared to the female group (mean \pm SD: -1.4 \pm 2.1 % fat; 0.2 \pm 1.0, respectively; p=0.009). **CONCLUSIONS:** This study demonstrates a differential phenotypic response to the prolonged ingestion of a commercial energy drink despite the similar patterns of fatty acid mobilization (i.e., lipolysis) between sexes throughout the intervention period. Future research should elucidate plausible mechanisms responsible for the gender-dependent body composition responses to consuming the supplement of interest.

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16.

EFFECTIVENESS OF NANOSCALE L-STEREIOISOMER AND D-STEREIOISOMER SEMI-CONDUCTORS ON MUSCULAR STRENGTH AND ENDURANCE

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Recently developed energy patches containing liquid crystal, semi-conductors derived from L-stereoisomers and D-stereoisomers allegedly resonate at frequencies in unison with biomolecules in the cells thus signaling specific metabolic pathways. According to the manufacturers the technology uses bioelectric stimulation produced by specific electrical frequencies in the body's magnetic field. The induced electron flow allegedly assists in recruiting calcium ions into the muscle fiber, thereby increasing muscle fiber recruitment during contraction. The manufacturers of these patches claim that significant improvement ($\geq 10\%$) in strength is possible. **Purpose:** To compare the efficacy of energy and placebo patches on muscular strength and endurance in collegiate varsity football players. **Methods:** Following a 5-min warm-up, 18 college varsity football players (age= 20.37 ± 1.24 yrs.; height= $169.91, \pm 7.44$ cm.; weight= 109.45 ± 19.85 kg.) were tested using a Biodex III isokinetic leg extension machine. Markers included peak torque, torque at .18 seconds, first third torque, last third torque and average peak torque as measured by 50 repetitions at $180 \text{ deg} \cdot \text{sec}^{-1}$. Participants were those in "skilled positions" and were not offensive or defensive linemen. The following week players were randomly assigned the energy or placebo patches. After placement of the patches on the participants by research assistants, the participants again completed a 5-min warm-up followed by identical pre-test protocol. Repeated measures ANOVAs were used to compare resultant data. **Results:** No significant differences were found between active and placebo patches for peak torque ($p=.74$), time to peak torque ($p=.52$), torque at .18 sec ($p=.84$), 1st third torque ($p=.93$), or last third torque ($p=.45$). **Conclusions:** The energy patches used in this study did not significantly alter performance in either muscle torque or endurance of the quadriceps as demonstrated by 50 knee extension repetitions. The manufacturers suggest that the energy patches simulate fat transport to the mitochondria aiding in the production of ATP resulting in a CHO sparing effect and contributing to greater endurance. Future research should focus on the efficacy of energy patches on longer term endurance activities.

17.

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

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PURPOSE: The purpose of this study was to determine the extent of muscular fatigue and reduction in performance due to a rigorous strength training protocol and to determine if Beta-hydroxy-Beta-methylbutyrate (HMB) is effective in curbing any reductions in performance. **METHODS:** Peak torque (PT) and Percent Decline of the quadriceps were examined using an isokinetic dynamometer. Thirteen apparently healthy college-aged male participants with prior weight training experience were randomly assigned supplementation with HMB (n=7; age = 22.29) or supplementation with placebo as a control (n=6; age = 22.00). Supplements were given to the participants for 10 days. Participants started supplementing 3 days prior to beginning the workouts and stopped supplementing 2 days after ending the workouts. Participants underwent pre-testing and post-testing on the isokinetic dynamometer. The isokinetic test involved 50 maximal leg extensions of the dominant leg. Following pre-testing the participants performed a lower body workout for 5 days designed to fatigue the quadriceps muscles. The workout involved 5 to 6 sets of high weight, low repetition strength training. Post-post testing was completed 3 days following completion of the strength training. **RESULTS:** There was no significant change in PT or Percent Decline following 5 days of the over-reaching strength training protocol for either group ($p>0.05$). **CONCLUSION:** HMB has been reported to aid in muscle recovery following strenuous exercise. Our results indicate no decline in PT or Percent Decline when HMB was supplemented during an over-reaching training protocol. Results of this study also indicate no significant decrease among the placebo group. It is possible that the training protocol did not allow for muscle exhaustion, thereby affecting the results. Also, the control group may have performed at a higher level than expected due to a placebo effect.

18.

ANALYSIS OF CRITICAL FACTORS OF HAMMER THROWERS

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Critical factors in the hammer throw event are velocity at release, angle at release, and height of release. Currently, European hammer throwers consistently out perform American throwers. Quantitative research pertaining to this has focused on small numbers of male hammer throwers. **PURPOSE:** This study attempted to reveal differences in critical release factors between male and female hammer throwers. We also determined differences between European and American hammer throwers based upon gender. **METHODS:** The performances of the top 16 male and female throwers at the 2003 World Athletic Final and the top 13 male and female throwers from the 2003 USA Track and Field Nationals were examined. Video was captured using three Canon 60 Hz cameras. DLT parameters were followed to bring the recorded video into the analysis stage of the study. The best throws of each athlete were digitized and analyzed using the Peak Motus 8.2 motion analysis system. **RESULTS:** Independent sample t-test revealed athlete mass ($p=0.00$), athlete height ($p=0.00$), distance thrown ($p=0.00$), release velocity ($p=0.06$)*, and release height ($p=0.05$) were different between male and female hammer throwers. Linear regression indicated that release height ($p=0.01$), release velocity ($p=0.06$)*, and total time ($p=0.04$) had an impact on the relationship between women hammer throwers from Europe and the United States. A relationship between release velocity ($p=0.00$) and release angle ($p=0.05$) were found to exist between the male hammer throwers from Europe and the United States. **CONCLUSIONS:** The sex differences between hammer throwers were not unexpected. Males are heavier, taller, and throw farther. European females are quicker across the ring and do have a higher release height that helps contribute to their domination over the American women. The critical factors that lead to continued European male success over the American males is greater release velocity and lower release angle.

19.

THE USE OF THE APRE PROTOCOL VS LINEAR PERIODIZATION FOR INCREASING BENCH PRESS STRENGTH IN COLLEGE ATHLETES

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PURPOSE: The purpose of this study was to see if the autoregulatory progressive resistance exercise protocol (APRE) was more or less effective than a traditional linear periodization protocol (LP) for improving absolute bench press strength (1RM) in Division One Football Players. **METHODS:** Twenty-four division one collegiate football players were divided into two groups who either followed an APRE protocol (n=12) or a LP protocol (n=12) during the six weeks of training sessions before spring practice sessions. The APRE training system allows athletes to progress at their own pace with two sets to failure. The repetitions performed with the given weight in the first set will determine an adjusted weight for the second set. The repetitions performed with the adjusted weight will determine the weight used for the following week. Thus, unlike traditional LP protocols there is no set increase for intensity that the athlete must follow from week to week. Following 6 weeks of training, a new 1RM Bench Press was established and improvements in total bench press strength were compared between the APRE and LP protocol groups. **RESULTS:** Data are reported as means \pm SD. The mean height and weight of the athletes was $1.87 \pm .07$ m and 107.72 ± 22.27 kg, respectively. Athletes had been involved with the program 2.65 ± 0.8 years. The APRE group demonstrated a significant increase in their bench press 1RM (9.54 ± 10.72 kg) over 6 weeks compared to the LP group (0.00 ± 5.04 kg) ($p=0.12$) **CONCLUSION:** These results indicate that the APRE was more effective than the LP means of programming in increasing the bench press over a period of six weeks.

Supported by the University of Missouri Strength and Conditioning

20.

BONE MINERAL DENSITY AND PERCENT BODY FAT OF CAREGIVERS AND NON-CAREGIVERS

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PURPOSE: In the U.S., over 20% of the adult population provides informal care to another adult (caregiver), often an aging parent or spouse. With the graying of America, it is expected that these numbers will increase in the near future. Caregiving is commonly associated with increased burden and stress, resulting in negative health consequences. Long-term exposure to stress may result in dysregulation of the release of cortisol. One form of cortisol dysregulation is a blunting of the awakening response. The broader health impact of repeated exposure to cortisol and dysregulation of its release has been linked to obesity and osteoporosis. There has been limited research on cortisol levels and body composition in caregivers. There is some research that suggests cortisol levels are higher in caregivers. Based on the current research, the hypothesis was that caregivers will have a blunted awakening response (AW), higher percent body fat (BF%), and lower bone mineral density (BMD) than non-caregivers. The purpose of this study was to compare AW, BF%, and BMD between female caregivers and non-caregivers.

METHODS: Thirty-one, 12 caregivers and 19 non-caregivers, females were recruited to participate in this study. Saliva samples were taken over two work days at the time of awakening and 45 minutes after awakening. Cortisol levels were measured by ELISA from the saliva. The difference between the two samples was calculated as the response of cortisol to awakening (AW). Total body bone mineral density (BMD) and percent body fat (BF%) were assessed using dual-energy x-ray absorptiometry (DXA). A MANOVA was conducted to compare AW, BMD, and BF% between caregivers and non-caregivers ($\alpha = .10$). **RESULTS:** The results indicate a significant multivariate difference between caregiving groups ($p < .10$). Follow-up analyses indicate that caregivers have significantly higher BMD than non-caregivers ($p = .04$). There was a trend toward higher BF% among caregivers ($p = .06$) and no difference in AW between the group ($p = .19$). **CONCLUSION:** These results do not support the hypothesis that caregivers have a blunted awakening response and lower bone mineral density. There is, however, a trend toward higher percent body fat among caregivers as hypothesized. Based on these results, we recommend that further study is needed to determine health implications of giving care and the role that cortisol may play in overall health.

21.

THE EFFECTS OF FORSKOLIN ON THE INTRACELLULAR SIGNALING PATHWAYS OF PROTEIN SYNTHESIS

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Previous research in tissues other than skeletal muscle has shown that forskolin (FSK) is capable of both stimulating and inhibiting the intracellular signaling pathway of protein synthesis. **Purpose:** The purpose of this investigation was to determine if FSK administration had an effect on the various elements of the Akt/mTOR pathway of protein synthesis. **Methods:** Ten (n = 10) healthy, young (21.6 ± 1.3yrs), non-obese (BMI = 25.5 ± 3.5kg/m²), recreationally active males were selected for participation. Following an eight-hr fast, two muscle biopsies of the *vastus lateralis* were performed; samples were sectioned and exposed to four *in vitro* treatments conditions: basal, FSK, insulin (INS), FSK+INS in an incubator/shaker under gas (60-min @ 35°C, 95%O₂ / 5%CO₂). All samples were analyzed for total and phosphorylated levels of Akt, mTOR, p70s6k, and 4EBP-1. **Results:** A Kruskal-Wallis test revealed there were differences ($p \leq 0.05$) in Akt phosphorylation between the basal and INS samples, FSK and INS samples, as well as between the FSK and FSK+INS samples. There were also differences ($p \leq 0.05$) in the ratio of phosphorylated Akt to total Akt (P:T) between the basal and INS samples and the FSK and INS samples. However, there were no significant differences in mTOR, p70s6k, and 4EBP-1 activation as a result of any stimuli, even compared to basal samples. **Conclusion:** To our knowledge this is the first study to explore the effects of *in vitro* FSK exposure on the Akt/mTOR pathway. The data indicate that when compared to basal and INS samples, FSK was a potential limiter of Akt phosphorylation, although there was no change in mTOR, p70s6k or 4EBP-1 phosphorylation.

22.

BLOOD GLUCOSE LEVEL EFFECTS DUE TO CAFFEINE, GLUCOSE, ASPARTAME, AND SUCRALOSE

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Caffeine (CF), glucose (GL), aspartame (AS), and sucralose (SU) are prevalent in almost all beverages. However, little is known about how the two artificial sweeteners affect blood glucose levels (BGL). **PURPOSE:** The purpose of this study was to determine how CF, GL, AS, and SU affect human BGL over the course of one-hour post ingestion. **METHODS:** Forty undergraduate students at Truman State University were recruited and divided into four testing groups (TG) of 10 for ease and accuracy of testing. Each TG was required to attend five different sessions—one for each mixture. During each session, participants were entirely sedentary from arrival until the BGL testing was completed. Participants' BGLs were monitored using a blood glucose meter (BGM) (One-Touch UltraSmart meter). Each participant had an initial BGL reading taken (baseline) prior to ingestion and then six more readings taken (once every 10 minutes) after the solution was ingested. All participants at a given session drank the same solution, however, each session they received a different solution (in random order) of 8 fluid ounces of either distilled water (DW); CF (150mg); GL (50g); AS (1000mg); or SU (1000mg). **RESULTS:** The control session with DW showed little change in BGL; the baseline BGL value was 82 mg/dl (BV=82); the ending BGL value was 82 mg/dl (EV=82); the average BGL was 82.57 mg/dl (AV=82.57); and the average standard deviation of each participants' seven BGL values was 1.90 (SD=1.90). The CF (150mg) session produced mixed results, with BGL dropping instead of rising; (BV=93; EV=89; AV=92.4; SD=4.1). The GL (50g) session showed an increase in BGLs (BV=96; EV=121; AV=128.7; SD=23.8). The AS session showed little change, which was expected; (BV=92; EV=91; AV=91.1; SD=3.0). Finally, the SU session decreased BGL; (BV=95.5; EV=88.5; AV=99.9; SD=7.8). **CONCLUSIONS:** The preliminary data produced expected changes in 4 of the drink mixes: 1) the DW (control) session—(zero to minimal BGL change); 2) the GL session—(significant BGL increase); 3) the AS session—(minimal BGL change); and 4) the SU session—(small decrease in BGL). As additional data is collected during this study, the final results of the effect of the artificial sweeteners may differ from preliminary indications. Consumers should become aware that low or no-calorie sweeteners can affect their BGL which may have a significant physiological effect.

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23.

MECHANISM OF INCREASED BONE MINERAL DENSITY IN RESISTANCE-TRAINED MALE ATHLETES COMPARED WITH RUNNERS AND CYCLISTS

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Resistance-trained athletes have significantly greater bone mineral density (BMD) than endurance trained athletes. However, the mechanism by which bone mass is increased with resistance training is not completely understood. **PURPOSE:** To determine if hormones secreted in response to resistance exercise mediate differences in bone mineral density between resistance- and endurance-trained male recreational athletes.

METHODS: Cyclists (CYCLE; n=19), runners (RUN; n=10), and resistance-trained males (RT; n=13), aged 19-45 y, completed 7-day training logs and diet records and the Historical Leisure Time Physical Activity Questionnaire. Whole body and regional bone mineral content (BMC) and BMD, and body composition were assessed using dual x-ray absorptiometry (DXA). Bone formation (osteocalcin, OC; bone alkaline phosphatase, BAP) and resorption markers (C terminal telopeptide of type I collagen, CTX), and hormones (testosterone, T; sex hormone binding globulin, SHBG; DHEA; intact parathyroid hormone; 25OH vitamin D; insulin-like growth factor-I, IGF-I; cortisol; estradiol; and free triiodothyronine) were measured in fasting serum samples. **RESULTS:** RT athletes had significantly greater body weight, lean body mass, whole body and regional BMC than CYCLE and RUN athletes; percent body fat did not differ among groups. By design, current bone loading scores were higher in the RUN and RT groups compared with the CYCLE group. Spine BMD was lower in CYCLE compared with RUN and RT. Bone turnover markers did not differ among groups. Serum BAP was positively correlated with whole body and regional BMD. IGF-I and the free androgen index (FAI) were significantly greater in the RT athletes and cortisol tended to be higher in the CYCLE and RUN groups ($p=0.06$). Multiple linear regression analysis demonstrated that differences in BMD among groups were due to differences in body weight and not to altered hormones or bone turnover markers. **CONCLUSION:** Resistance exercise is associated with increased whole body and regional BMC. Moreover, the beneficial long-term effects of resistance exercise on bone appear to be primarily due to increased body weight.

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24.

A COMPARISON OF PRE-SEASON AND MID-SEASON PEAK TORQUE AND PERCENT DECLINE IN COLLEGE WRESTLERS.

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PURPOSE: The purpose of this study is to determine if there is a difference between pre-season and mid-season peak torque (PT) and percent decline (PD) in college wrestlers. **METHODS:** Nine Division I collegiate wrestlers volunteered for participation in this study. The PT and PD of the quadriceps femoris were measured at 180 °/sec using a Biodex II isokinetic machine. The subjects completed fifty maximal leg extensions at 180 °/sec. Peak torque was recorded as the greatest amount of torque produced during any one repetition and PD was determined by taking the initial PT minus the final PT divided by the initial PT. A t-test was used to determine if significant ($p < 0.05$) changes occurred in these measures between pre and mid-season. **RESULTS:** The results of the study indicated that there was no significant ($p > 0.05$) change in PT or PD from pre-season to mid-season. **CONCLUSIONS:** A wrestling season is physically demanding on the wrestlers. They are constantly trying to maintain wrestling weights while competing in a physically taxing sport. In the present study the wrestlers were participating in two-a-day practices during the mid-season test time, therefore we might have expected to see an increase in PD or a possible decrease in PT, however, in the the wrestlers were able to maintain pre-season levels in both measured variables. This information is useful to the coaches and conditioning staff who try to limit any decline in muscle strength and endurance.

25.

HEAT SHOCK AND MARKERS OF SKELETAL MUSCLE REGENERATION FOLLOWING AN ACUTE BOUT OF ECCENTRIC CONTRACTIONS.

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Heat shock proteins (Hsp's) are molecular chaperones that are critical for the maintenance of cellular homeostasis and have been shown to protect cells and tissues from a large variety of protein damaging insults. While Hsp's have been implicated in reducing damage and preventing apoptosis little information exists on Hsp's role in muscle regeneration and hypertrophy. **PURPOSE:** To determine if a single heat shock (HS) treatment influences markers of muscle hypertrophy. **METHODS:** Wistar rats were randomized into two groups: control (35.4°C) or heat stressed (41°C, 20 min) 48 hours prior to a bout of downhill treadmill running (18 m/min, -16% grade). Soleus (Sol), white vastus lateralis (VLW) and red vastus lateralis (VLR) were assessed for total protein content, muscle protein concentration, as well as for Hsp70, Hsp27, Akt, and p70s6k 150 min following exercise. **RESULTS:** Heat shock significantly increased core temperature and Hsp content in skeletal muscle. No significant changes were found for total protein content or muscle protein concentration between groups. Heat shock led to reduced phosphorylation of Akt in the Sol and VLR slow muscles; however there were no differences in phosphorylation of the hypertrophic protein p70s6k. **CONCLUSION:** It appears that the induction of Hsp's do not impair the acute hypertrophic signaling response in skeletal muscle as measured by p70s6k. Further, the induction of Hsp's may reduce the phosphorylation of Akt following eccentric muscle actions in slow twitch muscles.

26.

ACUTE STRETCHING DOES NOT ALTER MUSCULAR PERFORMANCE IN THE HAMSTRINGS: ANALYSIS OF THREE STRETCHING TECHNIQUES

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Many researchers have investigated the effects of acute stretching on performance and have reported confounding results. Recently, stretching immediately prior to activity has come under question because of the negative influence it can have on muscle force output and the increased risk of injury. Physically active people are now faced with this paradox between common practice and recent research findings. **PURPOSE:** The purpose of this study was to analyze the effects of three stretching techniques on maximal strength performance of the hamstrings. **METHODS:** The study used a randomized, repeated measures, counterbalanced, within subjects experimental design. Forty healthy subjects volunteered for participation (males $n = 20$; mean age 22.35 ± 2.73 yrs; height = 177.39 ± 6.96 cm; weight = 84.98 ± 15.07 kg; females $n = 20$; mean age = 24.05 ± 10.87 yrs; height = 164.69 ± 7.88 cm; weight = 67.42 ± 11.83 kg). After five minutes of warm-up on a stationary bike at 50 W, subjects were tested for baseline isokinetic strength of knee flexion at $60^\circ \cdot s^{-1}$ and $180^\circ \cdot s^{-1}$ (Biodex System II dynamometer) in a prone gravity dependent position. Subjects were randomly assigned to one of four stretching groups with ten subjects assigned to each group ($n=10$; 5 males, 5 females); static (SS), ballistic (BS), Proprioceptive Neuromuscular Facilitation (PNF), and a no stretch control group (NS). After receiving the stretching intervention, strength of the hamstring muscles was reassessed at both speeds. Assessment of muscular performance consisted of the calculation of gain scores in mean peak torque (PT), peak torque – to body weight ratio (PTBW), total work (TW), and average power (AP) at each test speed. Statistical analyses consisted of 4x2 repeated measures ANOVA (stretch x time) for both isokinetic speeds. Independent t-tests were calculated to further observe between group differences. A significance level of $p \leq 0.05$ was used for all analyses. **RESULTS:** There were no significant differences observed in gain scores from the pre-stretch strength measures compared to the post-stretch measures for all stretching groups at both $60^\circ \cdot s^{-1}$ and $180^\circ \cdot s^{-1}$. There were also no significant differences in muscular output between stretching groups. **CONCLUSIONS:** Our data indicates that acute stretching does not negatively affect muscular performance. Varied stretching techniques can be used prior to performance without significant decreases in strength occurring. This contradicts other research where decreases in muscular performance after acute stretching have been noted. Future research is needed to identify if acute stretching is a safe activity to do during warm-up without hindering performance.

27.

A COMPARISON OF PRE-SEASON AND POST-SEASON SHOULDER STRENGTH IN COLLEGIATE SOFTBALL PLAYERS

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Normative values have been discussed in the literature relating to the strength ratio that occurs in the shoulder between the internal and external rotator muscles. This ratio has mostly been discussed in professional baseball players, particularly pitchers. Little research has identified ratios of position players, particularly those participating in softball. Identifying these ratios and changes due to competition will lead to better strengthening and in turn, better injury prevention. **Purpose:** To identify changes in rotator cuff strength over the course of a competitive softball season. **Methods:** Isokinetic tests were performed on the Biodex II System at pre- and post-season intervals for 12 collegiate softball athletes. Each subject performed concentric ($90^{\circ}\cdot s^{-1}$, $240^{\circ}\cdot s^{-1}$, & $450^{\circ}\cdot s^{-1}$) and eccentric ($90^{\circ}\cdot s^{-1}$) movements in internal and external rotation for both dominant and non-dominant upper extremities. Multivariate analyses were used on data sets after compilation. **Results:** A significant difference ($p = 0.030$) was found from pre-season to post-season with eccentric external rotation specifically in the non-dominant shoulder average power. No other significance was found with concentric or eccentric contractions in internal or external rotation of either shoulder. **Conclusions:** These results indicate a decrease in eccentric external rotation strength of the non-dominant shoulder from pre-season to post-season. It was also noted that all significant changes resulted in the non-dominant upper extremity. Thus suggesting the amount of use during the competitive season of the dominant upper extremity plays an integral role in strength maintenance. Future research should focus on relationships of the ratios of external and internal rotation strength with injury rates.

28.

EFFECTIVENESS OF LINEN TAPE AND SPECIALIZED TAPING MATERIALS IN REDUCING ANKLE JOINT MOTION AFTER EXERCISE

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Prophylactic ankle taping has been considered the mainstay of ankle injury prevention and has been used at all levels of competitive sports. Ankle taping is effective in restricting maximal static range of motion before exercise, but its effectiveness in limiting range of motion has been found to decrease after exercise. Perspiration and movement over time have been explained as factors for tape loosening during wear. New materials have been introduced that claim to hold up against sweat and remain supportive throughout training sessions. **PURPOSE:** The purpose of this research is to examine differences in range of motion at the ankle joint between linen tape and combinations of linen tape with specialized taping materials over the course of bouts of exercise.

METHODS: Nine males ($n = 9$; age 20.77 ± 2.5 yrs; height 179.33 ± 6.83 cm; weight 90.31 ± 15.93 kg) each had their right ankle taped on three separate occasions using each of three taping combinations; foam underwrap with linen tape (ULT), self-adherent flexible underwrap with linen tape (FLT), and self-adherent flexible underwrap with a self-adherent cohesive tape (FCT). The order in which the subjects received a specific taping combination was counterbalanced. Ankle range of motion (inversion, eversion, dorsiflexion, and plantarflexion) was assessed using an electricgoniometer (BIOPAC Systems, TSD130B, Goleta, CA). Ankle motion measurements were taken immediately after tape application, after 10 minutes of treadmill running at 6 mph with zero grade, and after 5 additional minutes of exercise on a Pro Fitter 3D Cross Trainer (Fitter International Inc., Calgary, Alberta). Each movement was measured passively three times by the same examiner, and all taping techniques were completed by the same individual following the taping protocol by Perrin (Athletic Taping and Bracing; Human Kinetics: Champaign, IL). Analysis consisted of repeated measures ANOVA to observe within group and between group differences. An alpha level of $p \leq 0.05$ was considered statistically significant for all analyses. **RESULTS:** No significant differences were observed for any of the motions analyzed across time. In addition, we also observed no significant differences in motions between the taping combination groups across time. **CONCLUSIONS:** Our results indicate that the linen tape provides as much stability as the specialized taping materials over 15 minutes of exercise. Regardless of the taping combination, support remained the same throughout exercise. This disagrees with some research in that tape loosens with exercise. More research should be done investigating the stability of these taping combinations over longer periods of time.

29.

EFFECTS OF HYDRAULIC RESISTANCE CIRCUIT TRAINING ON BONE MINERAL DENSITY IN POST-MENOPAUSAL WOMEN

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Osteoporosis is a serious health issue affecting women and men disproportionately. Postmenopausal women are at the greatest risk of developing the disease. Currently, the idea of utilizing exercise as an effective tool in treating or preventing osteoporosis is incomplete. **Purpose:** The purpose of this study was to examine the effect of hydraulic resistance circuit training on whole body bone mineral density (BMD) in postmenopausal women. **Methods:** Whole body BMD was measured using dual energy x-ray absorptiometry (DEXA) (Hologic QDR 4500) at baseline and 12 weeks. Ten subjects were randomly assigned to either an exercise group (EG) (n=5; age=60.8 ± 8.9 yr) or control group (CG) (n=5; age=52.2 ± 1.5). The EG were required to exercise 40 minutes per day three days per week for 12 weeks. The CG was instructed to continue their normal physical activity habits. The exercise circuit consisted of nine hydraulic resistance exercise machines that targeted major muscle groups as well as five jogging pads and four cycle ergometers of which were interspersed in a circular pattern. Each station was utilized for 40 seconds at which time a queue was sounded alerting the subjects to advance to the next station. Resistance was controlled by settings on the hydraulic machines (1-6; 1=least resistance 6=highest resistance) which control the diameter of the aperture responsible for allowing hydraulic fluid to pass. Initially, the hydraulic machines were set at the # 2 setting (weeks 1-4) and increased to settings 3 (weeks 5-8) and 4 (weeks 9-12) as time progressed. **Results:** A repeated measures ANOVA revealed a group x time interaction (p<0.05), indicating a significant increase in whole body BMD (baseline BMD = 1.084 ± .065, post BMD = 1.105 ± .072) in the EG. **Conclusion:** The results of this analysis indicate that hydraulic resistance circuit training was effective in increasing BMD and may be advantageous for post-menopausal women at risk for osteoporosis.

