

SOUTHWEST CHAPTER
AMERICAN COLLEGE OF SPORTS
MEDICINE

2007 ANNUAL MEETING



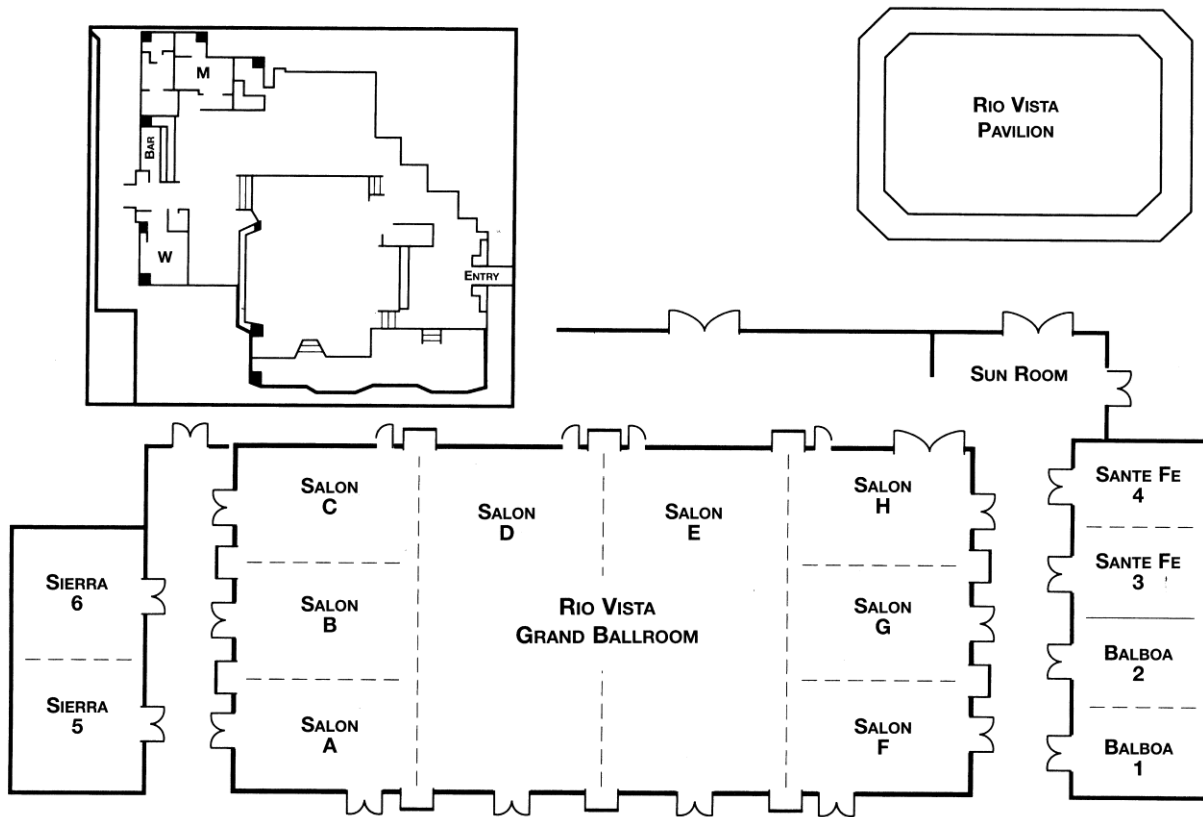
November 9-10, 2007

Marriott Mission Valley
San Diego, California

Jointly sponsored by the American College of Sports Medicine
and the Southwest Chapter of the American College of Sports Medicine

Marriott Mission Valley

Meeting and Banquet Facilities



Welcome to the

27th Annual Meeting

of the

Southwest Regional Chapter

of the

**AMERICAN COLLEGE
of SPORTS MEDICINE _{SM}**

November 9-10, 2007

**Marriott Mission Valley
San Diego, California**

**Jointly sponsored by the American College of Sports
Medicine and the Southwest Chapter of the
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FRIDAY, 9 NOVEMBER 2007, continued

Colloquium **1:30 pm – 2:45 pm** **Sierra 5/6**

Helping Overweight Pre-school Children and Their Overweight Mothers prevent Childhood Obesity

Nora Constantino, Ph.D., University of Nevada, Reno

Sponsored by New-Lifestyles, Inc.

#1 in Pedometers and Physical Activity Programs

Colloquium **1:30 pm – 2:45 pm** **Salon D**

Sport Nutrition: Training Tips and Tools

Linda Houtkooper, Ph.D., R.D., FACSM, University of Arizona

Melanie Hingle, MPH, P.D., University of Arizona

Student Research Award **3:00 pm – 4:30 pm** **Salon A/B**

Moderator: Steven Hawkins, Ph.D., FACSM, California Lutheran University

3:00 **Calcium/calmodulin-dependent protein kinase kinase regulates fatty acid uptake and oxidation during moderate intensity muscle contraction in part via activation of AMP-activated protein kinase.** Abbott, MJ and Turcotte, LP
Department of Biological Sciences, University of Southern California

3:15 **The Effects of Odor on Weightlifting in Men and Women**
Drummond, K.M., Plato, P. and Kao, J.
Department of Kinesiology, San Jose State University, San Jose, CA

3:30 **Backpack Straps Significantly Decrease Brachial Artery Blood Flow**
Neuschwander TB, Macias BR, and Hargens AR
Department of Orthopaedic Surgery, University of California-San Diego

3:45 **Validity of a Dietary Calcium Rapid Assessment Method Modified to Include Supplements for Active College Students.** Henry, M. B. and Almstedt, H. C.
Human Performance Laboratory, Department of Natural Science, Loyola Marymount University, Los Angeles, CA

4:00 **Aerobic Exercise Reverses High Fat Diet-Induced Impairments on the CAP/CBL Pathway in Skeletal Muscle.** Saito, M., S. J. Lessard, D. A. Rivas, D. W. Reeder, J. A. Hawley, B. B. Yaspelkis III. Exercise Biochemistry Laboratory, Department of Kinesiology, California State University Northridge, Northridge, CA

FRIDAY, 9 NOVEMBER 2007, continued

Symposium

3:00 pm – 4:30 pm

Salon D

Role of Physical Activity and Bone Loading on Bone Mineral Density

Moderator: Marta Van Loan, Ph.D., FACSM, University of California, Davis

3:00 – 3:30 *Methods to Score Physical Activity for Bone Affects*
Marta Van Loan, Ph. D., FACSM, University of California, Davis

3:30 – 4:00 *Physical Activity, Bone Loading, and Peak Bone Mass in Young Adults*
Victoria Jaque, Ph.D., California State University, Northridge

4:00 – 4:30 *Physical Activity, Bone Loading and Bone Mineral Density in Early Post-menopausal Women*
Kristine Shedd, Ph.D., University of California, Davis

Colloquium

3:00 pm – 4:15 pm

Salon E

Gatorade Sports Science Institute Special Session

Exercise and the Brain: Secret to Optimal Performance

J. Mark Davis, Ph.D., FACSM, University of South Carolina



SOCIAL EVENT

4:30 -7:00 PM

Rio Vista Pavilion

Poster Presentations

No Host Wine/ Cheese Reception

SATURDAY, 10 NOVEMBER 2007

Registration **Rio Vista Grand Ballroom Foyer** **7:30 am - 11:00 am**

Panel Discussion **8:00 am – 9:30 am** **Balboa 1/2**

Find Your Passion and Choose Your Path: Diverse Career Opportunities for Exercise Science Graduates

Moderator: Robyn Stuhr, M.A., American Council on Exercise

The Exercise Physiologist in Health Care

Robyn Stuhr, M.A., American Council on Exercise

Sports Performance: Educate and Motivate

Todd Durkin, M.S., Todd Durkin Enterprises

Making a Difference in Corporate Wellness

David Beadle, M.S., Qualcomm Human Resources

Consulting and Educational Opportunities

Fabio Comana, M.A., Consultant

Symposium **8:00 am – 9:30 am** **Sierra 5/6**

Sports Medicine and the Adolescent Athlete: Current Controversies and Challenges

Moderator: Sandra Hoffman, M.D., FACSM, Idaho State University

8:00 – 8:30 ***Update on the Preparticipation Physical Examination: Controversies***
Robert Sallis, M.D., FACSM, Kaiser Permanente of Southern California

8:30 – 9:00 ***Common Adolescent Sports Injuries: Challenges***
Sandra Hoffman, M.D., FACSM, Idaho State University

9:00 – 9:30 ***The Primary Care Sports Medicine Physician and the Adolescent Athlete: Controversies and Challenges***
Rosemary Agostini, M.D., FACSM, Virginia Mason Medical Center

SATURDAY, 10 NOVEMBER 2007, continued

Symposium

9:45 am – 11:15 am

Sierra 5/6

Advances in Resistance Training Research

Moderator: Brent Alvar, Ph.D., Arizona State University

9:45 – 10:15 *Health Benefits and Occupational Necessity for Resistance Training*

Brent Alvar, Ph.D., Arizona State University

10:15 – 10:45 *Applications of Whole Body Vibration for Improvements in Health and Performance*

Alfonso Jimenez, Ph.D., European University of Madrid

10:45 – 11:15 *Variable Velocity Training*

Lee Brown, Ph.D., FACSM, California State University, Fullerton

Symposium

9:45 am – 11:15 am

Santa Fe 3/4

Endothelial Function: Exercise Training, Aging, and Disease

Moderator: J. David Symons, University of Utah

9:45 – 10:15 *Vascular Function: Exercise, Aging, and Oxidative Stress*

Russell Richardson, Ph.D., University of California, San Diego

10:15 – 10:45 *Endothelial Function: Is It Improved by Exercise Training*

Jeffrey Jasperse, Ph.D., Pepperdine University

10:45 – 11:15 *Vascular Function: Myocardial Ischemia and Type 2 Diabetes*

J. David Symons, Ph.D., University of Utah

SATURDAY, 10 NOVEMBER 2007, continued

Colloquium

9:45 am – 11:00 am

Salon F/G

From Antiquity to the Genome: Enduring Contributions in Exercise Physiology

Charles Tipton, Ph.D., FACSM, University of Arizona

Sponsored by AEI Technologies

General Session and Luncheon

11:30 – 1:30

Salon A/B/C/D/E

Moderator: Ben B. Yaspelkis, III, Ph.D., President, SWACSM
California State University - Northridge

Student Awards

Recognition of Host School: Pepperdine University

Business Meeting

Founders Lecture

High and Dry: Tales from the Edge of a Normal Distribution

Larry Armstrong, Ph.D., FACSM
University of Connecticut

SOUTHWEST ACSM RECOGNITION AWARD

1982	D.B. Dill
1983	Albert Behnke
1984	Steve Horvath
1985	Fred Kasch
1986	John Boyer
1987	Herbert de Vries
1988	Charles Tipton
1989	G. Lawrence Rarick
1990	Lawrence Morehouse
1991	William Haskell
1992	Ralph Paffenbarger
1993	Franklin Henry
1994	George Brooks
1995	James Skinner
1996	Christine Wells
1997	Lawrence Golding
1998	Ken Baldwin
1999	Robert Conlee
2000	Gail Butterfield
2001	R. James Barnard
2002	Gene Adams
2003	Vivian Heyward
2004	Fred Roby
2005	Marta Van Loan
2006	Jack Wilmore
2007	Larry Verity



**Southwest Regional Chapter of the
AMERICAN COLLEGE
of SPORTS MEDICINE
2007 Administrative Council Members**

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<i>President-Elect</i>	Barbara Ainsworth, Ph.D., FACSM
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<i>Member-at-Large</i>	John Mercer, Ph.D., FACSM
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<i>Member-at-Large</i>	Felicia Greer, Ph.D.
<i>Regional Chapter Representative</i>	Marialice Kern, Ph.D., FACSM
<i>Student Representative</i>	Haim Mamane
<i>Newsletter Editor</i>	J. Richard Coast, Ph.D., FACSM.
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2007 SWACSM

Annual Meeting

ABSTRACTS

**Student Research Award
Poster Presentations**



STUDENT RESEARCH AWARD

1. Calcium/calmodulin-dependent protein kinase kinase regulates fatty acid uptake and oxidation during moderate intensity muscle contraction in part via activation of AMP-activated protein kinase

Abbott, MJ and Turcotte, LP

Department of Biological Sciences, University of Southern California

Calcium/calmodulin-dependent protein kinase kinase (CaMKK) and AMP-activated protein kinase (AMPK) have been individually implicated in the regulation of muscle substrate metabolism during exercise. The purpose of this study was to determine whether muscle CaMKK β is involved in the regulation of FA metabolism during muscle contraction and if it is involved, whether it does so independently of AMPK. Rat hindquarters were perfused at rest with (n=14) or without (n=16) 3mM caffeine or during electrical stimulation of moderate intensity (n=14). For each condition, rats were perfused in the presence or absence of 5 μ M STO-609, a potent inhibitor of CaMKK β . For matched FA delivery, FA uptake and oxidation increased ($P<0.05$) by 64 and 72% during caffeine treatment and 65 and 126% during muscle contraction. STO-609 had no effect ($P>0.05$) on FA kinetics at rest. However, STO-609 completely abolished ($P<0.05$) caffeine- and contraction-induced FA uptake and oxidation. FAT/CD36 plasma membrane content increased ($P<0.05$) by 28 and 59% during caffeine treatment and muscle contraction respectively, and STO-609 prevented these increases ($P<0.05$). CaMKK β and CaMKII activity was significantly increased ($P<0.05$) by caffeine treatment (102 & 96%) and muscle contraction (136 & 69%). STO-609 did not affect CaMKK β and CaMKII activity at rest but it prevented caffeine- and contraction-induced increases in activity. Caffeine and muscle contraction resulted in a 240% and 496% increase ($P<0.05$) in AMPK α_2 activity respectively. STO-609 resulted in a decrease ($P<0.05$) in AMPK α_2 activity by 54 and 52% during caffeine treatment and muscle contraction, respectively. These results demonstrate the critical importance of calcium-dependent signaling via CaMKK β activation in the regulation of FA uptake and oxidation during moderate intensity muscle contraction and provide evidence for CaMKK β -induced stimulation of AMPK in calcium-dependent signaling.

3. Backpack Straps Significantly Decrease Brachial Artery Blood Flow

Neuschwander TB, Macias BR, and Hargens AR

Department of Orthopaedic Surgery, University of California-San Diego

Millions of children and adults wear heavy backpacks every day at work and school. We hypothesize that brachial artery blood flow will decrease while wearing a loaded backpack. Eight healthy volunteers (6 men, 2 women, age range: 18 – 30 years) had the right brachial artery measured with ultrasound Doppler. Time-averaged velocity and brachial artery cross-sectional area were calculated using Philips software. Following baseline measurement, a backpack loaded with 12kg of books was placed on the subject's shoulders in the standard 2-strap condition for 10 min, after which brachial artery flow velocity and cross-sectional area measurements were repeated. Following an appropriate rest interval, the experiment was repeated with subjects donning the pack using only the right shoulder strap (so-called "free style"). A repeated measures ANOVA was used for statistical analysis; significance was set at $p<0.05$. Blood flow in both conditions decreased significantly ($p<0.0002$, repeated measures ANOVA), and although blood flow decreased more with the one-strap "free style" condition than with two straps, the difference was not significant ($p=0.1$). The mechanism of diminished blood flow is likely due to strap compression of the axillary vein, resulting in upper extremity venous congestion. Decreased blood flow to the arm while wearing a backpack may impair motor function in military personnel, rescue workers, firefighters, and school children.

2. The Effects of Odor on Weightlifting in Men and Women

Drummond, K.M., Plato, P. and Kao, J.

Department of Kinesiology, San Jose State University, San Jose, CA

Aromatherapy and olfactory research has been growing over the past two decades. New research is now focusing on the benefits of essential oils as an aid to athletic performance. These studies show a relationship between performance and psychological changes in response to the odor, such as increased motivation and vigor. Although research has shown how odors can affect performance at a psychological level, evidence linking physiological changes has yet to be fully discovered. The current study investigated the effects of peppermint and dimethyl sulfide on elbow flexion in men and women. Methods: Thirty men and women performed biceps curls to fatigue under three odor conditions: peppermint, dimethyl sulfide and no odor control. Electromyography was used to measure muscle activation, and the Profile of Mood States, and NASA-Task Load Index were used to measure psychological responses (or mood). Results: Dimethyl sulfide caused significant increases in resting heart rate, but had no significant effect on muscle activation. It also increased total mood disturbance, tension, temporal demand, frustration, and anger. Peppermint odor caused participants to feel less depressed, more vigorous, and, for women, less fatigued. There were no significant differences in ratings of perceived exertion (RPE) or the number of repetitions performed between conditions. Conclusions: Peppermint odor had a positive effect on mood during physical performance, but did not improve performance. Although there was no significant difference in muscle activation between odor conditions, there were changes noted in EMG activity for several participants. These differences seemed inconsistent and were not associated with specific odor conditions, RPE rating, increased repetitions performed, or elevated mood. This suggests that individual subjective feelings may have caused increases in muscle activation. Further research is needed on the mechanisms behind changes in performance due to the presence of an odor and how subjective feelings may alter performance.

4. Validity of a Dietary Calcium Rapid Assessment Method Modified to Include Supplements for Active College Students

Henry, M. B. and Almstedt, H. C.

Human Performance Laboratory, Department of Natural Science, Loyola Marymount University, Los Angeles, CA

Dietary calcium intake is an important factor in determining bone health. The rapid assessment method (RAM) for evaluating calcium intake has frequently been used by others. **Purpose:** Our aim was to evaluate the validity of daily calcium intake assessed via a newly modified LMU RAM compared with a three-day diet record (3DR). The usefulness of the LMU RAM with and without including dietary supplements was also evaluated. **Methods:** 47 participants (n = 31 women, 16 men) between the ages of 18 and 25, were recruited from multiple sources at Loyola Marymount University (LMU). Subjects completed the LMU RAM questionnaire and were instructed to record all food and beverage consumption for 3 days; 2 weekdays and 1 weekend day for a 3DR. **Results:** Mean calcium intake calculated was 935 mg \pm 420 mg and 1085 mg \pm 573 mg, for the LMU RAM and 3DR respectively. When calculating calcium intake via the LMU RAM without considering supplement use, calcium intake decreased 19%, to 763 \pm 290 mg per day. A strong positive correlation (r) was found between calcium intake measured with the LMU RAM and 3DRs ($r(45) = 0.854$, $p < 0.01$). Intraclass coefficients (ICC) revealed that agreement between the two instruments was good (ICC = 0.76, $df = 45$, $p < 0.01$). **Conclusions:** We have found the LMU RAM to be a valid tool which can be used to measure calcium intake in college-age subjects. The accuracy of this instrument improved by including assessment of dietary supplement sources of calcium. In order to use a rapid assessment questionnaire for calcium intake in your own population, modifications will need to be made to fit your subject pool. However, we believe the LMU RAM is applicable for use in the western United States college-aged population.

STUDENT RESEARCH AWARD

5. Aerobic Exercise Reverses High Fat Diet-Induced Impairments on the CAP/CBL Pathway in Skeletal Muscle

Saito, M., S. J. Lessard, D. A. Rivas, D. W. Reeder, J. A. Hawley, B. B. Yaspelkis III

Exercise Biochemistry Laboratory, Department of Kinesiology, California State University Northridge, Northridge, CA.

We recently demonstrated that chronic aerobic training improves components of classical insulin signaling cascade in high-fat-fed rodent skeletal muscle (Am J Physiol Endocrinol Metab Acta Physiol. In Press). However, it remained to be determined 1) if chronic aerobic exercise improves components of novel insulin signaling cascade and 2) whether classical insulin signaling cascade interact with novel insulin signaling cascade at aPKC α and TC10. The aim of this investigation was to determine whether chronic aerobic exercise reverses high-fat diet-induced impairments in the CAP/Cbl signaling cascade in rodent skeletal muscle. Sprague-Dawley rats were placed into either control (CON, n=16) or high-fat fed (n=32) dietary groups for 4 weeks. During a subsequent 4 week experimental period high-fat fed rats were assigned to either high-fat diet control (HF, n=16) or high-fat diet exercise training (HFX, n=16) groups. Following the experimental period, animals were subjected to hind limb perfusions in the presence (n=8/group) or absence (n=8/group) of insulin. In the plasma membrane fractions, neither high-fat feeding nor exercise training altered APS, c-Cbl or TC10 protein concentrations. In contrast, CAP protein concentration insulin-stimulated plasma membrane c-Cbl tyrosine phosphorylation were reduced by high-fat feeding and these impairments were reversed by chronic aerobic exercise. Of particular interest, insulin-stimulated aPKC α kinase activity toward TC10 was reduced by high-fat feeding and normalized by aerobic exercise. These findings indicate that chronic aerobic exercise can reverse high-fat diet-induced impairments on the CAP/Cbl pathway in high-fat fed rodent skeletal muscle and skeletal muscle the CAP/Cbl insulin signaling cascade, which was purported to be PI3K independent is not, and in fact appears to directly interact with the classical insulin signaling cascade.



POSTER PRESENTATIONS

1. Validation of step count function of two accelerometers under controlled conditions

Abraham¹, Teresa L., James J. McClain², Renee S. Getz¹, Catrine Tudor-Locke, FASCM¹

¹Walking Research Laboratory, Department of Exercise and Wellness, Arizona State University, Mesa, AZ; ²Cancer Prevention Fellowship Program, Office of Preventive Oncology, Division of Cancer Prevention, National Cancer Institute, National Institutes of Health, Bethesda, Maryland

INTRODUCTION: A measure of steps taken, typically using pedometers, has been accepted as a general indicator of physical activity behavior. Recently, accelerometers have included a step count function as a value-added output. The purpose of this study was to validate the step count function of the Actigraph Model GT1M (AG; Actigraph LLC, Pensicola, FL) and the ActivPal Professional (PAL; Pal Technologies, Glasgow, UK) against a direct observation (DO) criterion. **METHODS:** A convenience sample of 18 adults (4 males, 14 females; age=28.2±6.9 years; BMI= 24.1±2.5 kg/m²) wore the AG and PAL concurrently. The participants walked for one minute on a calibrated treadmill at 0% grade for 10 stages (1.5 mph-4.2 mph; 40.2-112.8 m/min, increasing by 7.8 m/min each stage), interrupted by 2 minutes standing rest in between each stage. Actual steps were directly observed and recorded by a handheld tally device. The mean and range of individual % error (detected steps-actual steps)/actual steps*100), correlations between speed and % error, and Repeated Measures ANOVA were used to compare accelerometer outputs vs. DO by stage. **RESULTS:** Both accelerometers consistently undercounted DO; range of mean % error was wider for AG (-5.7 to -66.2) than PAL (-4.3 to -9.1). For both accelerometers, % error was highest at 40.2 m/min and lowest at 112.8 m/min. Speed and % error were inversely correlated for both AG (r=-.80, p<.001) and PAL (r=-.51, p<.001). There were significant differences in steps between DO and AG (p<.001), and DO and PAL (p<.001). **DISCUSSION:** Both instruments undercounted steps compared to DO. The greatest error was seen at lower speeds; this is consistent with pedometer literature. At normal walking speeds (e.g., 80.4 m/min), the AG and PAL performed within a 6.6% and 5.3% margin of error, respectively. This error is higher than the 1% error found in pedometer literature.

2. Comparison of Two Single-Set Resistance Training Programs among Elderly Pulmonary Rehabilitation Patients: Rapid versus Delayed Intensity Progression

Alexander, Jeffrey L., Ph.D. & Melissa J. Benton, Ph.D., RN, CNS
Department of Interdisciplinary Health Sciences, A.T. Still University (Alexander); College of Nursing, Valdosta State University (Benton)

Single-set resistance training (SSRT) programs have been shown to increase strength in young adults in a relatively short period of time (e.g. 6-12 weeks). However, in older adults such programs tend to require a greater period of time to increase strength and improve functional fitness (FF). There may be a *threshold effect* for training intensity that mediates increases in strength with short-term SSRT.

Purpose: To compare strength and FF outcomes between two SSRT studies, rapid intensity progression (RP) and delayed intensity progression (DP), among elderly pulmonary rehabilitation (PR) patients. **Methods:** Twenty PR patients participating in an identical hospital-based PR program which met twice a week for 8 weeks, were randomly assigned to similar SSRT programs, which differed in intensity progression (RP: n = 10, mean age = 71.0 ± 3.7yrs; DP: n = 10, mean age = 65.4 ± 7.8 yrs). The SSRT consisted of one set of 8-15 repetitions of five exercises (incline chest press, seated leg press, latissimus pulldown, triceps pushdown, and biceps curl). Initial training loads were identical for both studies. Load increases for each exercise in the RP study consisted of 5-10% immediately following a session where 10 repetitions were completed. In contrast, load increases for the DP study consisted of 3-5 lbs. following *two* consecutive sessions wherein 12 repetitions were completed.

Results: RP resulted in significantly greater increases in upper body strength (chest press; p = .021) and FF (Arm Curl Test, p = .001; Lift and Reach Test, p = .003) than DP.

Conclusions: In this comparison study rapid progression of training intensity in a SSRT involving elderly PR patients was superior to delayed intensity progression. This difference may reflect a *threshold effect* for SSRT intensity. Future studies should include prospective examination of differing intensity progressions within SSRT programs with older adults.

3. Which physical fitness measures are most strongly related to mental health among faculty and staff at Southern Utah University?

Arrant, C., Hansen R.T., and Taylor, J. E.

Exercise Physiology Laboratory, Department of Physical Education and Human Performance, Southern Utah University, Cedar City, UT

Introduction: Some studies report a significant relationship between physical fitness measures and mental health, but not all are in agreement. Our purpose was to determine which physical fitness measures were most strongly related to mental health and if these differed between men and women among faculty and staff at Southern Utah University. Results would aid in the development of a campus wellness program. **Methods:** 41 women (aged 44.0 ± 11.6 yrs) and 27 men (aged 45.0 ± 11.3 yrs) were recruited by campus e-mail. Participants filled out a previously validated questionnaire which allowed us to quantify perceived mental health (MOS SF-36) with higher scores representing better mental health. Fitness testing included: blood glucose and lipids, blood pressure, resting heart rate, body composition, cardiorespiratory fitness, flexibility and muscular strength. Regression analysis using SPSS 13 provided importance scores between mental health and fitness measures. Correlations were determined with significance set at p<0.05. **Results:** Analysis indicated the measures most strongly related to mental health among men were body composition (r = -0.365, importance = 0.529) and cardiorespiratory fitness (r = 0.543, importance = 0.693). Among women, body composition (r = -0.596, importance = 0.686) and age (r = 0.511, importance = 0.543) had the strongest correlations with mental health. **Conclusion:** Several physical fitness measures are related to perceived mental health within this population. Relationships between physical fitness measures and mental health differ between men and women. Body composition was the measure common to both men and women with higher body fat percentages related to lower mental health scores. Knowledge of this relationship indicates that body composition should be a key target for campus wellness interventions for both mental and physical health. These relationships may also lead to improved methods in determining healthcare treatment options for both men and women.

4. Minute Averaging Underestimates Incidence of the VO₂ Plateau at VO₂max

Astorino, Todd A.

Department of Kinesiology, California State University, San Marcos

To compare VO₂ plateau incidence between two commonly-used techniques, sedentary, recreationally-active, and endurance-trained subjects (N = 108, age = 24.2 ± 6.2 yr) completed incremental exercise on the treadmill or cycle ergometer. Gas exchange data were obtained breath-by-breath (bXb) and time-averaged every 60 s. VO₂max attainment was verified with the Taylor et al. (1955) criterion (ΔVO_2 at VO₂max ≤ 2.1 mL.kg⁻¹.min⁻¹) as well as slope of VO₂ versus time. One-way ANOVA was used to compare gas exchange data across subjects. Linear regression was used to examine the slope of the bXb VO₂ versus time relationship during the last 60 s of incremental exercise, and multiple regression was used to examine predictors of ΔVO_2 at VO₂max. Non-parametric statistics were used to compare incidence of the VO₂ plateau across techniques and subjects. VO₂ plateau incidence was significantly higher (Z = -5.34, p < .05) using the VO₂-time slope (94 %) versus the Taylor criterion (60 %). Fitness was not associated with VO₂ plateau incidence, as plateau incidence using 60 s averaging was similar between recreationally-active (60 %), endurance-trained, (57 %), and sedentary subjects (61 %), H(2) = 0.017, p > .05. No correlation (p > .05) was evident between ΔVO_2 at VO₂max and VO₂max in endurance-trained (r = -0.02), recreationally-active (r = 0.11), or sedentary subjects (r = 0.17). In endurance-trained subjects, a model comprising respiratory rate (RR), tidal volume (TV), and ventilation (V_E) explained 23 % of the variance in ΔVO_2 . Scientists should use the VO₂-slope technique to best detect the VO₂ plateau and refrain from using secondary criteria to verify VO₂max attainment. It is also recommended that researchers consider relationships between RR, TV, and ΔVO_2 , as these predictors account for significant variance in the VO₂ response during exercise.

6. Effect of Oolong Tea on Balance Performance in Naïve Tea Users

Zhou, B. and M. Lovegren

Division of Kinesiology and Recreation, California State University Dominguez Hills, Carson, CA.

Research Problem: Since the positive results have been reported from recent research, herbal tea has been recommended as an alternative for control of blood glucose and prevention of cancers and cardiovascular diseases. However, the effects of herbal tea on physical performance, such as balance performance, have not been studied. Because herbal tea has function in lowering blood glucose and contains caffeine, balance control may be impacted immediately after using it. The purpose of this study is to examine whether using hot-water extracted oolong tea will positively or negatively impact balance performance in naïve tea users. Methods: Thirteen healthy college students were recruited to participate in this study. Three balance tests, the Sensory Organization (SOT), Adaptation (AT), and Limits of Stability tests (LOS), were conducted on a Neuro-Com Balance System before and after using the tea. The blood glucose and dizziness were evaluated by the One Touch system and a questionnaire. Analysis: The paired t-test was used to compare the difference in all variables. Our results indicated that compared to the baseline, oolong tea significantly lowered blood glucose by an average of 11mg % (p < 0.05) without change in the dizziness scores (p > 0.05). The current study also revealed that as a result of oolong tea treatment, subject's performance on balance control was improved. A most significantly improvement was observed in the AT (p < 0.01). The vestibular ratio, equilibrium and end point excursion scores were enhanced as well (p < 0.05). Conclusion: Oolong tea had a positive impact on balance performance in our subjects, which might be related to the enhanced central nervous system activity due to stimulation of caffeine contained in oolong tea.

5. Cardiopulmonary Test-Retest Variability in College-Age Female Athletes

Booth, Audrey, Harnoor Singh, Staci R. Stevens, J. Mark VanNess
Pacific Fatigue Laboratory, University of the Pacific, Stockton, CA

The reliability of cardiopulmonary values during serial exercise testing has been examined in healthy and pathological conditions. Three to four percent variability between tests is attributed to biological factors and up to 8% variability is considered acceptable within pathological populations. In a recent study in our lab, patients with Chronic Fatigue Syndrome (CFS) showed variability scores of up to 27% on repeated exercise tests. In other studies repeated tests were done with several days in between, so that it is not known if exercise tests can be reproduced within 24 hours.

PURPOSE: The purpose of this study was to establish the degree of variability among cardiopulmonary measures during an exercise test-retest paradigm in healthy, physically active women, with the exercise tests separated by 24 hours. **METHODS:** Ten (n=10) college age women athletes performed two graded exercise tests to maximal exertion on a bicycle ergometer. The tests were separated by 24 hours. Peak values for heart rate (HRmax), oxygen consumption (VO₂ max), ventilation (V_Emax), respiratory quotient (RQ) and values at anaerobic threshold (AT; HR@AT, VO₂@AT, and V_E@AT), were compared between test 1 and test 2. Maximal effort was determined using ACSM guidelines. **RESULTS:** One subject failed to reach criteria for maximal effort and was removed from the analysis. Percent variability for each value is shown below:

Variable	Test		% Variability
	1	2	
HRmax	183±11	177±16	3.3±4.9
HR@AT	153±18	153±20	6.8±4.6
VO ₂ max	47.0±3.8	45.2 ±4.1	2.6±5.6
VO ₂ @AT	31.9±5.1	30.5±6.0	4.0±14.3
V _E max	110.7±12.3	106.8±18.1	3.8±11.2
V _E @AT	57.2±13.2	59.4±14.6	6.5±3.9

Variability for all factors were similar to reported values for pathological populations and were similar to the variability reported for sedentary populations. **CONCLUSIONS:** Within this small group of subjects, test-retest variability was very small, less than 4% for the majority of the measures.

Supported by the CFIDS Association of America

7. Maximal Pressure vs. Phrenic Nerve Stimulation as Means of Evaluating Inspiratory Fatigue

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Different methods have been used to evaluate fatigue and function of inspiratory muscles in humans. These methods vary greatly in their level of simplicity of performance and their discomfort to subjects. Bilateral phrenic nerve stimulation (BPNS), maximal sniffs, and maximal inspiratory pressure (MIP) were used to estimate inspiratory muscle fatigue. The purpose of this study was to compare the different methods of testing inspiratory fatigue to determine the accuracy of MIP values compared to the BPNS, which is commonly thought to be the most accurate. Six subjects performed repeated incremental breathing bouts to fatigue the diaphragm. Between bouts MIP values were recorded, and the procedure was repeated until the MIP values dropped by at least 20% from pre-fatigue levels. Before and after the exercise bouts MIP, BPNS at 1Hz, 10Hz, and 20Hz, and maximal sniff measurements were performed. Transdiaphragmatic pressure was measured from BPNS and sniff as the indication of inspiratory pressure. The results showed significant decreases in BPNS, sniff and MIP following fatigue, and these values were highly correlated. In conclusion, MIP values can be an accurate substitute for a more invasive BPNS assessment of inspiratory fatigue.

8. A Field Based Approach for Examining Bicycle Seat Design Effects on Seat Pressure and Perceived Stability

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Previous researchers have reported insightful information on how bicycle seat design influences seat interface pressure during stationary ergometry, however a field based approach that considers stability of the seat and factors that interact with seat design have not been examined. It was the purpose of this present study to investigate the effect of various bicycle seat designs on seat pressure and perceived stability in male and female cyclists during non-stationary bicycling. Thirty participants, comprising male and female recreational cyclists, pedalled a bicycle at 118 W over a 350 m flat course under three different seat conditions: standard seat, a seat with a partial anterior-medial cut-out, and a seat with a complete anterior cut-out. Mean seat pressure values were collected with a remote pressure-sensing mat and perceived stability was assessed using a continuous visual analogue scale. Results revealed that seat pressure values were 51% greater for males than females ($p = 0.02$). Anterior seat pressure and stability values for the complete cut-out seat were significantly lower than values for the standard ($p < 0.05$) and partial cut-out seats ($p < 0.05$). The complete cut-out seat seems to minimize pressure near the anterior perineum as expected but may reduce bicycle handling performance since perceived stability was compromised in this seat. In summary, males display greater total seat pressure than females and the choice of saddle design should not be dictated by interface pressure alone since optimal seat pressure and perceived seat stability appear to be inversely related.

10. Countermovement Vertical Jump with Drop-step is Higher than Without in Collegiate Football Players

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The vertical jump is a performance test commonly used to assess explosive power and predict athletic ability. Typically, the vertical jump is performed with a countermovement from a stationary stance. We hypothesized that taking a quick step back prior to initiating the jump, known as the "drop-step" technique, would result in a higher vertical jump. The purpose of this study was to compare countermovement vertical jumps (CMJ) done from the stationary-stance position to CMJ performed with the drop-step with trained athletes. NCAA Division I football players ($N = 56$) performed three trials each of stationary-stance and drop-step CMJs in a randomized order. A paired t -test revealed that a significantly ($p < 0.01$) higher jump height was achieved with the drop-step CMJ (69.3 ± 8.0 cm) compared to the stationary-stance CMJ (66.5 ± 8.0 cm). The two jump conditions were highly related ($r = 0.95$), and the rank order of the athletes tended to be similar from one condition to the other ($\rho = 0.94$). Trial-to-trial reliability was similar for each condition ($CV = 3.5\%$ stationary-stance; $CV = 4.1\%$ drop-step). It is important to standardize CMJ testing procedures because a significant difference in the height achieved exists between the stationary-stance and drop-step techniques.

9. Three Different Active Video Games

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Video games continue to be popular among children and young adults, while overweight and obesity numbers continue to rise. Different types of active video games have become available to the public. **Purpose:** The main goal of this project was to examine the heart rate and energy expenditure of three different active video games. **Methods:** Thirteen healthy male and female participants, aged 25.7 (± 5.7) years, participated in this study. Participants had a mean body mass index of 26.5 (± 4.8) kg/m². At the first session, the participants were familiarized with three games: (1) kick or hit lighted pads on three different posts (3-Kick), (2) riding a bike in a video racing game, and (3) boxing against a video simulated opponent. The participants were familiarized with the metabolic equipment and the mask. At a separate session, participants were connected to the metabolic cart and heart rate monitor for 10 minutes for baseline measurements. Following baseline data collection, participants were allowed to play any or all of the three games for 30 minutes, while being continuously monitored by the metabolic cart and heart rate monitor. All data were entered into SPSS 14.0 in order to determine significant differences. **Results:** Participants had an average resting heart rate of 82.3 (± 11.4) bpm, resting kcal/min of 1.4 (± 0.3), and resting VO₂ of 3.7 (± 0.5) ml/kg/min. During the 30 minutes of exercise, participants metabolized 7.5 (± 0.5) Kcal/min for a total of 226.1 (± 48.7) Kcal. The average Rating of Perceived exertion (6-20 scale) was 14.0 (± 2.0). When comparing the 3 different games, ANOVA revealed that the VO₂ was significantly higher in the 3-Kick game compared to the boxing game. No other significant differences existed. **Conclusion:** The participants exercised at an intensity that is in line with the ACSM recommendations of 150-400 Kcal/day of physical activity.

11. Three Different Intense Concentric Exercise Bouts Fail to Evoke Postactivation Potentiation

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Postactivation potentiation (PAP) is a transient increase in muscular power following heavy conditioning activity. Hence, the conditioning activity an athlete engages in during the few minutes leading up to a power event can have a tremendous effect on the event's outcome. Therefore, in an effort to determine an optimum load for evoking PAP, we evaluated power during a concentric bench press throw (BPT) prior and subsequent to three different heavy conditioning exercise intensities relative to 1-repetition maximum (RM). Twelve men (age = 22.9 \pm 2.7 years, bench press 1RM = 1.20 \pm 0.12 kg·kg⁻¹ body weight) following a familiarization day completed 5 heavy isotonic presses at ~55, 70, and 86% 1RM, in counterbalanced order on separate days. Peak and average acceleration (linear accelerometer sampling 1000 Hz) and surface electromyography (EMG) of the triceps brachii was collected during pre- and post-conditioning exercise BPT performance (4-min rest). Three BPT trials were collected pre- and post. Mean data across trials (M \pm SD), both peak and average values of acceleration and EMG, respectively, were evaluated with two-way ANOVA with repeated measures. No differences ($p > 0.05$) were observed in peak accelerations (m·s⁻²) prior to (3.0 \pm .45, 3.1 \pm .53, 3.1 \pm .71, respectively) and following 55, 70, and 86% 1RM (2.9 \pm .48 m·s⁻², 3.1 \pm .48 m·s⁻², 3.1 \pm .72 m·s⁻², respectively); however, for the 55% 1RM condition, average acceleration decreased ($p > 0.05$), whereas acceleration was not different ($p > 0.05$) for the remaining conditions. Peak, average, and median triceps EMG was unaffected ($p > 0.05$) indicating fatigue unlikely explains our inability to observe PAP. These findings refute the hypothesis that PAP is evoked predominantly by a transient shift of the concentric force-velocity relationship. We conclude that it is unlikely to potentiate volitional concentric performances; however, this may not be true of stretch shortening or eccentric performances.

12. The effectiveness of a simple in-home training program on balance, mobility and leg strength in the elderly

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The increase in the number of elderly and their great concern for falls motivates a greater understanding in how to increase balance and stability. Many effective programs exist which require special equipment or classes. **Purpose:** To determine if a simple, guided, in-home training program is effective in reducing fall risk. **Methods:** 35 subjects, 65 years or older who were not engaged in an exercise program, but could stand unassisted for at least 5 minutes, were recruited. Mean subject age was 77.8 years with 13 males and 22 females. Subjects were randomly assigned to either a training or control group. Three preliminary laboratory tests were conducted to measure postural sway, mobility and isometric quadriceps strength. There was no significant difference in the two groups' test values or ages. The trained group participated in an in-home training two times a week for six weeks with one of the investigators while the untrained group did not participate in any exercise program. Training consisted of lower extremity exercises focused on strength development using elastic bands and balance activities. After the six weeks, all subjects returned to the laboratory to repeat the measurements and fill out a survey. **Results:** Upon completion of the study, trained subjects had significantly greater isometric leg strength ($p = 0.02$) while the untrained subjects showed no significant difference ($p = 0.80$). Trained subjects were significantly faster in the mobility test ($p=0.04$) while untrained showed no difference ($p = 0.33$). Postural sway measurements were mixed in either indicating no difference or improvements in the trained group. Trained subjects indicated that their balance and mobility had improved as a result from the training while the untrained either reported no difference or an increased concern. **Conclusions:** The results indicate the effectiveness of this simple program and the need to evaluate dynamic balance measurements.

14. Do Postmenopausal Women Meet the Dietary Guideline for Physical Activity: Perception versus METs?

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The *Dietary Guidelines for Americans* recommends adults "accumulate at least 30 minutes of moderate physical activity most days of the week". Our purpose was threefold: 1) determine the degree to which Dietary Guideline for physical activity was met; 2) determine the contribution of household activity, outside work and occupational physical activity to total physical activity, and 3) assess the agreement between perceived intensity versus MET classification. Healthy postmenopausal women ($n=132$) completed a modified Paffenbarger Physical Activity Questionnaire listing activity, frequency, duration and intensity of activities. Perceived intensity was coded as: 1- light, slight change in breathing; 2- moderate, some perspiration, slightly faster than normal breathing; 3- heavy perspiration, heavy breathing. Met intensities were $1 = MET \leq 5$; $2 = MET 5.1 - 6.9$; $3 = MET \geq 7.0$. Load was scored 0-2 based on degree of weight bearing. Total physical activity (TPA) was calculated as $TPA = MET \times Time \times Intensity \times Load$. Two TPAs were calculated 1) perceived intensity (TPA-P) and 2) MET intensity (TPA-M). Height and weight were measured; BMI calculated. 70% ($n=93$) of the women met the DRI from recreational activity alone, 57% ($n=53$) of whom had a $BMI \leq 25$. When household activity, outside work and occupational tasks were included in the TPAs, the women meeting the DRI increased to 88% ($n=116$); 56% ($n=65$) of whom had a $BMI \leq 25$. As BMI increased, hours/week of physical activity decreased. On average, women overestimated the intensity of their physical activity by 24%. The discrepancy between perceived and MET intensities used in the calculation of TPA was significant (T-test, $p < 0.05$). For 18% of women, household and occupational activities contributed significantly to TPA, but not to a lower BMI. In general, post menopausal women overestimated the intensity of their exercise, but most met the DRI for minutes of physical activity.

13. On the determination of ventilatory threshold and respiratory compensation point via respiratory frequency

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Previous investigations have reported respiratory frequency (f_R) analysis to be useful for determining ventilatory threshold (V_T) and respiratory compensation point (RCP) during cycle ergometry. The methods of identifying f_R thresholds have been largely subjective and/or unable to identify both V_T and RCP (D_{max} method). Additionally, the majority of these investigations have not provided appropriate analysis techniques to assess agreement between f_R analysis and standard gas exchange criteria for V_T /RCP. Thus, the purpose of this study was to examine the feasibility of f_R analysis to detect V_T /RCP. Thirty-six amateur competitive cyclists (mean \pm SE age = 33 ± 1.5 ; height = 177.5 ± 1.5 cm; weight = 77.2 ± 2.6 kg; $\dot{V}O_{2max} = 4.386 \pm 0.163$ l min^{-1}) completed a maximally graded exercise test upon an electromagnetically-braked cycle ergometer. Respired gases were monitored breath-by-breath throughout the exercise protocol. V_T /RCP were determined using multiple gas exchange criteria, and by f_R analysis, employing an iterative least-squares linear regression technique ($V_T f_R / RCP f_R$). Additionally, the D_{max} method was used to determine a single threshold in f_R . Three subjects were excluded from the analyses, as the investigators were unable to identify V_T and/or RCP due to an unreasonably low signal:noise ratio. Bland-Altman procedure for inter-analysis comparison ($n = 33$) revealed unacceptably high mean bias \pm 95% CI for $V_T/V_T f_R$ (4.75 ± 51.5 W), V_T/D_{max} (79.4 ± 96.1 W), RCP/D_{max} (26.4 ± 69.6 W). $RCP f_R$ resulted in a more reasonable mean bias \pm 95% CI (10.2 ± 24.4 W) when compared with RCP. These data indicated f_R analysis was insufficient, alone, to determine V_T and RCP in trained cyclists. The analysis techniques in the current investigation revealed substantial limits of agreement and/or bias for all estimations, save $RCP f_R$, which may be appropriate as secondary or confirmatory criteria for RCP determination.

15. The Association of Hand Grip Strength and Baseball Swing Velocity

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Introduction: For a baseball player, hitting home runs is a very important skill. The greater your bat swing velocity the farther the baseball will travel thereby increasing the likelihood of hitting a home run. It has long been hypothesized that the velocity of a baseball swing is correlated with hand grip strength. The theory being that the more force the hands can create, the greater the velocity of the swing. Purpose: The purpose of this correlational study was to determine if there is any association between existing hand grip strength and bat velocity. Methods: 16 Community College baseball players were recruited to participate in the study. Their average age was 18.69 ± 0.60 (in years). Each player was instructed to take 5 practice swings and then 3 trial swings. The trial swings were taken with a Zinger 33 inch, 30 ounce bat and swing velocity was measured with the BatMaxx by Technasport. The best of the three trials was used for purposes of data analysis. Hand Grip Strength was taken with the Takei hand-grip dynamometer. The players were instructed to take the dynamometer from their side and squeeze as they raised it to shoulder height. Each player was given two trials for each hand with the best to be used for purposes of data analysis. Statistics: Data was analyzed using a Pearson correlation with significance set to .05. Results: No significant correlation was seen between hand grip strength and bat swing velocity ($p=.95$). Discussion: The data seems to show there is no correlation between hand grip strength and bat swing velocity as previously seen in other research. This could have occurred because the sample size was small ($n=16$) and the study lacked significant power. It could have also resulted because the players lacked experience (community college). Conclusions: More research needs to be done to discover what creates bat swing velocity, in order to help baseball players swing with more velocity and therefore, hit more home runs.

16. Variation in Nocturnal Blood Glucose Levels in Apparently Healthy Individuals

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Previous research has demonstrated that apparently healthy individuals, who exercise regularly, are capable of consistently controlling blood glucose (BG) levels, with small glucose excursions, during daytime hours. Thus it seems logical to hypothesize that apparently healthy adults, with various physical activity levels, will display small nocturnal variations (12 a.m.–6 a.m.) in BG and area under the concentration curve (AUC) values, across a 3 night period, when controlling for carbohydrate (CHO) consumption, physical activity, and body fat percentage (BF%). The purpose was to assess nocturnal variation of BG in apparently healthy, active adults over a 72 hour period using the Continuous Glucose Monitoring System (CGMS). Eighteen apparently healthy, active volunteers (24.3 ± 1.6 yrs.) of normal weight and/or BF% served as subjects. Subjects wore the CGMS unit for three days and calibrated it 3 to 4 times per day. During this time, subjects completed a dietary recall, which was analyzed via Nutritionist Five Software for macronutrient content, while physical activity was assessed using the Digiwalker pedometer. After 3 days of data collection, the stored amperometric data from the CGMS unit was transferred and converted to glucose concentrations. AUC values were also calculated from the BG data as an aggregate assessment of glucose per hour. Due to some defective CGMS sensors and to several subjects eating after 9 pm, which affected nighttime BG monitoring, data from 12 of 18 subjects were used for statistical analysis in this study. Correlations conducted with descriptive variables revealed that BF% strongly related to average BG ($r = .78$; $p < .01$) and AUC ($r = .79$; $p < .01$), so BF% was added as a covariate, along with CHO grams consumed, and daily pedometer steps to adjust for any influence these variables might of had on average BG and AUC during the nocturnal hours. A RM-ANCOVA revealed no significant differences in average BG ($F_{(2,16)} = 2.71$, $p = .097$, $\eta^2 = .26$) or AUC ($F_{(2,16)} = 2.74$, $p = .095$, $\eta^2 = .26$) across 3 days. However, significant intra-individual variability in BG and AUC was apparent, so a simple coefficient of variation (CV) (S.D./mean) was computed, which revealed that intra-individual variability in BG and AUC over the 3 nocturnal periods ranged from 1% to 18%. Our primary finding in this study was that no statistically significant differences were found in average BG and AUC in apparently healthy, active individuals during the nocturnal hours across a 72-hour period. Surprisingly, the present study revealed that intra-individual variation in average nocturnal BG and AUC ranged up to 18% over the 3 days.

18. Abdominal Induced Respiratory Fatigue

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The diaphragm has been shown to be activated during some exercises that are primarily non-respiratory in nature. Sit-up training has been used to increase various measurements of respiratory muscle strength, including maximal inspiratory and expiratory pressures. Alternatively, maximum ventilation has been used to induce abdominal muscle fatigue. To test the effect of abdominal muscle fatigue on various respiratory muscle parameters, eight subjects performed maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) measurements and an incremental breathing test before and after completing a one time fatiguing exercise bout of sit-ups. Each subject acted as their own control performing the same measurements 3-5 days following the exercise bout, substituting rest for exercise. Following sit-up induced fatigue, significant decreases were measured in MIP [121.6 ± 26 to 113.8 ± 23 cmH₂O ($P < .05$)], and incremental breathing test duration [9.6 ± 1.5 to 8.5 ± 0.7 minutes ($P < .05$)]. A significant difference was also observed between control post MEP to exercise post MEP [172.1 ± 50 to 150.9 ± 47 cmH₂O ($P < .05$)]. No significant decreases were observed between pre and post measurements in the control condition. We conclude that after a one-time fatiguing sit-up bout there is a reduction in respiratory muscle strength (MIP, MEP) and endurance (incremental breathing test duration).

17. Estimates of Energy Availability in Female High School Distance Runners

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Bone mineral accrual is most rapid during early adolescence, and requires adequate nutrition to maintain an optimal rate. Previous work under controlled laboratory conditions showed a suppression in biomarkers of bone formation in young adult women subjected to a restricted energy availability (EA, defined as the difference between energy intake (EI) and exercise energy expenditure (EEE)) of 30 kcal·kg⁻¹·FFM·d⁻¹. Our purpose was to estimate EA and its association with bone mineral density (BMD) and menstrual function in high school distance runners. Eighteen female cross-country runners (age 15.4 ± 0.9 y) who had been training for a minimum of one year completed a menstrual history questionnaire, a 5-day food record using palm pilot/PDA technology, and a training log, which was verified by the team coach. BMD was measured by central DXA at the lumbar spine, proximal femur, and whole body. EA was treated as a dichotomous variable using a cut-off value of 40 kcal·kg⁻¹·FFM·d⁻¹ to determine athletes with low or sufficient EA. The results showed no difference in age, height, weight, body fatness, or age at menarche between runners with sufficient EA (n=12) and those with low EA (n=6). ANCOVA adjusted for age at menarche, BMI, and menstrual status indicated that athletes with low EA had significantly lower whole body BMD (1.090 ± 0.082 g·cm⁻²) compared to those with sufficient EA (1.134 ± 0.071 g·cm⁻²), $p = 0.04$. Other bone sites showed a consistent pattern of lower BMD in athletes with low EA, but these were not statistically significant. These data are preliminary, however, they may explain the low BMD previously reported in some adolescent distance runners. Our findings warrant more definitive studies using objective and accurate measures of energy intake and expenditure to determine the threshold of sufficient EA in this population, and associations of EA with BMD and bone turnover. This study was supported in part by a grant from the Southern California Industry of Food Technologists.

19. A Submaximal Treadmill Test to Accurately Predict VO_{2max} in 18-65-Year-Old Adults

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This study sought to develop a regression model to predict maximal oxygen uptake (VO_{2max}) based on submaximal treadmill exercise (EX) and non-exercise (N-EX) data involving 100 participants, ages 18–65 years. The EX data included the self-selected treadmill speed when participants' exercise heart rate initially rose to 70–90% of predicted maximum heart rate (HR_{max}; 220 - age) while progressing through three 4-min stages involving walking (3.0–4.0 mph), jogging (4.1–6.0 mph), and running (> 6.0 mph). The N-EX data included various demographic (age, gender), biometric (body mass index [BMI]), and questionnaire (participants' perceived functional ability [PFA] to walk, jog, or run given distances, and their self-reported level of physical activity [PA-R]) information. All participants successfully reached a maximal level of exertion (mean ± SD; maximum heart rate (HR_{max}) = 185.2 ± 13.2 bpm; maximum respiratory exchange ratio (RER_{max}) = 1.17 ± 0.05; maximum rating of perceived exertion (RPE_{max}) = 19.0 ± 0.8) during a graded exercise test (GXT) to assess VO₂ max (mean ± SD; 41.39 ± 9.15 mL·kg⁻¹·min⁻¹). Multiple linear regression generated the following prediction equation ($R = .94$, $SEE = 3.11$ mL·kg⁻¹·min⁻¹): VO_{2max} (mL·kg⁻¹·min⁻¹) = $33.20 + (5.42 \times \text{gender}; \text{females} = 0, \text{males} = 1) - (0.235 \times \text{age}) - (0.429 \times \text{BMI}) + (3.040 \times \text{ending treadmill speed}; \text{mph}) + (0.379 \times \text{PFA}) + (0.674 \times \text{PA-R})$. All six predictor variables were statistically significant ($p < .001$) and cross validation procedures using PRESS (predicted residual sum of squares) statistics revealed minimal shrinkage ($R_p = .93$ and $SEE_p = 3.31$ mL·kg⁻¹·min⁻¹). In summary, this submaximal treadmill test, and accompanying regression model, yields relatively accurate VO_{2max} estimates in healthy men and women (ages 18–65 years), using both EX and N-EX data.

20. Energy Requirements of Simulated Firefighting Tasks

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We directly measured oxygen uptake ($\dot{V}O_2$) of firefighters performing a series of firefighter tasks at a self-selected pace. Twenty male firefighters completed a maximal treadmill test to determine aerobic capacity ($\dot{V}O_{2\max}$). On a separate day, heart rate, $\dot{V}O_2$, and performance time were measured with a portable metabolic system while firefighters completed a continuous series of 10 firefighting tasks. Subjects' treadmill $\dot{V}O_{2\max}$ was 46.2 ± 7.8 mL·kg⁻¹·min⁻¹ and their HR_{max} was 183 ± 7 bpm. The elapsed time between completing the $\dot{V}O_{2\max}$ test and performing the firefighter skill course was 6.2 ± 3.8 weeks with a range of less than 1 week to 13 weeks. On the skills course, performance time was 11.65 ± 2.21 min, and average $\dot{V}O_2$ was 29.1 ± 8.0 mL·kg⁻¹·min⁻¹. During the skills course, subjects worked at an average of 62% of their treadmill $\dot{V}O_{2\max}$, and their ending HR was 95% of their treadmill HR_{max}. There was a moderately strong inverse correlation between $\dot{V}O_{2\max}$ and performance time ($r = -0.725$; $p < 0.001$) and a strong correlation between $\dot{V}O_{2\max}$ and average rate of energy expenditure during the firefighter protocol ($r = 0.825$; $p = 0.001$). The results indicated that firefighters with a higher $\dot{V}O_{2\max}$ were able to expend energy at a higher rate and complete the firefighting protocol more quickly. This emphasizes the importance of cardiovascular fitness to firefighting effectiveness and safety.

22. Electron Conductance in Red versus White Skeletal Muscle Mitochondria

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Reactive oxygen species (ROS) are formed as a result of single electron leaks from the electron transport chain (ETC). ROS production is increased under conditions where mitochondrial driving forces are high. The purpose of this study was to examine the kinetics of electron flow down the ETC in skeletal muscle mitochondria (MITO) from different fiber types. MITO isolated from rat white and red muscle were sonicated and given a bolus of either NADH or succinate to stimulate maximal electron flow (V_{max}) from Complex I and II, respectively. Electron flow was assessed from the rate of oxygen consumption (J_o). The influence of driving force on electron flow was examined by experimentally manipulating the NAD/NADH and fumarate/succinate ratios and measuring the ½ O₂/H₂O couple from the polarograph. Redox potential difference (ΔE_r) was determined by subtracting the redox potential of the electron donor (fuel) from that of the electron acceptor (oxygen). The conductance of electron flow down the ETC was calculated from the slope of the relationship between ΔE_r and J_o. The V_{max} for red MITO from Complex I was 1.73 times that of white MITO (831.5 vs. 479.8 nmol O₂/mg/min), while the V_{max} from Complex II was only 17% greater than that of white MITO (155.5 vs. 132.5 nmol O₂/mg/min). Conductance of electron flow from Complex I was twice as high in red MITO as it was in white MITO (66.5 vs. 32.7 millisiemens (mS)/mg MITO protein). Conversely, conductance from Complex II was just 25% greater in red MITO than in white (13.0 vs 10.5 mS/mg MITO protein). These findings suggest that MITO from white muscle must maintain a higher redox pressure to meet a given ATP demand and may have important implications regarding ROS formation. Supported by National Science Foundation IBN-0116997

21. Intensity Outputs of Low Cost Objective Physical Activity Assessment Instruments: Comparison with Actigraph Accelerometer

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Development and validation of low cost objective physical activity (PA) assessment instruments that are capable of detecting time in moderate-to-vigorous PA (MVPA) is required prior to broader use. Example instruments include the New Lifestyles NL-1000 (NL: New Lifestyles, Inc., Lee's Summit, Missouri, USA, \$48), an accelerometer with a modifiable MVPA intensity threshold, and the Omron HJ-151 (OM; OMRON Healthcare, Inc., Bannockburn, IL, \$13), a piezoelectric pedometer which outputs MVPA based on estimated walking speed (i.e., modeled from steps/min and participant height). The utility of these low cost instruments would be enhanced if they provided MVPA outputs consistent with the Actigraph (AG; Actigraph LLC, Pensacola, FL, \$325), an accepted research grade accelerometer. **Purpose:** This study compared NL and OM outputs of time in MVPA with that of the AG accelerometer in free-living adults. **Methods:** Participants (n=26) wore the three instruments concurrently during waking hours (other than water activities) for one day. The NL MVPA intensity range was set to 4-9 (manufacturers' default setting). MVPA time from the NL and OM were recorded by participants at day end. Analogous AG minute-by-minute values were downloaded and imputed using a validated cutpoint (MVPA_≥1952 counts/min). Descriptive statistics, percent difference, repeated measures analysis of variance, and effect size (ES) were used to compare instrument outputs. **Results:** Detected time in MVPA for NL, OM, and AG were 44.6 ± 22.4 , 38.0 ± 19.7 , and 48.0 ± 20.6 min, respectively. Compared with AG, NL and OM detected 7.1% and 20.8% less time in MVPA, respectively. The difference between OM vs. AG MVPA ($\Delta = 10.0$ min) was significant ($p < .001$, $ES = 0.49$). All other comparisons were not significant. **Conclusion:** In comparison to AG MVPA, the NL detected comparable outputs while the OM detected significantly lower time in MVPA. Current data support the NL as a potential low cost instrument alternative for detection of MVPA in free-living adults.

23. Sleep Quality and Lifestyle Behaviors in College Students

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The Pittsburg Sleep Quality Index (PSQI) is a self-rated questionnaire which assesses sleep quality and disturbances over a 1-month time interval. Surveys indicate that about 15-35% of the adult population complain of frequent sleep disturbances, which current research has linked to higher body mass index (BMI). **Purpose:** The main objective of our study was to research the relationship between sleep quality, body composition, physical activity, and alcohol consumption in college students. **Methods:** We measured the sleep quality of 43 participants aged 18 to 25 years using the PSQI. Physical activity (MET-hours/week) and alcohol consumption were measured through questionnaires. BMI, percent body fat, and muscle mass was measured using dual-energy x-ray absorptiometry (DXA, Hologic Inc, Waltham, MA). **Results:** Pearson correlations revealed no relationship between body composition and sleep quality. Frequency of drinking was negatively associated with sleep duration ($R = -0.318$, $p < 0.05$), hours spent drinking in a typical week was positively associated with sleep disturbances ($R = .456$, $p < 0.01$), and lastly, quantity of drinks in a typical week was positively associated with daytime dysfunction ($R = 0.317$, $p < 0.05$). Physical activity (MET-hours/week) was positively associated with sleep duration ($R = .328$, $p < 0.05$). **Conclusions:** Contrary to recent publications, we found no correlation between sleep quality and body composition. However it seems that 10-20% of the variation in sleep quality may be influenced by alcohol consumption in this population. Also, active individuals seem to have healthier sleep habits. Further research with a larger sample size, including problematic and non-problematic sleepers, is needed. Our healthy sample of college-age volunteers may not reflect the other populations.

24. Effects of Interrupted Resistance Training on Bone Mineral Density in Growing Rats

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The purpose of this study was to examine the efficacy of interrupting a daily resistance training program for enhancing bone modeling and bone mineral density (BMD) in growing male rats (initially 8 wks old). It has previously been suggested that interrupting an exercise regimen periodically during a training day allows mechanoreceptors to recover, potentially leading to a greater osteogenic response. We compared a resistance training program where the exercise was uninterrupted (i.e., continuous repetitions) against a resistance training program where the exercise was interrupted (2 times during a training day). The total volume of work performed between the two resistance training groups was equivalent by design. Twenty-three male rats were randomly divided into a Control (Con, n=8), an uninterrupted resistance trained group (UT, n=8), and an interrupted resistance trained group (IT, n=7). The UT and IT groups were conditioned to climb a vertical ladder with weights appended to their tail 3 days/wk for 6 wks. All exercised animals initially carried 30% of their body weight (BW) and progressed to 150% BW by the beginning of wk 5 and maintained the training weight for the final 2 wks of the training regimen. Serum osteocalcin (OC), urinary deoxypyridinoline (DPD) adjusted by creatinine, and left tibial BMD (using dual energy x-ray absorptiometry) were determined in all groups. OC (ng/ml) was significantly greater for both UT (45.65 ± 1.00) and IT (46.33 ± 1.74) compared to Con (37.86 ± 1.43). The adjusted serum DPD was not significantly different between groups. Left tibial BMD (g/cm^2) was significantly greater for both UT (0.235 ± 0.003) and IT (0.238 ± 0.002) compared to Con (0.223 ± 0.001). The results indicate that both resistance training programs were equally effective in eliciting an osteogenic response that culminates in a significant elevation in BMD in growing animals.

26. A 20-Year Exercise Program and Changes in Physical Fitness Levels Among Middle-Aged Men

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Physical fitness levels decline with age; however, engaging in regular physical activity can prevent this decline. The purpose of this study was to investigate the long-term effects of a daily exercise program on changes in physical fitness levels. The daily program was followed for 20 years. Healthy, but previously sedentary adults (N = 20; initial age = 30-60 years) participated in an exercise research program offered at the university. The program consisted of a daily exercise class and physical fitness testing. The daily exercise class met 5 days/week throughout an academic year. The actual attendance rate over the 20-year period was 3.5 days/week. The exercise class was 45 minutes in duration and consisted of: warm-up, calisthenics, aerobic activity, and cool-down. A fitness assessment protocol was used to evaluate the fitness levels of each participant before joining in the exercise program and then at the end of each academic year. The testing batteries included: the 3-minute step test and PWCmax test for cardiorespiratory fitness, the bench press test for muscular fitness, skinfold measurements for body composition, and the sit-and-reach test for flexibility. All physical fitness levels significantly improved during the study ($p < .05$). The largest improvements were observed during the first year of participating in the exercise program, and slow, gradual improvements continued thereafter. The improvements plateaued after a few years of starting the program, but the participants maintained their improved fitness levels during the study despite getting 20 years older. The study indicated that the positive effects of regular physical activity do not diminish, even after 20 years of participation.

25. Association Between Family Income and Peripheral Artery Disease in US Adults

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Background: Little is known about whether family income is associated with peripheral artery disease in a large US population.

Objectives: We investigated the association between family income and peripheral artery disease in 4332 healthy US men and women aged 40 to 85 years from the National Health and Nutrition Examination Survey (1999-2004).

Methods: Family income was classified as low (<\$25,000), moderate (\$25,000 to <\$55,000), and high (\geq \$55,000) income categories. Peripheral artery disease (PAD) was determined using ankle-brachial index (ABI) <0.9, which calculated as ankle systolic blood pressure divided by brachial systolic blood pressure. Multiple logistic regression models were used to investigate the association between family income and PAD after adjustment for age, sex, race, and additional adjustment for other multiple risk factors. The highest family income (\geq \$55,000) was the reference category.

Results: After adjustment for age, sex, and race, there was a direct association between family income and PAD (p for trend <0.001). The odds ratios (and 95 % CI) of having PAD across family income categories were: 1.00 (\geq \$55,000, reference group), 1.42 (0.79, 2.58), and 2.74 (1.54, 4.86) (P for trend <0.001). These associations persisted after additional adjustment for cigarette smoking, alcohol intake, body mass index, physical activity, high-density lipoprotein and total cholesterol, hypertension, and diabetes mellitus (P for trend = 0.01). Individuals with a low income had twice greater odds of having PAD (odds ratio = 2.7, 95 % CI = 1.54, 4.86) as compared with individuals with a high income category.

Conclusions: Low income is positively associated with prevalence of peripheral artery disease in a large US middle-aged and elderly population.

27. Human Powered Vehicle (HPV) Ergonomic Study Project

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The purpose of this project was to determine optimal geometries related to the recumbent frame design of the HPV. This would produce the initial volume and frontal area dimensions needed for aerodynamic testing. A stationary test rig was constructed that allowed for alterations in hip joint angle and various handlebar locations. An SRM Powermeter was employed to collect power (W) generated at the crank and heart rate (HR) data was also collected. Since the aerodynamic shell would greatly reduce air flow to the pilot, the effects of temperature and humidity on power output were also examined. Three male participants (mean age 21.3, SD 2.0 yrs) and pedaled at a cadence of 80 rpm at six resistance levels (80, 105, 130, 155, 180, 205 Watts). Hip angles between 105 and 150 degrees were examined. On any given day of testing, each participant pedaled at the ambient temperature and relative humidity (RH) of the indoor air conditioned lab (mean temp 62 degrees F; mean RH 24 percent) and also at an elevated temperature and RH (e.g., 104 degrees F, RH 50 percent). All participants began each test with a warm up phase pedaling at the lowest resistance level for 10 minutes and were then asked to maintain pedaling at 80 rpm as the resistance increased. The participant pedaled for five minutes and each participant performed all combinations of resistance and hip angle in a random order over the course of a two week period. Results: Optimal hip angle (i.e., greatest mean power with lowest mean HR) was between 115-135 degrees; handlebar location had no effect on power measures or HR; increased temperature has the potential to reduce power output by 25 percent at a given HR. Recommendations: seating position should consider hip joint angle; ventilation to the pilot should be given high priority; handlebar location should consider control of the HPV and clearance of the legs during pedaling.

28. Are self-reports of physical activity a useful tool in evaluating fitness and health among faculty and staff at Southern Utah University?

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Introduction: Research indicates that self-reports are a valid measure of physical activity. Although physical activity is related to fitness and health, it is unclear how strongly these measures are related to self-reports. Our purpose was to determine if self-reports of physical activity would be a useful tool in evaluating fitness and health among faculty and staff at Southern Utah University. Results would aid in the development of a campus wellness program. **Methods:** Volunteers were recruited by campus e-mail. Participants (women, $n=41$; men, $n=27$) completed a previously validated questionnaire assessing current physical activity which was used to estimate total daily energy expenditure (TDEE/kg) and weekly hours of vigorous and moderate activity. Fitness measures included body composition, cardio-respiratory fitness, blood pressure, blood glucose, lipids and resting heart rate. Relationships were evaluated with significance set at $p<0.05$. **Results:** Analysis indicated significant correlations existed between TDEE/kg and body composition, cardio-respiratory fitness and total cholesterol. These three fitness measures were most strongly related to TDEE/kg among women ($r=0.65$, $r=0.41$ and $r=0.36$ respectively). Body composition was the only significant correlation ($r=0.56$) among men. Further analysis revealed significant correlations between weekly vigorous activity and body composition in both men and women ($r=0.55$, $r=0.58$ respectively) and cardio-respiratory fitness in women only ($r=0.49$). No significant associations existed between fitness measures and weekly moderate activity. **Conclusion:** Self-reported physical activity was a good indicator of some fitness measures in this sample. In combination with other health related measures such as family history, age and diet, self-reported physical activity would be a valuable fitness evaluation tool, especially with respect to body composition and cardio-respiratory fitness, and is a useful measure in evaluating health risks. It is important to note that only vigorous activity was sufficient to influence body composition in this sample.

30. Investigating the Discriminative Properties of a Multidimensional Balance Scale Between Older Adults at Different Levels of Functional Ability

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Falling is associated with increased morbidity and mortality. Older adults with impaired activities of daily living (ADL) are more likely to sustain a fall when compared to older adults with no such impairment. Many falls could be prevented if the contributing risk factors were identified early and appropriate intervention strategies implemented. **PURPOSE:** The purpose of this study was to determine if the Fullerton Advanced Balance (FAB) scale (Rose, 2003; Rose et al., 2006) could discriminate between two levels of functional ability (high or low) in a sample of 119 community-residing older adults. A cross-sectional design was used to determine the extent to which overall performance on the balance scale correctly classified older adults into a high or low category of functional ability based on established cutoff values developed for the Composite Physical Function (CPF) Scale (Rikli & Jones, 1999). **METHODS** Older adults attending a community-based balance and mobility screenings completed the self-report CPF scale followed by a series of balance and mobility tests that included the FAB scale. **RESULTS** Discriminant Function Analysis (DFA) demonstrated that the total FAB scale score correctly classified 63% of the sample who were low functioning, and 90% who were high functioning. The total FAB scale score demonstrated an overall classification of 84%. **CONCLUSION** The FAB scale demonstrates strong discriminative validity, and can be used to identify older adults of lower functional ability who would be appropriate candidates for a fall risk reduction program.

29. Bone Mineral Density of the Lumbar Spine in College Rowers and Controls

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Bone mineral density (BMD) begins to develop in the womb and continues to increase into adulthood, reaching a peak around age 30. Many factors contribute to the development of BMD including dietary intake, physical activity, and genetics. **Purpose:** The main objective of our study was to look at the change in BMD at the spine over an 8-month training season in crew athletes compared with controls. **Methods:** We measured BMD of 35 participants (14 male, 21 female), ages 18 to 25 years using dual-energy x-ray absorptiometry (DXA, Hologic Inc, Waltham, MA). Measurements were taken during preseason and after 8 months of training. Calcium intake (mg/d) and physical activity (MET-hours/wk) were quantified from questionnaires. **Results:** Examining men and women separately, groups were not statistically different in age or calcium intake. Female crew athletes ($n=10$, mean years of rowing = 5.3), were more physically active (146 ± 69 vs. 35 ± 17 MET-hours/wk, $p<0.05$), had a higher BMI (24.3 ± 3.2 vs. 20.8 ± 2.5 , $p<0.05$), and greater lean body mass (51.9 ± 6.0 vs. 39.0 ± 3.1 , $p<0.01$) than female controls ($n=11$). Male crew athletes ($n=7$, years of rowing=2.4), had a lower BMI (22.4 ± 1.6 vs. 26.4 ± 3.4 , $p<0.05$) than male controls. An analysis of covariance, controlling for lean mass, revealed that there were no significant differences in BMD, at the spine, after 8 months of rowing training for men or women. Although not statistically significant, male crew athletes showed a 1.3% increase in spinal BMD, while controls increased 0.9%. **Conclusions:** Changes in BMD at the spine were not significantly different between rowing athletes and controls. Therefore, rowing did not seem to offer a significant advantage for bone health. In this convenience sample, overtraining by the athletes or restrictive eating practices in the light-weight rowers could be influencing results.

31. Effects of creatine monohydrate versus polyethelene glycosolated creatine supplementation on muscle strength, power output, and endurance

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The purpose of the present study was to compare the effects of 30 days of CM versus PEG creatine supplementation on muscle strength, power output, and endurance. Fifty-eight healthy men (mean \pm SD age=21 \pm 3 yrs; stature= 176 \pm 6 cm; mass =75 \pm 14 kg) volunteered and were randomly assigned to 1 of 4 groups: (a) placebo (PL; 3.6 g of microcrystalline cellulose; $n = 15$), (b) CM (5 g creatine; $n = 13$), (c) low-dose PEG creatine; 1.25 g of creatine (PEG_{1.25}; $n = 14$), or (d) moderate-dose PEG creatine; 2.50 g of creatine (PEG_{2.50}; $n = 16$). Testing was conducted before (pre-) and after (post-) a 30-day supplementation period. Measurements included body mass, countermovement vertical jump (CVJ) height, power output during the Wingate test (peak power [PP] and mean power [MP]), 1 repetition maximum bench press (1RM_{BP}) and leg press (1RM_{LP}), and repetitions to failure at 80% of the 1RM for bench press (REP_{BP}) and leg press (REP_{LP}). Body mass and MP increased ($P \leq 0.05$) from pre- to post-supplementation for the CM group only, whereas 1RM_{BP} and 1RM_{LP} increased ($P \leq 0.05$) for the CM, PEG_{1.25}, and PEG_{2.50} groups only. CVJ height, PP, REP_{BP}, and REP_{LP} increased ($P \leq 0.05$) for all groups. These findings indicated that the recommended safe dose of 5 g \cdot d⁻¹ of CM increased body mass and improved muscle strength (1RM_{BP} and 1RM_{LP}) and mean power output (MP). Lower doses of PEG creatine (1.25 and 2.50 g \cdot d⁻¹) improved muscle strength (1RM_{BP} and 1RM_{LP}) to the same extent as 5 g \cdot d⁻¹ of CM, but did not alter body mass, power output, or endurance. Compared to the PL group, neither CM nor PEG creatine supplementation improved peak power output (CVJ or PP) or muscle endurance (REP_{BP} or REP_{LP}). Overall, PEG creatine may be ergogenic, but improvements may be dose-dependent.

32. Detecting Malingering on a Reaction Time Test

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Computer-based reaction time (RT) tests are used in our lab to determine if reaction time is altered in pathological conditions. **PURPOSE:** The purpose is to find signs indicative of malingering when using the California Computerized Assessment Package (CalCap®). **METHODS:** Twenty (N=20; 10 male and 10 female) subjects completed three CalCap tests. The first test was to familiarize subjects with the testing equipment. The subjects were then asked to perform optimally on the test (Fast), or intentionally try to demonstrate a slow reaction time (Slow). The two conditions were assigned in a counter-balanced design. Four reaction time measures were analyzed; simple reaction time (SRT), choice reaction time (CRT), and two forms of sequential reaction time (SQRT 1 and SQRT 2). The range of responses and the comparison of the responses to normative values were used to inform when the subject was feigning lethargy. **RESULTS:** There were no differences between genders, so these were combined and analyzed together (shown below). Reaction time measures were significantly slower in the intentionally slow condition. RT measures in the Slow condition also demonstrated abnormally high range scores. **CONCLUSIONS:** There are at least two primary ways to detect if someone is cheating on the CalCap: 1) abnormally slow reaction-times, beyond what is expected even in pathological conditions and 2) high variability in the responses, this indicates inconsistency when subjects attempt to intentionally prolong their reaction times.

Means	SRT	CRT	SQRT1	SQRT2
Fast	260±27	367±27	440±70	504±105
Slow	1203±686*	625±147*	688±136*	717±118*

Range	SRT	CRT	SQRT1	SQRT2
Fast	191±89	195±66	390±131	602±72
Slow	1386±871*	489±207*	382±101	477±120†

* p<0.05 vs Fast (Slow condition is significantly less)

† p<0.05 vs Fast (Slow condition is significantly greater)

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33. Correlates of Physical Functioning in Older Adults

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Background: Physical functioning (PF), commonly described as a dimension of health-related quality of life, may influence the ability of older adults to participate in activities of daily living. An understanding of the factors that influence PF in older adults is critical to developing effective intervention strategies to improve overall quality of life for this population. Methods: In this observational study, 114 older adults (mean age = 77.4 ± 7.8 yrs, mean BMI = 27.2 ± 4.9) from the Phoenix area volunteered to complete a self-administered questionnaire. Physical activity was determined using the Physical Activity Scale for the Elderly (PASE). Body mass index (BMI) was determined by self-reported height and weight, and PF was assessed by the Medical Outcomes Study Short-Form-36. Gender differences were examined by independent t-tests (mean ± S.D.) and correlations were determined by bivariate and multivariate regression analysis (reported as standardized β coefficients, p-values). Results: Older adult men (N = 46) have better PF than older adult women (68.0 ± 20.7, 59.1 ± 25.1, respectively, p < 0.05). Self-reported levels of physical activity were not related to PF. Body Mass Index (β = -0.419, p < 0.001), age (β = -0.253, p = .005), and gender (β = -0.178, p = 0.04) were independently associated with PF (model R² = 0.260), when adjusting for disease status, smoking, and the PASE score. Gender, age, and BMI explain 26 % of the variation in PF in older adults; however, obesity is the strongest predictor. Conclusion: Gender, age, and BMI are independently associated with physical functioning in older adults. Older, obese women may have reduced physical functioning, which may have an impact on activities of daily living. Additional research is warranted to address the assessment of these factors when designing appropriate intervention strategies for this target population.

34. Is Physical Activity Reported by Questionnaire Related to Musculoskeletal Fitness Values in a Group of Spanish Active Women?

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Sedentary lifestyle is a critical behavioral factor that must be avoided to maintain health status in the general population. Oppositely, improvements in musculoskeletal fitness (MF) are a well recognized as having a positive influence on health, especially in sedentary women. The purpose of this study is to analyze the potential positive relationship between Physical Activity (PA) reported by questionnaire and the MF levels in a group of physically active Spanish women. The study sample was composed of 363 physically active women (with more than 6 months of attendance in a fitness center, three times per week). Participants were classified as apparently healthy based on their responses to the PAR-Q (Thomas et al., 1992), and had completed the Physical Activity & Health Questionnaire (Paffenbarger et al., 1993). After completing the questionnaires, the women's musculoskeletal fitness levels were assessed with the protocols and specific tests included in the Eurofit Fitness Tests Battery for Adults (Oja, Tuxworth, 1995), which includes: the trunk lateral flexion test, the sit-and-reach test, the hand-grip test, the CMJ test and the flexed-arm hang test. The measures of PA reported in the questionnaire were: mean daily distance walked, walking pace, stairs climbed daily, number of sports practiced the previous year, the perceived effort during the PA practice, and most importantly the time spent in vigorous activities during the week and during weekends. The results obtained have shown no significant relationships between the MF levels (flexibility, strength, muscular endurance or power) and any of the PA measures reported by the participants using the Physical Activity & Health Questionnaire (Paffenbarger et al., 1993).

35. Ethnic Differences in Bone Mineral Density of College Age Students

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The purpose of this study was to examine the ethnic differences in bone mineral density (BMD) of college age students. One hundred and eight male and female students were recruited from a variety of classes. Four ethnic groups were considered including: white, Asian, black, and Hispanic. Descriptive statistics presented as means \pm SD

Ethnicity	Age (yrs)	BMI (kg/m ²)	% fat	BMD (g/cm ²)
White (n=42)	24.36 \pm 3.51	25.87 \pm 4.13	33.72 \pm 11.18	1.217 \pm .110
Asian (n=12)	21.58 \pm 2.87 $\dagger\dagger$	22.81 \pm 2.92 \dagger	31.78 \pm 10.45	1.138 \pm .064*
Black (n=18)	23.00 \pm 2.38	28.03 \pm 5.04	35.14 \pm 11.45	1.272 \pm .144
Hispanic (n=36)	23.06 \pm 4.57	27.62 \pm 6.32	36.07 \pm 10.38	1.179 \pm .080*

*significantly different from black $p \geq .05$

\dagger significantly different from black and Hispanic $p \geq .05$

$\dagger\dagger$ significantly different from whites $p \geq .05$

Hispanics and Asians had a significantly lower BMD than blacks. When examining the differences by sex, the same difference existed in males. However, for the BMD of females alone, blacks were significantly different from Asians and whites but not Hispanics. Asians had a significantly lower Body Mass Index (BMI) than blacks and Hispanics partially explaining some of the difference in BMD.

36. Dehydration and Fluid Shifts Do Not Accompany the Metabolic Abnormality That Exists in Chronic Fatigue Syndrome

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A reduction in peak oxygen consumption (VO₂ max) between two maximal exercise tests administered over a two-day period has been suggested as a metabolic abnormality that is unique to chronic fatigue syndrome (CFS). The reduction in VO₂ max of 27% observed in preliminary studies may be due to lowered blood volume from either dehydration or abnormal fluid shifts resulting from the first bout of exercise. **PURPOSE:** The purpose of this study was to assess fluid volume before and after two exercise tests to determine if the metabolic abnormality is accompanied by dehydration or abnormal fluid shifts. **METHODS:** Ten (n=10) women with CFS performed two cardiopulmonary exercise tests to maximal exertion separated by 24 hours. They were separated into two groups based on at least 8% reduction in peak VO₂ on the second test. Fluid volumes were obtained by multispectrum bioelectrical impedance before and after each exercise bout.

RESULTS: All subjects reached criteria for maximal effort on both exercise tests. Six of the 10 subjects demonstrated reductions of at least 8%, four subjects did not (-11.6 \pm 2.2% versus 4.8 \pm 13.3%; F=8.55, $p < 0.05$). There were no significant differences between the absolute values of either test 1 or test 2 for pre- and post-exercise for total body water (test 2 values for pre-ex: 34.8 \pm 7.8 vs. 35.05 \pm 2.9 and post-ex; 34.5 \pm 7.6 vs. 34.9 \pm 2.9), intracellular fluid (test 2 values for pre-ex: 20.7 \pm 1.5 vs. 21.1 \pm 0.9 and post-ex; 20.6 \pm 1.4 vs. 21.0 \pm 0.9), or extracellular fluid (test 2 values for pre-ex: 14.1 \pm 4.4 vs. 13.95 \pm 2.04 and post-ex; 13.9 \pm 4.4 vs. 13.9 \pm 2.1). There were also no differences in the changes between test 1 and test 2 in any of the fluid measures. **CONCLUSION:** These results indicate that the significant reductions in exercise performance and oxygen consumption during the second exercise test are not due to alterations in vascular volume or fluid shifts.

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37. Fibrinogen and Peripheral Artery Disease in US Adults: The 1999-2002 NHANES

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Background: Whether fibrinogen relates to peripheral artery disease in a large US population remains less clear. **Objectives:** We investigated the association between fibrinogen and peripheral artery disease in 2543 US men and women aged 40 to 85 years from the National Health and Nutrition Examination Survey (1999-2002). **METHODS:** Systolic blood pressures were measured at the brachial and posterior tibial vessels, and ankle-brachial index (ABI) was calculated as ankle systolic blood pressure divided by brachial systolic blood pressure. Peripheral artery disease (PAD) was classified as ABI < 0.9 . Fibrinogen was measured by the STA-compact (the Clauss clotting method). Multivariate logistic regression models were used to investigate the association between fibrinogen and PAD after adjustment for age, sex, race, and other multiple risk factors, respectively. The lowest fibrinogen quartile (< 314 mg/dL) was the reference category. **RESULTS:** After adjustment for age, sex, and race, there was a direct association between fibrinogen and PAD (p for trend < 0.001). The odds ratio of having PAD for persons in the highest fibrinogen quartile (≥ 412 mg/dL) was 6.21 (95% CI: 2.58, 14.98) as compared with persons in the lowest fibrinogen quartile. These associations persisted after additional adjustment for multiple risk factors (education, cigarette smoking, alcohol intake, body mass index, high-density lipoprotein and total cholesterol, hypertension, and diabetes mellitus). The odds ratios of having PAD across fibrinogen quartiles were 1.00 (referent), 1.94 (95% CI: 0.73, 5.12), 2.51 (95% CI: 0.95, 6.65), and 5.05 (95% CI: 2.00, 12.71) (p for trend < 0.001). Men and women who had the highest fibrinogen quartile had a 5 times higher odds of having PAD as compared with those who had the lowest quartile of fibrinogen.

CONCLUSIONS: We conclude that increased levels of fibrinogen are associated with development of peripheral artery disease in U.S. men and women.

38. Is Balance a Limiting Factor in Athletic Performance?

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The increasing popularity of using unstable surfaces to improve the performance of both competitive and recreational athletes is based primarily on anecdotal evidence. The empirical evidence concerning the effectiveness of these training modalities has been equivocal, and to our knowledge the relation between balance and athletic performance has yet to be established. The objective of this study was to determine this relation, using overall sway (OS) as measured by the Biodex Stability System as a measure of balance and 10 yard (9.144 m) shuttle run time (RT) as a measure of athletic performance. Anthropometric data were collected on 100 healthy men and women (ages 18-30), who then completed both activities during the same testing session. Pearson product moment correlations were used to quantify the relation between RT (in seconds) and OS (in degrees). No significant relation existed between OS and RT when controlling for age ($R^2 = .006$; $p = .944$), gender ($R^2 = .004$; $p = .587$), height ($R^2 = .002$; $p = .587$), weight ($R^2 = .003$; $p = .646$), BMI ($R^2 = .0002$; $p = .890$), or all of the above variables collectively ($R^2 = .0004$; $p = .855$). The low correlations between balance and athletic performance suggest that balance may not limit athletic performance when it falls in a "normal" range. Improved performance following balance training may be due to indirect factors, such as eccentric strength gains. Further investigation is necessary to clarify the role of balance training in improving athletic performance.

40. Nasal Acoustic Rhinometry Does Not Detect Differences in Sympathoadrenal Activation in Chronic Fatigue Syndrome

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Patients with Chronic Fatigue Syndrome (CFS) have lower oxygen consumption than sedentary controls (CON). Alterations in autonomic nervous system activity may contribute to the lower oxygen consumption observed in CFS. These alterations have been documented but not well described. Thinning of the nasal mucosa and resultant increase in nasal cross sectional area (NCSA) is an indicator of normal sympathetic response to exercise. Nasal acoustic rhinometry (NAR) may provide a tool to detect alterations in this response. **PURPOSE:** The purpose of this study was to determine: 1) The efficacy of NAR as an index of the sympathoadrenal activation during an exercise challenge. 2) If there are differential NCSA responses to an exercise challenge in CFS patients. **METHODS:** CFS patients (CFS; $n=20$) and sedentary control subjects (CON; $n=17$) performed a graded exercise test to maximal exertion. NAR was used to determine NCSA on both nostrils immediately before and within 15 minutes post exercise. The NCSA results were combined for both nostrils for comparison of the overall response. **RESULTS:** CFS patients had lower peak VO_2 than CON (24.68 ± 5.26 vs. 31.56 ± 5.20 ml/kg/min $F=15.8$; $p<0.01$). There were no differences in combined NCSA between CFS (-0.57 ± 5.08 cc) and CON (0.07 ± 4.3 cc). Within each group subjects were then assigned to either an increased or decreased NCSA subset. Again no differences in NCSA were observed between CFS and CON, nor did peak heart rate or ventilation differ for NCSA within the groups. **CONCLUSIONS:** Despite the significantly lower peak oxygen consumption in CFS patients, no differences in NCSA were observed. Because neither group demonstrated expected increases in NCSA, too much time may have elapsed between the end of the exercise bout and when NCSA was determined. Studies are currently being undertaken where NCSA is determined immediately after exercise.

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39. Acute Effects of Whole Body Vibration at Different Frequencies on Sit and Reach Test

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The aim of this study was to examine the acute effects of Whole Body Vibration (WBV) at different frequencies on the sit and reach (SR) test in subjects with good to poor flexibility (≤ 33 cm). Fifty-three undergraduate students (8 women and 45 men; mean age 22.5 ± 1.4 years; mean height 174.9 ± 8.9 cm; mean weight 74.0 ± 12.8 kg) participated in this study. The subjects were randomly assigned to one of five different groups: no WBV (control group) and 20, 30, 40 and 50 Hz WBV frequencies. WBV treatment was administered while standing on a vibrating platform (Nemes Bosco-system, Rome, Italy) with knees bent at 100° . The amplitude administered by the vibration platform was (peak to peak) 4mm. The WBV treatment consisted of 2 series of vibration each consisting of 60 seconds of vibration. Immediately prior to and following the 2 series of WBV training, each with 60 seconds rest, the subjects participated in SR test assessment. The results show that WBV groups had a larger increase on the SR test as compared to the control group. Additionally, although there was no significant difference between groups, the 30 Hz WBV group (2.13 ± 2.64 cm; $\Delta +161\%$) showed superior increase versus WBV groups 20 Hz (1.18 ± 2.69 cm; $\Delta +44\%$), 40 Hz (2.03 ± 1.67 cm; $\Delta +148\%$) and 50 Hz (1.65 ± 1.59 cm; $\Delta +101\%$) versus the control group (0.81 ± 1.30 cm). These results suggest that WBV training, especially 30 Hz and amplitude 4 mm, have a positive effect in hamstring and low back flexibility.

41. Cardiovascular, Metabolic, and Perceptual Responses to Backward and Forward Walking in Water

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The purpose of this study was to compare the physiological and perceptual responses, and stride characteristics while walking backward in water with those observed while walking forward in water, with and without a water current. Eight healthy males volunteered as subjects for the study. The subjects underwent the trials utilizing an underwater treadmill. Oxygen uptake (VO_2), respiratory exchange ratio (R), heart rate (HR), minute ventilation (VE), blood lactate concentration (BLa), ratings of perceived exertion (RPE: for breathing and legs, RPE-Br and RPE-Legs, respectively), blood pressure (for systolic and diastolic pressures, SBP and DBP, respectively), and stride frequency (SF) were measured. Additionally, VO_2 per SF (VO_2/SF) and stride length (SL) were calculated. The VO_2 , R, HR, VE, BLa, RPE-Br, RPE-Legs, VO_2/SF , and SBP were significantly higher while walking backward in water than when walking forward in water for every experimental condition ($P<0.05$). The RPE-Legs was significantly higher than RPE-Br while walking backward in water ($P<0.05$). Both in forward and backward walking in water (both with and without a current), the VO_2 -HR ($P<0.001$), VO_2 -walking speed ($P<0.001$), and HR-walking speed ($P<0.001$) relationships were significantly correlated. Furthermore, the SF was significantly higher ($P<0.001$) and the SL was significantly lower ($P<0.001$) while walking backward in water, compared to walking forward in water, both with and without a water current. These results indicate that walking backward in water elicits higher physiological and perceptual responses than those produced when walking forward in water.

42. A Novel Exercise Intervention to Alleviate Lower Back Pain

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The purpose of this investigation was to explore the efficacy of a retrolocomotion intervention program to alleviate Lower Back Pain (LBP) in the athletic population. Athletes with self-reported LBP ($n=5$; 21.2 ± 5.1 yr) volunteered to participate in supervised intervention sessions tri-weekly for three weeks. Sessions consisted of walking backward on a treadmill at preferred pace for fifteen minutes per session. Self reported pain rating and preferred retrolocomotion velocity (RV) were recorded pre and post intervention. Uniaxial accelerometers (1000 Hz) secured bilaterally on the distal tibia and forehead were implemented to measure IA where $IA = [1 - (\text{Head Peak}/\text{Leg Peak} \times 100)]$. A biaxial electrogoniometer (1000 Hz) was implemented to obtain sagittal and coronal range of motion (ROM) of the lumopelvic region (T12-S2) between right leg strides. Dependent t-tests were used to evaluate pre-post self-reported pain rating, RV, and lumbopelvic ROM. A 2×2 (time \times limb) repeated measures ANOVA was utilized to evaluate bilateral IA. Level of significance was set at $p \leq 0.05$ for all statistical comparisons. Results identified a significant decrease in self-reported pain rating (pre= 3.2 ± 1.3 , post= 1.0 ± 0.5 , $p=0.004$) and a significant increase in RV (pre= 1.12 ± 0.13 , post= 1.39 ± 0.11 m/s, $p=0.003$) with no significant differences in IA or ROM. Due to observed varied individual subject responses, a single subject analysis was performed *post-hoc*. A significant increase in sagittal (pre= $11.78^\circ \pm 1.89^\circ$, post= $16.53^\circ \pm 1.83^\circ$) and coronal (pre= $10.86^\circ \pm 1.32^\circ$, post= $17.50^\circ \pm 1.57^\circ$) ROM for 3 of 5 subjects was observed. A significant decrease in IA = (pre = $63.24\% \pm 8.82\%$, post= $46.04\% \pm 9.90\%$, Mean Diff. = 17.20%) for 4 of 5 subjects was observed. The decrease in IA post-intervention may be an indirect measure of a decreased potential of impact energy absorbed within the lower back and a reduction in potential axial loading of the lumbar spine. These results suggest that retrolocomotion intervention may serve as an alternative exercise/rehabilitation modality for assisting some athletes to cope with LBP.

44. Powercranks Versus Normal Bicycle Cranks: An EMG Comparison

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Powercranks are an independent bicycle crank system that eliminates contralateral leg contribution during the pulling phase of the crank cycle. As such, Powercranks are thought to activate and thus train the hip and knee muscle flexors to a greater extent than pedalling with normal cranks. Our study examined if the hip and knee flexors were in fact more active during pedalling with Powercranks than normal cranks. Eight participants randomly performed 5 min exercise bouts using Powercranks and normal cranks while surface EMG activity of muscles iliopsoas, rectus femoris, biceps femoris, and lateral gastrocnemius were recorded during stationary ergometry. EMG data were collected 1 week after cessation of a 6 week Powercrank training program. Raw EMG data for each muscle were analyzed by first computing the average root mean square (RMS) for ten crank cycles and then normalizing the mean RMS value to the peak RMS value for each muscle. Results revealed that muscles iliopsoas and rectus femoris were 31% and 35% more activity, respectively, during the Powercrank than normal crank condition ($p = 0.001-0.017$). Muscles biceps femoris and lateral gastrocnemius were not different between conditions ($p > 0.05$). From these results it may be concluded that after familiarization, pedalling with Powercranks requires greater muscle activation from hip flexor but not knee flexor muscles suggesting that pedalling with Powercranks may be a more effective exercise for the hip flexor muscles than pedalling with normal cranks.

43. Kinematics and Muscle Activity Patterns during Running on Concrete and Sand

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The net energy cost differences associated with running on a variety of surfaces has been studied (Pinnington and Dawson, 2001; Lejeune *et al*, 1998). However, the kinematic and muscle activity changes related to these different surfaces are not well understood. **Purpose:** To investigate the kinematic and electromyographic differences of running on a solid surface (concrete) and on a softer surface (sand). **Methods:** 10 fit college students (5 male, 5 female) were asked to run at a full effort sprint on flat concrete and on sand with at least two full strides being in the collection area. EMG data was collected on four lower extremity muscles while digital video data was collected at 60 Hz. Two-dimensional kinematic data were obtained using an 18 point spatial model created by manually digitizing the subjects. Hip, knee and trunk angles and EMG activation patterns were compared between the two surface conditions between subjects. **Results:** No significant differences were found for the maximum value of the hip, knee or trunk angle during a stride. At contact, the sand condition mean was larger than the concrete condition for all three measurements, but not significantly different. At takeoff, the trunk angle was significantly different ($p = 0.03$) between the two conditions. The hip and knee angles were not significantly different at takeoff. During the sand trials, the semitendinosus illustrated greater activation, especially right after foot contact. In contrast, the gastrocnemius showed a delay in its activation and less activation during these trials. The tibialis anterior showed an overall decrease in activation with greater activation prior to touchdown. The vastus lateralis showed the least variation with nearly uniform activation patterns for both trials. **Conclusions:** Clearly differences were found, but it is not clear that, with practice, these differences would be found or if these differences are potentially harmful.

45. Vertical Jump is Significantly Correlated with Maximal Isometric Force

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Many studies have used the vertical jump to measure maximum power output. The purpose of this study was to investigate the correlations between vertical jump and maximum isometric force, high-pull peak velocity of 30% isometric MVIC, high-pull rate of velocity development (RVD), and rate of force development (RFD). Twenty healthy college-aged kinesiology students participated in this study (age: 23.20 ± 1.50 years; height: 174.91 ± 7.80 cm; weight: 76.98 ± 20.72 kg). Subjects were required to attend two sessions with 48 hours of rest in between. Session 1: subjects performed 3 maximal isometric pulls with 1 minute rest between repetitions. Subjects performed the pulls inside a power rack while standing on a force plate. Session 2: subjects performed 3 maximal high-pulls with 30% of their MVIC from session 1 with 1 minute rest between repetitions. In addition, subjects were instructed to perform 3 maximal countermovement vertical jumps with arm swing on a force plate with 15 seconds rest between repetitions. Pearson r correlation was used to calculate relationships between these variables. There were no significant ($p < 0.05$) correlations between vertical jump and high-pull peak velocity of 30% MVIC ($r = 0.19$, $p=0.41$), high-pull RVD max ($r = -0.12$, $p=0.61$), or RFD max ($r = -0.02$, $p=0.92$). Vertical jump was significantly correlated to maximum isometric force ($r = 0.67$, $p < 0.001$). The weak correlations between vertical jump and high-pull RVD may be explained by the different resistance levels of each exercise (max vs. 30%). In addition, the isometric pull uses explosive lower body strength only, while the high-pull uses both lower and upper body strength. In conclusion, subjects who have greater isometric strength tend to jump higher than subjects who produce less strength.

46. Integrative Framework Increases Physical Activity Among University Students

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The National College Health Assessment indicates that 56% of university students fail to engage in 30- to 60-min of physical activity (PA) on all or most days of the week. The U.S. Centers for Disease Control advocates the integration of community resources to enhance outcomes from public health promotion programs. Therefore, we evaluated the efficacy of an integrative framework to promote increased PA on an ethnically diverse University campus. Participants registered for a 10-wk incentive-based Wellness Challenge. Criteria for completion included attendance at 3 wellness-related campus activities posted on the University's online calendar and engagement in at least 10 small self-reported behavior changes from a list provided (e.g., park further away from your destination for 1 wk). Moreover, participants received a circular slide chart with campus walking routes and the number of calories burned from walking at three different speeds specific to their body weight. Those that met completion criteria were entered into a drawing for a cruise and other prizes. Campus departments and organizations implemented all activities on the activity calendar. Attendance at calendar activities was verified with sign-in sheets. From a campus of 21,098 undergraduate/graduate students, 1384 enrolled and 155 completed the Challenge (men = 22%/women = 78%; age = 22.5 ± 3.6 yrs; BMI = 24.8 ± 4.9). Pre- vs. post-Challenge analysis with dependent t-tests and χ^2 analysis were performed on parametric and non-parametric data, respectively. We observed self-reported improvements ($p < 0.01$) in general health, number of days-wk⁻¹ of endurance exercise (↑ 0.75 days), and number of days-wk⁻¹ of resistance exercise (↑ 0.34 days). Those completing the challenge also increased their use of campus pathways for walking/running (↑ 26%, $p < 0.01$). We conclude a program integrating resources on a campus can evoke small positive increased PA levels. Research on the efficacy of longer, large-scale programs on direct health indicators is needed.

48. Acute effects of a thermogenic nutritional supplement on energy expenditure and cardiovascular function at rest, during low-intensity exercise, and recovery from exercise

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The purpose of present study was to examine the acute effects of a thermogenic nutritional supplement on energy expenditure (EE) and cardiovascular function at rest, during low-intensity exercise, and recovery from exercise. Twenty-eight healthy sedentary participants [mean ± SD age = 22.3 ± 1.9 years, height = 172.8 ± 10.3 cm, and weight = 72.2 ± 15.7 kg] volunteered this randomized, double-blinded, placebo-controlled, cross-over study. Each experimental trial was divided into 4 phases: (a) 30 min of initial resting, followed by ingesting of the placebo or the thermogenic nutritional supplement, (b) 50 min of post-supplementation resting, (c) 60 min of treadmill walking (3.2 to 4.8 km/hr), and (d) 50 min of post-exercise recovery. Gas exchange parameters measured by indirect calorimetry and heart rate (HR) were recorded during all 4 phases, blood pressure was only measured at rest, and rating of perceived exertion (RPE) was only recorded during exercise. EE and oxygen consumption rate ($\dot{V}O_2$) were greater for the supplement than the placebo at 50 min after supplementation. Also during the post-supplementation period, diastolic blood pressure (DBP) was higher at 30 and 45 min, while the respiratory exchange ratio (RER) was higher at 20 and 30 min for the supplement. During the exercise, only EE, $\dot{V}O_2$, HR, systolic blood pressure (SBP), and DBP were all greater for the supplement than the placebo. These findings indicated that the thermogenic nutritional supplement increased resting EE and exercise $\dot{V}O_2$ with only minimal effects on blood pressure and HR, and no meaningful effects on RER or RPE. These results suggested that the combination of thermogenic ingredients in this nutritional supplement may be useful to help maintain a negative caloric balance, but may not influence substrate utilization or perceived exertion.

47. Acute effects of capsule stretching: are they mediated by optimum angle of external torque?

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Baseball pitchers are susceptible to glenohumeral internal rotation deficit and the sequelae of associated injuries. Chronic improvement in internal rotation range of motion (IRROM) has been observed in response to regular capsular stretching (CS) programs. Less is known about the acute effects of CS and if these effects are confined to the capsule per se. Therefore, we examined the acute effects of no CS vs. CS after 15, 30, and 45 pitches (~70 mph) in nine collegiate pitchers. Active and passive IRROM following warm-up, CS, and each set of pitches were evaluated with an electric inclinometer whereas passive stretch force was measured with an electronic dynamometer. Separately, optimum angle of external torque was determined on each arm via isokinetic testing (60 °/sec). Optimum angle has been reported as a predictor of strain response to active stretch in muscle. By correlation, we evaluated if a bilateral index of optimum angle (dominant minus non-dominant arm) influenced acute change in passive IRROM in response to CS. Analyses of variance with repeated measures were used to test for significant differences. Despite a trend for acute response, measures of IRROM between no CS vs. CS and pitch number were not different and passive stretch force was unaffected ($p > 0.05$). Correlations between the bilateral index and changes in passive IRROM were moderately positive (r values of 0.30, 0.51, and 0.41 for 15, 30, and 45 pitches, respectively). We assert that the heterogeneity of our sample, with respect to optimum angle, prohibited us from observing positive effects on IRROM and passive stretch force; however, heterogeneity enabled us to support the hypothesis that a longer optimum angle mediates the extent to which external rotator cuff muscles respond acutely to CS. As such, we conclude that CS is not confined to stretching capsule, as the name implies.

49. The Slope of the $\dot{V}O_2$ -Speed Relationship during Walking and Running is Positively Correlated to $\dot{V}O_{2\text{Peak}}$ in Healthy Males and Females

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A positive relationship has been shown between peak oxygen uptake ($\dot{V}O_{2\text{peak}}$) and $\Delta\dot{V}O_2/\Delta$ work rate during cycle ergometry (Mallory et al., Med. Sci. Sports Exerc., 34: 1279-1287, 2002), indicating that fitter persons demonstrate reduced "delta" efficiency during cycle ergometry. We examined the relationship between $\dot{V}O_{2\text{peak}}$ and $\Delta\dot{V}O_2$ during walking and running in healthy men and women. Nineteen males (age 26.4 ± 6.4 yr.; ht: 179.9 ± 7.2 cm; wt: 77.7 ± 8.7 kg; % fat: 16.3 ± 7.3) and 21 females (age 25.6 ± 4.9 yr.; ht: 167.2 ± 5.4 cm; wt: 61.6 ± 7.7 kg; % fat: 24.0 ± 6.8) underwent two separate exercise sessions on different days consisting of level-grade treadmill walking at 2.0 mph (54 m/min), 3.0 mph (80 m/min), and 4.0 mph (107 m/min), and running at 6.0 mph (161 m/min). Subjects exercised for 5 min at each velocity, with 3 min rest in between each exercise bout. Pulmonary ventilation and gas exchange were measured breath-to-breath each min of the test. The average $\dot{V}O_2$ obtained during the last two min of exercise for both exercise sessions was used to determine $\Delta\dot{V}O_2$. $\dot{V}O_{2\text{peak}}$ was assessed during an inclined walking treadmill test. When using data from both walking and running trials combined, $\Delta\dot{V}O_2$ was positively correlated with $\dot{V}O_{2\text{peak}}$ ($y=0.053x + 3.43$; $r^2 = 0.30$; $P < 0.001$). For walking speeds alone, $\Delta\dot{V}O_2$ was also positively correlated with $\dot{V}O_{2\text{peak}}$ ($y=0.038x + 2.90$; $r^2 = 0.14$; $P = 0.017$). These results are consistent with the findings for cycle ergometry and suggest that the more aerobically fit the subject, the greater the increase in oxygen cost as walking/running speed increases. The mechanism for the reduced "delta" efficiency among fitter persons during treadmill walking and running is unknown. Supported in part by R21 CA112323-01A1 and an NIH grant to the GCRC RR00847

50. Actigraphy and Heart Rate Monitoring for Characterization of Post-Exertional Malaise in Chronic Fatigue Syndrome

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Post-exertional malaise (PEM) is an important criterion for the diagnosis of Chronic Fatigue Syndrome (CFS) and a difficult symptom for patients with the illness to manage. Characterization of PEM is challenging because of reliance on self-report measures from the patient. **PURPOSE:** To utilize objective measures to characterize the phenomenology of PEM. **METHODS:** An Actiheart® device was attached to two subjects (one CFS patient and one sedentary control subject) at least 48 hours before undergoing a standardized physical stressor (two maximal exercise tests over two days). The Actiheart device was attached for at least 48 hours after the exercise tests. Activity counts (AC) and energy expenditure (EE) were obtained pre- and post-exercise during sedentary (SED), light (L), moderate (M) and heavy (H) activity. **RESULTS:** The CFS patient showed large decreases in AC (SED; -3%, L; -28%, M; -50%, H; -16%) and EE (SED; -67% L; -56%, M; -80% and H; -92%) in the post exercise state compared to the pre-exercise state. The control subject showed moderate increases in both AC (SED; 2%, L; 9%, M; 27% H; N/A) and EE (SED; 28%, L -28%, M; 24%, H; 14%) in the post-exercise state. Paradoxically, the pre-exercise to post-exercise comparison of the percent of time spent at each activity intensity was not different in the CFS subject. The heart rate recordings between subjects and conditions differed by less than 6%. **CONCLUSIONS:** An exercise stressor may provide a valuable paradigm for studying PEM in CFS. The large reductions in EE and AC may provide objective evidence for PEM in the CFS patient. The differential response in AC and EE between the CFS patient and the control patient shows that the phenomenology of the response is different in CFS as compared to a sedentary individual.

52. Prediction of Peak Anaerobic Power from Physiological Parameters of the Lower Extremities

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Much research has examined the relationship between neuromuscular and metabolic determinants of anaerobic capacity; however, minimal research has investigated the physiological aspects of peak power generation. The purpose of this study was to examine the association between maximal anaerobic power and multiple physiological parameters of the lower extremities, including leg length (cm), leg lean mass (%), and bone mineral density (BMD). Seventeen men aged 19 - 29 years participated in this study. Seven subjects participated on the college track team and had two or more years of sprint-based training. The other 10 subjects were recreationally-active. BMD, lean, and fat mass of the lower extremities were assessed from a whole body scan using dual-energy x-ray absorptiometry (DXA, GE Lunar Prodigy Advance). Anaerobic power was assessed using the 30-second Wingate Anaerobic test (WAnT, Monark Model No. 894E, Sweden). Average peak power was equal to 11.18 ± 1.27 W/kg. Stepwise linear regression was used to examine predictors of anaerobic capacity. A significant correlation ($r^2 = 0.35$, $p < 0.05$) occurred between the percentage of leg lean mass and relative peak power. When all three independent variables were used as predictors of peak power, the following linear regression equation was obtained ($r^2 = 0.55$, $p < 0.05$): Peak Power = $0.081(\text{leg length}) + 3.158(\text{avg leg BMD}) + 7.457(\text{avg leg lean \%}) - 7.426$. Data support our hypothesis in that leg length, leg lean total tissue percent, and leg BMD, as a whole, are significant predictors of anaerobic power and capacity.

51. Body segment and coordination pattern effects on release velocity values in throwing

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It is known that many body segments contribute to the velocity produced during high velocity throwing. Additionally, specific coordination patterns during a throw clearly impact the final ball velocity. The connection between these two factors merits further study. **Purpose:** Identify the impact of various throwing positions on a subject's ability to generate velocity. **Methods:** Ten male college students with throwing experience were recruited to throw a standard baseball with their dominant (D) and non-dominant (ND) hand in 3 conditions: while sitting with trunk and non-throwing arm constrained (SIT), standing with no step (NS) and throwing without restrictions (WR) with maximal velocity as the goal. Coordinate data was collected at 120 Hz for 13 points using a 6-camera Vicon Peak motion system. Velocity, shoulder and elbow angles were analyzed at release. **Results:** As expected, there was a significant main effect for hand ($p = 0.008$) and for condition ($p = 0.000$), but no interaction for velocity. The value for SIT was significantly different than for NS or WR. This difference in velocity was accompanied by differences in the elbow and shoulder angle at release. The elbow illustrated a main effect for side ($p = 0.000$), not condition and an interaction ($p = 0.003$). The elbow was less extended in the ND condition (mean = 120.2° versus 137.9°). The greatest difference in conditions occurred for the NS condition where the mean elbow angle was 142.6° for D and 112.5° for ND. The shoulder showed a main effect for side ($p = 0.008$) and for condition ($p = 0.000$) with no interaction. The ND throws had a smaller angle than the D throws. **Conclusions:** The results show that a decrease in body segments available to produce distal endpoint velocity does decrease the velocity produced. However, the coordination patterns are also extremely influential.

53. The Effect of Core Exercises on Transdiaphragmatic Pressure

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Abdominal exercises are traditionally used to strengthen the core muscles for better balance, coordination and ability to perform acts from those of daily living to intense exercise. They also, however, compress the abdomen, and likely lead to increased diaphragm work. The objective of this study was to evaluate the transdiaphragmatic pressures produced by performing thirteen specific abdominal exercises. Thirteen different exercises were examined with a variety of difficulties ranging from what was perceived as very easy (sit-and-reach) to difficult (double leg lift). Six healthy subjects, aged 22 to 53 participated. Each subject had two balloon-tipped catheters inserted to obtain gastric and esophageal pressure, from which transdiaphragmatic pressure was calculated. The subject performed a maximal inspiratory pressure (MIP) and three sniff maneuvers to get peak attainable pressures prior to performing the exercises. Resting pressure was also measured. The exercises were performed from least to most difficult for five repetitions each and the peak pressure for all five repetitions was averaged for each exercise. There was a significant difference between the exercises and maximal pressures, as well as between exercise and resting pressures ($P < .001$). There were three different levels within the exercises illustrating three categories of pressures. It was found that seven of the exercises produced pressures 50% of MIP or higher, which would likely provide a training stimulus to the diaphragm if used as a respiratory exercise. These measurements of pressure provide insight on the extent to which the diaphragm is recruited during different abdominal exercises.

54. The Effects of Pursed Lip Breathing Under Hypoxic Conditions on Exercise Performance

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The purpose of this study was to determine the effects of pursed lip breathing (PLB) on time trial performance at an altitude of 4300m compared to spontaneous breathing in healthy male subjects. COPD patients use PLB to maintain oxygen saturation through increases in tidal volume and decreases in ventilation rate. SaO₂, heart rate, blood pressure and rate of perceived exertion (RPE) were also measured to determine if there is a difference between PLB and spontaneous breathing during a time trial at altitude.

Eight male subjects were used. No significant difference was found in time trial performance between PLB and spontaneous breathing at altitude (23.09± 1.98min and 22.92± 2.31min respectively). SaO₂ (76± 2% and 77± 3%), heart rate (159± 3bpm and 159± 5bpm), blood pressure (181± 4mmHg and 180± 4mmHg) and RPE (17± 1 and 16± 1) were not significantly different between PLB and spontaneous breathing time trials. However, significant differences were observed as work was completed for heart rate and RPE. A trend was also observed in decreasing SaO₂ as work was completed (p = 0.10). None of the patient spontaneously used PLB during the spontaneous breathing time trial.

PLB does not increase time trial performance at altitude. The physiological and psychological parameters were not changed by PLB during time trials at altitude. Decreases in ventilation rate and increases in tidal volume observed during PLB in COPD patients at rest may not have been present during exercise. Because exercise increases ventilation rate and tidal volume, benefits of PLB may have not occurred during the time trial. Minute ventilation, which is increased in PLB at rest, may not have been different for both breathing conditions during the time trial. Further investigation at altitude with ventilation measurements may better illustrate the role of PLB in SaO₂ maintenance and exercise performance.

56. Does Supramaximal Testing on the Cycle Ergometer Confirm Attainment of VO₂max in Untrained Subjects?

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The purpose of this study was to determine if supramaximal testing on the cycle ergometer confirms attainment of VO₂max in untrained subjects. Thirteen inactive subjects (6 men and 7 women, mean age, height, weight and VO₂max = 22.4±3.9 yr, 68.7±3.4 in, 157.8±34.9 lb, and 33.35±4.4 mL/kg/min, respectively) initially completed an incremental test to fatigue on the cycle ergometer. At least 24 h later, supramaximal testing at a workload equal to 105 %VO₂max was completed, and this test was repeated at least 24 h later. During exercise, gas exchange data were acquired using a metabolic cart and expressed every 15 s. Heart rate and rating of perceived exertion were recorded throughout testing. A paired t-test was used to compare the incremental and supramaximal VO₂max values, and Pearson's pairwise correlation was used to determine the reliability of supramaximal testing. Average VO₂max from incremental testing (33.35±4.4 mL/kg/min) was not different (p>0.05) from VO₂max via supramaximal testing (32.85±4.81 mL/kg/min). Test/retest correlation for supramaximal VO₂max and exercise time was significant, r (10) = 0.99, p<0.05 and r (10) = 0.90, p<0.05. Average RERmax from incremental testing (1.24±0.07) was lower (p<0.05) than during supramaximal testing (1.33±0.18). Average HR at VO₂max was slightly higher during incremental testing (191.2±13.1 b/min) compared to the supramaximal protocol (187.4±10.5 b/min). With no difference in VO₂max between protocols, and high test/retest reliability, we conclude that supramaximal testing can be used to confirm attainment of VO₂max in untrained subjects.

55. The Relationship Between Rate of Velocity Development and Rate of Force Development

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There has been a need for research investigating potential relationships between rate of force development (RFD) and rate of velocity development (RVD) since these measures are often concurrently evaluated while performing static and dynamic movements. The purpose of this study was to investigate relationships that might exist between these variables. Twenty kinesiology students participated in this study (age 23.20 ± 1.51 years, height 174.91 ± 7.79 cm, weight 76.98 ± 20.72 kg). Participants performed 3 repetitions of an isometric mid-thigh pull for determination of RFD, and 3 repetitions of a dynamic mid-thigh high pull at 30% of their MVIC for determination of RVD, on 2 separate days with 48 hours rest between. Relationships between RVD and RFD were made by comparing maximum RFD values and those measured at 50, 100, 150, 200, and 250 ms during the isometric pull to maximum RVD values measured in the dynamic high pull. In addition, maximum s-gradient values (half the time it takes to reach peak force) were also compared to maximum RVD values. Pearson r correlations were calculated to find any relationships. Results of this study demonstrated no significant (p<0.05) correlations between maximum RVD values at 30% MVIC and maximum RFD values (r=0.41; p=0.7) and values collected at 50 (r=0.03; p=0.91), 100 (r=0.08; p=0.73), 150 (r=0.03; p=0.91), 200 (r=-.04; p=0.88), or 250 (r=-0.06; p=0.81) ms. These findings may have resulted from 1) the different nature of the movements (isometric vs. dynamic), 2) neuromuscular variations in motor unit recruitment and activation, and/or 3) varying levels of sliding muscle filaments that occur when performing these movements. In conclusion, RFD and s-gradient values showed no significant relationship with maximum velocity values and may be poor predictors of maximum velocity when performing dynamic movements.

57. Adhesive Capsulitis and Dynamic Splinting: a Controlled, Cohort Study

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Study Design: Cohort, case series

Objectives: The purpose of this study was to examine the efficacy of dynamic splinting on adhesive capsulitis in a prospective, cohort study of patients diagnosed with Stage II Adhesive Capsulitis.

Background: Adhesive capsulitis is characterized by fibrosis, pain, and decreased range of motion (ROM) and, external rotation is the most frequently affected ROM.

Methods: This study examined the effect of the Dynasplint® shoulder system on patients diagnosed with stage II adhesive capsulitis in examination of cohorts grouped by treatment:

Group I; Control patients were only treated with cortical steroid injection(s) and self-directed "Home therapy" for 90 days before being prescribed further treatments.

Group II; Physical therapy exclusively for 90 days

Group III; Combined physical therapy and the Dynasplint shoulder system, 90 days.

Group IV; Dynasplint shoulder system exclusively, 90 days.

Results: There was a significant difference in the mean Active Range of Motion, Supine External Rotation between the control group and all treatment groups (p < 0.001, nested ANOVA). However there was not a significant difference between the treatment groups.

Conclusion: The lack of difference between groups suggests that all 3 methods were statistically equal in treating patients with stage II adhesive capsulitis in this study, and further investigation should be conducted to determine which protocols achieve increased range of motion the quickest for patients with this pathology.

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