

SOUTHWEST CHAPTER
AMERICAN COLLEGE OF SPORTS
MEDICINE

2009 ANNUAL MEETING



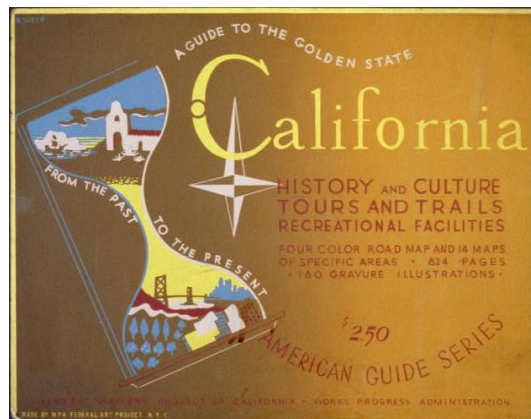
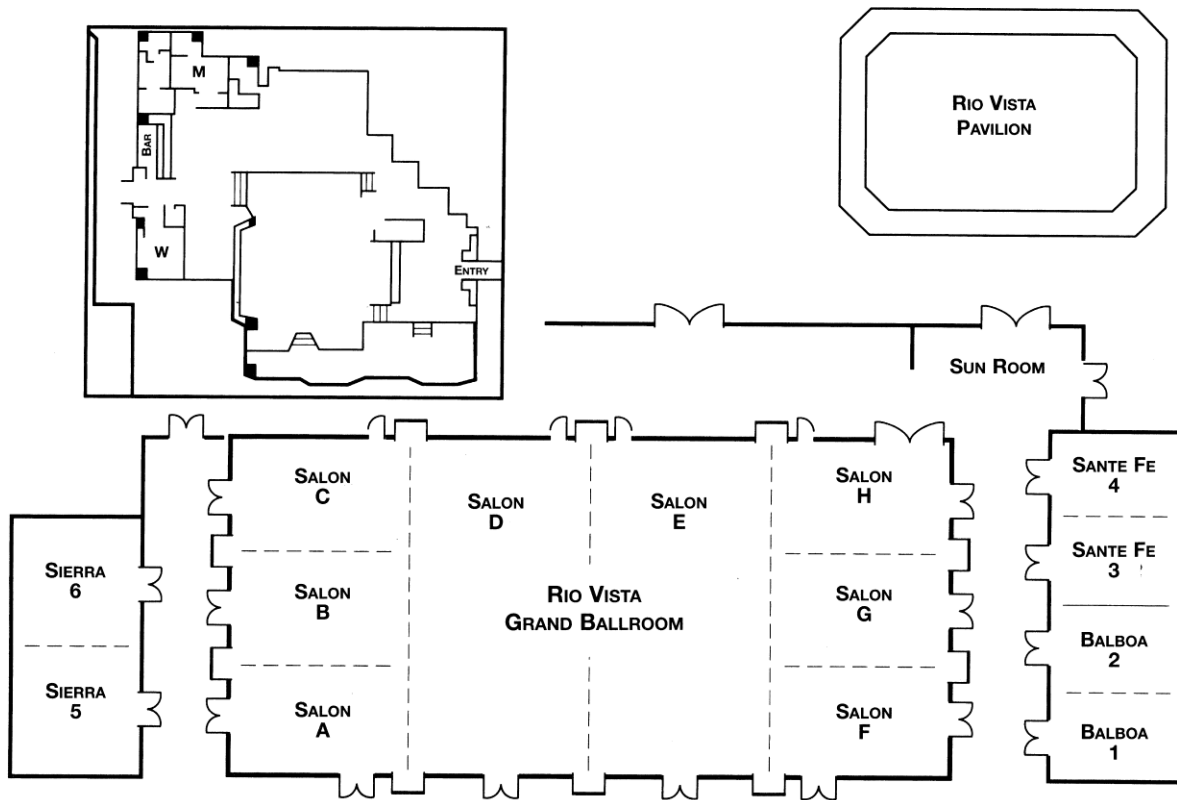
October 23-24, 2009

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

29th Annual Meeting

of the

Southwest Regional Chapter

of the

AMERICAN COLLEGE
of SPORTS MEDICINE SM

October 23-24, 2009

**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**

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The Southwest ACSM annual meeting has been approved for 14 Continuing Education Credits by the American College of Sports Medicine. There is no separate fee for CECs. Please retain the Certificate obtained at registration.

FRIDAY, 23 OCTOBER 2009

Registration **Rio Vista Grand Ballroom Foyer** **7:30 am – 4:00 pm**

Concurrent Colloquia **8:00 am – 9:15 am**

Research Ethics **Salon A**
Jim Pivarnik, Ph.D., FACSM, Michigan State University

The Descriptors of Healthy Aging: Role of Exercise **Salon B**
Taylor Marcell, Ph.D., California State University, Stanislaus

Unintentional Synchronization of Movement during Side by Side Walking: Contributing Factors and Potential for Gait Rehabilitation **Salon C**
Jeff Nessler, Ph.D., California State University, San Marcos

Sudden Death in Active People **Sierra 5**
Christopher Gee, M.D., University of Utah

Resting Metabolic Rate Debate **Sierra 6**
Jason Karp, Ph.D., RunCoachJason.com

General Session **9:30 am – 11:30 am** **Salon D/E**

Moderator: Fred Kolkhorst, Ph.D., FACSM, President, SWACSM

SWACSM Recognition Award

Preview of Meeting: Fred Kolkhorst, Ph.D., FACSM
San Diego State University

D.B. Dill Lecture

Exercise and Pregnancy
Jim Pivarnik, Ph.D., FACSM
President, American College of Sports Medicine
Michigan State University

LUNCH

11:30 AM - 1:00 PM

FRIDAY, 23 OCTOBER 2009, continued

Symposium **1:15 pm – 2:45 pm** **Salon E**

Exergames Unlocked: The Utilization of Active Video Games for Exercise

Moderator: Brian Haddock, Dr.PH, California State University, San Bernardino

- 1:15 – 1:45 ***Exergaming as Exercise***
 Brian Haddock, California State University, San Bernardino
- 1:45 – 2:15 ***Research in Exergaming***
 Shannon Siegel, Ph.D., California State University, San Bernardino
- 2:15 – 2:45 ***Exergaming in the Community***
 Ernie Medina, Dr.PH, XRtainment Zone

Symposium **1:15 pm – 2:45 pm** **Salon A/B**

Thermoregulation and Exercise

Moderator: Gary Mack, Ph.D., Brigham Young University

- 1:15 – 1:45 ***Sweat Gland Function during Exercise in the Heat: Role of Nitric Oxide***
 Gary Mack, Ph.D., Brigham Young University
- 1:45 – 2:15 ***Thermoregulation and Multiple Sclerosis***
 Andrea White, Ph.D., University of Utah
- 2:15 – 2:45 ***Thermoregulation and Microgravity***
 Sue Schneider, Ph.D., University of New Mexico

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

Exercise is Medicine: The Past, Present, and Future

Sandy Hoffmann, M.D., FACSM, Idaho State University

FRIDAY, 23 OCTOBER 2009, continued

Colloquium

1:30 pm – 2:45 pm

Salon D

Gatorade Sports Science Institute Special Session

Inflammation in Obesity and Athletes

Janet Rankin, Ph.D., FACSM, Virginia Tech University



Student Research Award

3:00 pm – 4:30 pm

Salon A/B

Moderator: Linda Wilkin, Ph.D., California State University, San Bernardino

3:00 The Effect of Concurrent Cell Phone Use and Walking on Gait Characteristics

Jennifer Aldridge, University of Nevada, Las Vegas

3:15 Effects of Menstrual Status on Bone Turnover Markers in Female Athletes

Lesley Naliboff, University of California, Davis

3:30 AICAR and Metformin Preferentially Activate Different AMP-Activated Protein Kinase (AMPK) Isozymes to Regulate Muscle Metabolism and SIRT1 Activity in L6 Muscle Cells

Lindsey Bogachus, University of Southern California

3:45 Hepatic Fat Fraction Changes are Predicted by Insulin Receptor Signaling Pathway mRNA Levels with a Nutrition Education and Strength Training Intervention in Latino Adolescents

Daniel Croymans, University of California, Los Angeles and University of Southern California

4:00 An Evaluation on the Effectiveness of Different Hypoxic Manipulation Models: A Meta-Analysis

Roy M. Salgado, California State University, Sacramento

4:15 Effectiveness of Interval Training in Small Ability Groups to Improve Cardiorespiratory Fitness

Bradley J. Warr, Arizona State University

FRIDAY, 23 OCTOBER 2009, continued

Colloquium

3:00 pm – 4:15 pm

Salon D

The Obesity Paradox: An Inconvenient Truth About Body Fat, Health, and Mortality Risk

Glenn Gaesser, Ph.D., FACSM, Arizona State University

Symposium

3:00 pm – 4:45 pm

Sierra 5/6

Applying Science and Theory to Fall Prevention Practices

Moderator: Debbie Rose, Ph.D., California State University, Fullerton

3:00 – 3:05

Introduction to Symposium

Debbie Rose, Ph.D., California State University, Fullerton

3:05 – 3:25

Improving Falls Risk Management by Adopting the Chronic Care Model

Steven Castle, M.D., University of California, Los Angeles

3:25 – 3:45

Integrating Biomechanical Principles in Fall Prevention and Rehabilitation

Jill McNitt-Gray, Ph.D., University of Southern California

Witaya Mathiyakom, PT, Ph.D., California State University, Northridge

3:45 – 4:05

Designing and Implementing Effective Fall Risk Reduction Programs: No One Size Fits All Approach

Debbie Rose, Ph.D., California State University, Fullerton

4:05 – 4:30

Improving the Success of Falls Prevention Programs: Is Incorporating Behavior Change Theory the Answer?

Cheryl Der Ananian, Ph.D., Arizona State University

4:30 – 4:45

Summary and Questions

SOCIAL EVENT

4:30 -7:00 PM

Rio Vista Pavilion



Poster Presentations

Graduate School Fair

No Host Wine/ Cheese Reception

SATURDAY, 24 OCTOBER 2009

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

Concurrent Colloquia **8:00 am – 9:30 am**

Latencies, Vibrations, and the Neural Control of Balance **Salon A/B**
John Milton, M.D., Ph.D., Claremont Colleges

Career Opportunities in Public Health **Sierra 5/6**
Ismael Aguila, M.S., CSCS, LA County Department of Public Health

Concurrent Symposia **8:00 am – 9:15 am**

Fitness and Fatness **Salon D**

Moderator: Steven Blair, Ph.D., FACSM, University of South Carolina

8:00 – 8:35 ***Fitness and Fatness***
Steven Blair, Ph.D., FACSM, University of South Carolina

8:35 – 9:10 ***Fitness, Fatness, and All Cause Mortality***
Chong Lee, Ph.D., Arizona State University

The Science and Application of Resistance Training **Salon E**

Moderator: E. Todd Schroeder, Ph.D., University of Southern California

8:00 – 8:35 ***Skeletal Muscle Plasticity: Adaptations to Anabolic Stimuli***
E. Todd Schroeder, Ph.D., University of Southern California

8:35 – 9:15 ***Application of Strength and Conditioning Principles***
Casey Burgener, University of San Diego

SATURDAY, 24 OCTOBER 2009, continued

Concurrent Symposia 9:30 am – 10:45 am

The Role of Energy Availability (EA) in Bone Health and Sports Injury among Female Athletes Salon A/B

Moderator: Jeanne Nichols, Ph.D., FACSM, San Diego State University

9:30 – 9:55 *EA as the Underlying Cause of the Disorders of the Triad*
Jeanne Nichols, Ph.D., FACSM, San Diego State University

9:55 – 10:20 *Low EA, Bone Turnover, and Injury*
Mitch Rauh, Ph.D., Rocky Mountain University

10:20 – 10:45 *Nutritional Considerations for Preventing and Treating Athletes at Risk for low EA*
Katherine Beals, Ph.D. R.D., FACSM, University of Utah

Physical Activity, Nutrition, and the Prevention and Treatment of Cancer Sierra 5/6

Moderator: Louise Kelly, Ph.D., California Lutheran University

9:30 – 9:55 *Relationship of Physical Activity and Diet to Cancer Prevention and Treatment*
Louise Kelly, Ph.D., California Lutheran University

9:55 – 10:20 *Physical Activity and Breast Cancer: Effects on Prevention, Treatment, and Survivorship*
Christina Dieli-Conwright, Ph.D., City of Hope National Medical Center

10:20 – 10:45 *Ethnic Differences in Obesity Phenotype: Implications for Cancer Risk*
Rebecca E. Hasson, Ph.D., University of Southern California

SATURDAY, 24 OCTOBER 2009, continued

General Session

11:00 – 12:30

Salon D/E

Moderator: Fred Kolkhorst, Ph.D., FACSM, President, SWACSM
San Diego State University

Student Awards

Recognition of Host School: California State University, San Bernardino

Business Meeting

Founders Lecture

Exercise Dose-Response: How Much Is Enough?

Steven Blair, Ph.D., FACSM
University of South Carolina



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 |
| 2008 | Steven Loy |
| 2009 | Lorraine Turcotte |



**Southwest Regional Chapter of the
AMERICAN COLLEGE
of SPORTS MEDICINE
2009 Administrative Council Members**

| | |
|--|---|
| <i>Past President</i> | Barbara Ainsworth, Ph.D., FACSM |
| <i>President</i> | Fred Kolkhorst, Ph.D., FACSM |
| <i>President-Elect</i> | Steven Hawkins, Ph.D., FACSM |
| <i>Executive Director</i> | John C. Young, Ph.D., FACSM |
| <i>Member-at-Large</i> | Linda Wilkin, Ph.D., FACSM |
| <i>Member-at-Large</i> | John Mercer, Ph.D., FACSM |
| <i>Member-at-Large</i> | Michele LeBlanc, Ph.D. |
| <i>Member-at-Large</i> | Felicia Greer, Ph.D. |
| <i>Regional Chapter Representative</i> | Marialice Kern, Ph.D., FACSM |
| <i>Student Representative</i> | Megan Grimstvedt |
| <i>Newsletter Editor</i> | J. Richard Coast, Ph.D., FACSM. |
| <i>Associate Executive Director</i> | Ben B. Yaspelkis III, Ph.D., FACSM |
| <i>Founders</i> | Gene Adams, Ph.D., FACSM Robert Conlee, Ph.D., FACSM Robert Bielen, M.D. Janet Lunn, M.A. James McIlwain, M.S. Marge Murphy, Ph.D. Gary Adams, Ph.D. (deceased) |

2009 SWACSM

Annual Meeting

ABSTRACTS

**Student Research Award
Poster Presentations**



STUDENT RESEARCH AWARD

1. THE EFFECT OF CONCURRENT CELL PHONE USE AND WALKING ON GAIT CHARACTERISTICS

Aldridge, J.M., J.A. Mercer FACSM, J.S. Dufek FACSM, and R. Tandy
Biomechanics Laboratory, Department of Kinesiology and Nutrition Sciences,
University of Nevada, Las Vegas, Las Vegas, NV

Currently 84% of the population in the United States uses a cell phone. It has been documented that pedestrians demonstrate fewer precautionary behaviors while using a cell phone. In addition, dual-tasks have been noted to have a significant effect on gait characteristics in young adults. **Purpose:** The purpose of this study was to examine the effects that concurrent cell phone use and walking has on gait and situation awareness. **Methods:** Subjects ($n=18$; 24.67 ± 3.60 yrs) completed three five-minute treadmill walking conditions at a self-selected speed: 1) CONTROL (walking only), 2) TALK (walking and talking), and 3) TEXT (walking and texting). During each condition lights (red, green, and yellow) were displayed in the visual field and the number of detected lights was recorded. Kinematic data of the feet was recorded using a motion analysis system (120 Hz). **Results:** Using a one-way repeated measure ANOVA it was determined that light detection ($F_{(2,17)}=39.777$, $p<0.001$) and toe clearance (TC_{min}) ($F_{(2,17)}=8.574$, $p=0.001$) were different between conditions. Specifically, light detection decreased during TEXT (2.6 ± 2.2 lights) versus TALK (5.8 ± 0.05 lights, $p<0.001$) or CONTROL (5.9 ± 0.05 lights, $p<0.001$) and TC_{min} decreased during TALK (56.3 ± 3.66 mm, $p=0.002$) and TEXT (56.1 ± 4.481 mm, $p=0.014$) versus CONTROL (58.5 ± 4.35 mm). Stride rate ($F_{(2,34)} = 1.086$, $p = .333$), step width ($F_{(2,34)} = 1.483$, $p = .241$), step width variability ($F_{(2,34)} = 2.341$, $p = .112$), and maximum toe clearance ($F_{(2,34)} = 1.794$, $p = .182$) were not different among conditions ($p > .05$). **Conclusion:** A reduction in TC_{min} and decreased light detection ability occurred while walking and using a cell phone. A reduction in TC_{min} could lead to an increased likelihood of tripping. A decrease in the number of lights detected could lead to an increased likelihood of not detecting a "walk / do not walk" sign while crossing a street or other compromising situations.

3. HEPATIC FAT FRACTION CHANGES ARE PREDICTED BY INSULIN RECEPTOR SIGNALING MRNA LEVELS WITH A NUTRITION EDUCATION AND STRENGTH TRAINING INTERVENTION IN LATINO ADOLESCENTS

Daniel M. Croymans, B.S.^{1*}, Michael C. Gao, B.S.^{1*}, Hooman Allayee, Ph.D., Michael I. Goran² Ph.D. and Christian K. Roberts, Ph.D., FACSM^{1,3}

*These two authors contributed equally. ¹Department of Physiological Science, University of California, Los Angeles, CA. ²Department of Preventive Medicine and Department of Physiology and Biophysics, Keck School of Medicine, University of Southern California, Los Angeles, CA. ³Department of Epidemiology and Center for Metabolic Disease Prevention University of California, Los Angeles, CA

INTRODUCTION. Prediabetes and future risk of type 2 diabetes are significant issues in obese adolescents, especially Latinos. We previously noted few significant group effects induced by either a 16-week high-fiber low-sugar nutrition education program (N), or N plus twice/week strength training (N+ST). **HYPOTHESIS.** In this study, we analyzed white blood cell transcriptional profiles and explore whether underlying genetic networks relate to measured phenotypes. Specifically, we hypothesized that intervention-related gene expression changes might predict phenotypic changes. **METHODS.** We isolated mRNA from pre- and post-intervention blood cells and used transcriptional profiling via Illumina's HumanRef-8 v2 Expression BeadChip (Controls (C): $n=15$, N: $n=16$, N+ST: $n=12$). To determine the genes' functional grouping, we ran Ingenuity Pathway Analysis on N and N+ST groups' significantly-changed probes ($p\leq 0.05$ Wilcoxon test, fold change ≥ 1.41 , unchanged in C). **RESULTS.** We found 5 significant Canonical Pathways for N, and 4 for N+ST ($p\leq 0.01$). We further investigated one pathway most *a priori* related to the available phenotypic measures, insulin receptor signaling ($p=.0015$ in N+ST). We derived 9 genes for further analysis: ACLY, CBL, CRKL, FOXO3, FOXO4, JAK1, MTOR, PIK3R2, and TSC1, and correlated their change to the change in 14 measures of body composition, glucose regulation and insulin sensitivity. We found a direct relationship ($p\leq 0.05$), except for FOXO3, between the increase in their mRNA level and hepatic fat fraction (HFF) decrease; TSC1, CRLK, ACLY, and MTOR, remained significant after Bonferroni correction (two-tailed $p\leq 0.0004$). **CONCLUSION.** HFF is a marker of non-alcoholic fatty liver disease and an important risk factor for metabolic dysfunction. We demonstrate that in the N+ST group, there is mRNA upregulation in the insulin receptor signaling pathway in white blood cells, related to a decrease in HFF. A N+ST intervention is potentially efficacious for reducing risk for non-alcoholic fatty liver disease and its related metabolic complications in Latino adolescents.

2. AICAR AND METFORMIN PREFERENTIALLY ACTIVATE DIFFERENT AMP-ACTIVATED PROTEIN KINASE (AMPK) ISOZYMES TO REGULATE MUSCLE METABOLISM AND SIRT1 ACTIVITY IN L6 MUSCLE CELLS

Bogachus, L.D. and L.P. Turcotte FACSM
Department of Biological Sciences & Kinesiology, University of Southern California, Los Angeles, CA

AMP-activated protein kinase (AMPK) and SIRT1 have been shown to be key regulators of glucose and fatty acid (FA) metabolism. L6 muscle cells were treated using RNAi technology to genetically silence AMPK α 1 and AMPK α 2 and incubated \pm AICAR (2mM, 2hr) or Metformin (2mM, 3hr). After treatment, glucose uptake (GU) and FA uptake (FAU) and oxidation (FAO) were measured using [2-3H]deoxyglucose or [1-14C]palmitate. AMPK α , AMPK α 1, and AMPK α 2 phosphorylation, PGC-1 α acetylation and SIRT1 activity were measured. The effects of genetic and pharmacological treatments on metabolic parameters were assessed with ANOVA. AMPK α 1 silencing eliminated the Metformin-induced decrease in FAU and FAO and blunted the Metformin-induced increase in GU ($P<0.05$). AMPK α 2 silencing eliminated the AICAR-induced increase in GU and FAO and reduced AICAR-induced FAU by 27% when compared to AICAR-induced FAU in cells treated with Cyclophilin B RNAi ($P<0.05$). In AMPK α 1 deficient cells, AICAR but not Metformin significantly increased AMPK α phosphorylation ($P<0.05$). Conversely, in AMPK α 2 deficient cells, Metformin but not AICAR significantly increased AMPK α phosphorylation ($P<0.05$). AMPK α 1 phosphorylation was significantly reduced in AICAR-treated AMPK α 2 deficient cells and in Metformin-treated AMPK α 1 deficient cells ($P<0.05$). The Metformin-induced increase in AMPK α 1 phosphorylation was similar in AMPK α 2 and Cyclophilin B deficient cells ($P<0.05$). The AICAR-induced increase in AMPK α 2 phosphorylation was similar in AMPK α 1 and Cyclophilin B deficient cells ($P<0.05$). AICAR and Metformin treatment significantly increased SIRT1 activity ($P<0.05$). AMPK α 2 deficient cells had significantly higher AICAR-induced SIRT1 activity when compared to similarly treated Cyclophilin B deficient cells ($P<0.05$). In AMPK α 1 and AMPK α 2 deficient cells, Metformin-induced SIRT1 activity was significantly higher than in similarly treated Cyclophilin B deficient cells ($P<0.05$). PGC-1 α acetylation data are in line with the SIRT1 activity measurements. Our data show that in muscle cells, Metformin & AICAR regulate glucose and FA metabolism via preferential phosphorylation (activation) of different AMPK isoforms but similar stimulation of SIRT1 activity.

4. EFFECTS OF MENSTRUAL STATUS ON BONE TURNOVER MARKERS IN FEMALE ATHLETES

Lesley A. Naliboff¹, Marta D. Van Loan² FACSM and Gretchen A. Casazza¹
¹Sports Performance Laboratory, University of California, Davis, Medical Center Sports Medicine Program, Sacramento, CA ²USDA, ARS, Western Human Nutrition Research Center, Davis, CA.

Purpose: Our study examined differences in bone mineral density (BMD), markers of bone turnover, and serum 25-hydroxy-vitamin D levels in female athletes with different menstrual status. **Methods:** 18 female athletes, matched on running >10 miles per week, were divided into eumenorrheic (EM), amenorrheic (AM), and oral contraceptive (OC) groups (6 subjects in each group). Subjects performed a maximal treadmill test (VO_{2peak} test), completed 7 day exercise training records, and 3 day diet records. Subjects also completed an eating disorder evaluation (EDE-Q), and bone density scans (DXA) for total body, lumbar spine and femur BMD. Serum samples were analyzed for bone-specific alkaline phosphatase (BAP), carboxyterminal cross-linked telopeptide of type I collagen (CTX), parathyroid hormone (PTH), and serum 25-hydroxy-vitamin D levels. **Results:** There were no anthropometric, diet or training differences between groups. While there were no differences in BMD or BAP among groups, bone resorption, as measured by CTX, was elevated in AM compared to OC (0.42 ± 0.07 ng/mL for AM and 0.22 ± 0.03 ng/mL for OC). PTH was also significantly higher in AM compared to OC (33.5 ± 4.1 pg/ml for AM and 21.1 ± 2.1 pg/ml for OC). There were no significant differences in serum 25-hydroxy-vitamin D levels; all groups had levels above the recommendation of 30 ng/ml. **Conclusions:** Our results demonstrate that while BMD was not affected by menstrual status, markers of bone resorption were sensitive to menstrual status in athletes. Amenorrheic athletes had the highest bone resorption while those taking oral contraceptive had the lowest bone resorption. High bone resorption may put young amenorrheic athletes at higher risk for stress fractures and impair peak bone accretion.

5. AN EVALUATION ON THE EFFECTIVENESS OF DIFFERENT HYPOXIC MANIPULATION MODELS: A META-ANALYSIS

Salgado, R. M., Parker, D. L, and Quintana, R.
I.E. Faria Exercise Physiology Research Lab, Department of Kinesiology,
California State University Sacramento, Sacramento, Ca

We have previously reported that hypoxic manipulation (HM) (various forms of altitude training) as a whole was more effective for improving sea-level performance versus normoxic training. Data from other studies suggest all four HM models may or may not improve sea-level performance. Because of the conflicting data on HM studies it is still unclear which HM model is the most effective for improving sea-level performance. To further investigate this inconclusive data, we applied the meta-analytic technique to HM studies. The purpose of this meta-analysis was to identify if a specific HM model was more effective in improving sea-level exercise performance utilizing the meta-analytical technique. A literature search was conducted to locate HM studies that met our inclusion criteria. If inclusion criteria were met, studies were read and coded for: 1) HM models and 2) performance which was defined as performance in a TT or peak power output during a graded exercise test or total work capacity. Twenty-seven HM studies were included for the analysis which yielded a total of 92 effects sizes (ES). Cohen's d ES was calculated for each outcome. ES's were corrected for small sample bias then weighted mean ES was calculated. Ninety-five % CI were calculated based on the weighted mean and standard deviation (SD). Weighted mean ES and SD were 0.17 +/- 0.07, 0.21 +/-0.12, 0.38 +/-0.22, 0.37 +/- 0.04, and 0.21 +/- 0.03 for control, LHTL, LHTH, LLTH, and IHE, respectively. Examination of the 95% CI showed LLTH was statistically different from the control group, while none of the other HM models were significantly different from the control. To conclude, the results of our study suggest LLTH will most likely provide a greater effect for improving sea-level performance.

6. EFFECTIVENESS OF INTERVAL TRAINING IN SMALL ABILITY GROUPS TO IMPROVE CARDIORESPIRATORY FITNESS

Bradley J. Warr PA-C, MPAS, PhD Student, Daniel Dodd PhD,
CSCS*D, Brent Alvar PhD, CSCS*D, FNCSA, Pamela D. Swan, Ph.D.,
FACSM
Arizona State University, Exercise and Wellness Program

INTRODUCTION: Aerobic exercise is the most common modality to improve running performance and cardiovascular fitness (VO₂ peak).
PURPOSE: To evaluate the effectiveness of structured interval training versus a regimen of self-prescribed, self-paced exercise in small ability groups of Fire Academy cadets for the purpose of improving VO₂ peak and running performance. **METHODS:** Fire Academy cadets (n=42; M=40/F=2;19-42 years) completed a submaximal 1.5 mile test (Larsen,G.E. 2002). Two ability groups were formed based on the 1.5 mile run time, which then completed 12 weeks of cardiovascular training. Group A completed 6 weeks of interval training (INT) (20 minutes three times per week) progressively increasing in intensity starting with a 4:1 rest to work ratio and ending with a 1:1 ratio, averaging 2.5:1. Group B completed six weeks of self prescribed, self-paced continuous aerobic training (SP) (20 minutes three times per week), maintaining at least 75% of age predicted heart rate peak. Retesting of the 1.5 mile run was completed prior to training regimen cross-over. Group A then completed 6 weeks of the SP protocol while group B completed 6 weeks of INT protocol. Both groups completed a final 1.5 mile run after the second training period. **RESULTS:** Results showed a significant difference between training protocols for improvements in the 1.5 mile run time (INT=8.15% vs SP=4.35%, p=.01) and in VO₂ peak (INT=.87 ml/kg/min vs SP=.55 ml/kg/min, p=.04). **CONCLUSION:** Interval training in small ability groups proved to be statistically superior to self-prescribed, self-paced exercise for the improvement of 1.5 mile run time and for VO₂ peak improvement. **Keywords:** interval training, running performance, VO₂ peak, ability groups



POSTER PRESENTATIONS

1. Spatial Proximity and Interpersonal Synchronization During Side by Side Treadmill Walking

Aboy, R., Evans, M., Nessler, J.A.

Department of Kinesiology, California State University, San Marcos

Humans walking side by side often synchronize their stepping unintentionally. This behavioral attractor appears to be relatively strong, as the amount of synchronization was previously found to be robust to alterations in the exchange of visual and auditory information between partners. The purpose of this study was to further explore the limits of this behavior by altering inter-subject spatial proximity and measuring its effects on the synchronization of stepping. Ten pairs of subjects (age = 23 ± 2.77 , height = 1.67 ± 0.06 m, leg length = 77.98 ± 4.17 cm) walked side by side on treadmills at an average speed of 2.46 ± 0.10 mph. Because differences in leg length were previously found to directly relate to synchronization, subjects were matched in a manner that minimized such differences. Each pair of subjects completed nine, 60-second trials in which treadmills were side by side, moved apart laterally by 0.3, 0.9, 1.5, and 2.1m, or staggered by 0.6, 1.2, and 1.8m. In addition, subjects completed a trial in which they stepped independently. Reflective markers were placed over the right lateral malleolus and acromion process of each subject for the purpose of assessing synchronization and inter-subject distance, respectively. Markers were tracked via optical motion capture. Results indicated that the amount of synchronization was unaffected by separating subjects for distances up to 2.1m (Repeated Measures ANOVA, $p=0.692$). The direction of separation

3. EFFECT OF HIGH INTENSITY INTERVAL TRAINING (HIIT) ON CARDIOVASCULAR FUNCTION AND MUSCULAR FORCE

Ryan Allen, Matthew Jurancich, Dan Roberson, Todd A. Astorino

Department of Kinesiology, CSU—San Marcos

The primary aim of the study was to examine the effect of HIIT on cardiovascular function and muscular force. Six men and women (mean age and physical activity equal to 25.7 ± 5.18 yr and 7.0 ± 2.8 h/wk, respectively) completed HIIT consisting of 6 d of training including 4 to 6 Wingate tests per day over 3 wk. Resting blood pressure (BP) and heart rate (HR) were assessed pre- and post-training to evaluate cardiovascular function. Muscular force was evaluated pre- and post-training using isokinetic dynamometry. Data were analyzed using a paired t-test and two-way ANOVA with repeated measures. There was no effect ($p > 0.05$) of HIIT on resting HR (68.5 ± 7.4 b/min vs. 71.2 ± 6.9 b/min), systolic BP (123.1 ± 11.4 mm Hg vs. 121.9 ± 13.4 mm Hg), or diastolic BP (76.7 ± 8.7 mm Hg vs. 77.6 ± 7.5 mm Hg) compared to baseline. $\dot{V}O_2$ max was increased ($p < 0.05$) by 6 % across subjects. Peak (9.16 ± 1.40 W/kg vs. 8.12 ± 1.47 W/kg), mean (6.90 ± 0.93 W/kg vs. 6.25 ± 0.97 W/kg) and minimum power (4.72 ± 0.71 W/kg vs. 3.99 ± 0.73 W/kg) from the Wingate test were significantly higher ($p < 0.05$) post-training versus pre-training, and fatigue index was lower ($p < 0.05$). At 60 deg/s, nonsignificant trends ($p = 0.06 - 0.10$) were revealed for lower average knee extension power and torque post-training versus pre-training. At 180 deg/s, work fatigue was attenuated (40.8 ± 8.9 % vs. 49.5 ± 8.2 %), and total work ($1,657.3 \pm 500.2$ ft/lb vs. $1,544.3 \pm 589.5$ ft/lb) was increased ($p < 0.05$) with training. Data from this preliminary study reveal that HIIT has no effect upon resting cardiovascular function, although it seems to alter voluntary muscular force production and reduce fatigability.

2. THE RELATIONSHIP BETWEEN LOWER EXTREMITY MUSCULAR POWER AND PHYSICAL FUNCTIONING AND HEALTH RELATED QUALITY OF LIFE AMONG OLDER CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS

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Skeletal muscle weakness is common among older, chronic obstructive pulmonary disease (COPD) patients, especially in the lower extremities. Lower extremity power is essential for numerous activities of daily living (ADLs). The purpose of this study was to determine the influence of lower extremity muscular power (LP) on the physical functioning (PF) and health-related quality of life (HRQL) of older COPD patients enrolled in pulmonary rehabilitation (PR). Twelve patients (66 ± 2.8 , females = 5; males = 7) met the study inclusion criteria; however, only eleven completed all testing as one patient dropped out of the study (female) due to physician misdiagnosis and referral to PR. After two 1 RM leg strength tests using a seated leg press, separated by at least 48 hours, participants LP was assessed using the Tendo[®] Fitrodyne Powerlizer system. PF was measured using the 6-Minute Walking (6MWT), Chair Stand (CS), and 8-Foot-Up-and-Go (8FUG) tests. HRQL was assessed using the Medical Outcomes Survey Short Form-36 (SF36). The relationship of LP to PF and HRQL was determined via calculating Pearson correlations while controlling for the potential confounders: age, BMI, and sex. Peak leg power was highly correlated to 6MWT distance ($r = 0.792$, $p = .019$), but not with the CS or 8FUG test. Peak leg power was highly correlated with the following SF36 constructs: Physical Function ($r = 0.75$, $p = .032$), Role Physical ($r = 0.854$, $p = .007$), and Social Functioning ($r = 0.823$, $p = 0.012$). This study demonstrates that LP in this older adult, COPD sample is significantly correlated to PF and HRQL, especially as it relates to physical functioning. Further research is needed to examine the impact of increasing LP in this population via resistance training to determine if this translates to improved PF and HRQL, a central goal in PR programs.

4. LANDING STRATEGIES MAY ATTENUATE PEAK GROUND REACTION FORCES IN A HOME-BASED JUMPING PROGRAM IN PREMENOPAUSAL WOMEN

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While jumping exercise benefits bone, a specific dose-response to jump training has not been reported. As part of a 4-year dose-response jumping study in premenopausal women, we report ground reaction forces (GRFs) for subjects participating in an unsupervised home-based jumping program. **Methods:** Of 102 women randomly assigned to one of nine jumping groups, varying by height (4", 8", or 12") and repetitions (10, 50, or 100 jumps per day), or control, 76 completed jumps based on their group assignment at home three days per week for eight months (aged 23.4 ± 4.5 yr). Subjects were pre- and post-tested for bone and nutritional status. During the pre-test visit, correct jumping technique was demonstrated and critiqued for each subject, and was the only demonstration they received. At post-test, subjects performed ten jumps onto a Kistler force platform from their prescribed box height using the technique they used at home. Average peak GRF and impulse (area under curve) was determined for peaks within each subject's mean ± 1 SD after filtering (4th order Butterworth filter, 150 Hz). **Results:** While repeated measures ANOVA showed no significant difference in average peak GRFs across the three height groups (3.4, 3.6, 3.9 times body weight for 4", 8", and 12" step, respectively; $p > 0.29$), a significant difference in average impulse (%BWs) across the three height groups did exist (0.46, 0.52, 0.61; $p < 0.001$). Therefore, subjects did not lower their center of gravity before beginning their descent, but did augment their landing to dampen the force of the fall (e.g. landed toes first or used deep knee bend). Previous laboratory-based studies have shown GRFs of over 6 times body weight for a 12" drop. **Conclusion:** Subjects who perform a jumping program at home may unknowingly adopt a landing strategy to dampen the force of impact to prevent discomfort or perceived risk of injury.

5. VALIDITY OF UNIAXIAL AND TRIAXIAL ACCELEROMETERS FOR ASSESSMENT OF PHYSICAL ACTIVITY IN ADULTS

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Purpose: The purpose of the study was to assess the validity of the uniaxial GT1M and the triaxial GT3X Actigraph accelerometers against oxygen consumption.

Methods: Thirty-four participants aged 18 to 30 years performed three 6-minute bouts of exercise on a treadmill at 4.8, 6.4, and 9.7 km·h⁻¹. Oxygen consumption was measured minute-by minute using a metabolic system.

Results: The GT3X had significantly higher counts at all speeds as compared with GT1M accelerometer ($p < 0.001$). Mean error for the GT1M at 4.8 km·h⁻¹ was +2862 cpm (limits of agreement +1897 to +3828), at 6.4 km·h⁻¹ was +4852 cpm (limits of agreement +3616 to +6088), and at 9.7 km·h⁻¹ was +9369 cpm (limits of agreement +6589 to +12148). Whereas, mean error for the GT3X at 4.8 km·h⁻¹ was +5716 cpm (limits of agreement +3589 to +7843), at 6.4 km·h⁻¹ was +13142 cpm (limits of agreement +8329 to +17954), and at 9.7 km·h⁻¹ was +8580 cpm (limits of agreement +5846 to +11314).

Conclusions: These data suggest that the uniaxial GT1M and the triaxial GT3X Actigraph accelerometers are valid tools for measuring treadmill walking and jogging.

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7. THE EFFECT OF SIMULATED ANTI-GRAVITY ON MUSCLE ACTIVITY

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Research is emerging on muscle activity during running in the water and during running on a treadmill that reduces body weight (BW) by supporting the runner by applying an upward force through lower body positive pressure (LBPP). Muscle activity may differ during running in the water and/or running on a LBPP treadmill – but it is not clear if the pressure applied to the lower extremity influences the measurement of muscle activity. Therefore, the purpose of this study was to determine if LBPP influences electromyography (EMG). Each subject ($n=3$, age 25.3±4yrs, mass 57.6±8.6kg, height 1.6±0.08m) completed isometric maximal voluntary contractions (MVC) under four levels of LBPP: 100%, 75%, 50%, 25% of BW. Subjects completed 5 trials of a 5-second MVC per condition. Rest was provided between trials. Order of conditions was randomized to account for fatigue and learning. During each MVC, EMG was recorded (1500 Hz) for the rectus femoris (RF), vastus medialis (VM), and vastus lateralis (VL). EMG data were reduced by removing any zero-offset, full-wave rectifying and calculating the average (AVG) EMG across 5-seconds. AVG EMG for each muscle was compared using a repeated measures ANOVA ($\alpha=0.05$) with simple effects testing comparing the 100% condition to all other conditions. AVG EMG was not influenced by LBPP for any muscle ($p > .05$). From this experiment, it seems that muscle activity is not influenced by LBPP. Information such as this will be helpful at understanding muscle activity in situations where pressure is applied to the lower extremities.

Table 1. Comparison (Mean (SD)) of EMG activity normalized to 100% BW.

| | 100% BW | 75% BW | 50% BW | 25% BW |
|--------|-------------|--------------|-------------|-------------|
| RF (%) | 100.0 (0.0) | 113.9 (30.6) | 99.5 (24.5) | 98.4 (28.9) |
| VM (%) | 100.0 (0.0) | 114.0 (30.3) | 99.6 (24.3) | 98.4 (21.1) |
| VL (%) | 100.0 (0.0) | 113.6 (29.9) | 99.5 (24.4) | 98.4 (29.5) |

6. EFFECTS OF GLYCEMIC INDEX (GI) AND DIETARY FIBER ON POST-PRANDIAL INSULIN AND GLYCEMIC EXCURSIONS

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Postprandial hyperglycemia and hyperinsulinemia are associated with elevated cardiovascular risk.

PURPOSE: We examined the effects of GI and dietary (predominantly cereal) fiber on postprandial glucose and insulin responses.

METHODS: Eleven adults [5 men; 6 women; age = 42.4 ±15.6 yr; weight = 69.9 ±11.1 kg; height = 174.2 ±9.0 cm] were studied on 4 randomized days at the General Clinical Research Center (GCRC). On each occasion subjects consumed one of 4 breakfast meals: High-fiber/Low-GI (HF/LGI; GI = 44, fiber = 20.4 g); Low-Fiber/Low-GI (LF/LGI; GI = 43; fiber = 4.3 g); Low-Fiber/High-GI (LF/HGI; GI = 70; fiber = 3.6 g); High-Fiber/High-GI (HF/HGI; GI = 71; fiber = 20.3 g). Meals were equal in total kcal (~600) and macronutrient composition (~90g digestible carbohydrate; ~21g protein; ~16g fat).

RESULTS: One-hour delta blood glucose increased significantly above baseline following all meals ($p < 0.01$) except after HF/LGI. Regardless of fiber content, high-GI meals resulted in ~10% greater glucose AUC ($p < 0.05$). For low-GI meals, HF significantly ($p < 0.05$) attenuated 1-hour delta insulin, but HF had no effect on 1-hour delta insulin in the high-GI meals. Regardless of fiber, LGI significantly ($p < 0.05$) lowered insulin AUC. However, whereas fiber had no effect in HGI meals, insulin AUC was 34% lower following HF/LGI as compared to LF/LGI ($p < 0.001$).

CONCLUSIONS: In healthy adults, a meal low in glycemic index and high in cereal fiber appears to blunt post-prandial insulin and glycemic excursions. High fiber content in meals blunts these excursions only if the meal has a low glycemic index. Thus the full benefit of a low glycemic index meal for minimizing postprandial dysmetabolism may be dependent in part on cereal fiber.

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8. EFFICACY OF MULTIMODAL TRAINING TO ALTER BONE MINERAL DENSITY AND BODY COMPOSITION IN PERSONS WITH SPINAL CORD INJURY: A CASE STUDY.

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Dramatic loss of bone and muscle mass are consequent with spinal cord injury (SCI). In this study, subjects participated in a preliminary investigation in which DXA scans were performed at baseline and after six months. A 45 year-old male with a complete chronic SCI at C5-C6 served as a control. A 21 year-old woman two months post-SCI (complete injury at C5) underwent intense training 2 – 3 d/wk, 2 – 3 h/d, consisting of vibration training, body weight support treadmill training, resistance training, electrical stimulation, and load bearing exercise. In the control subject, body weight increased by 4 kg, mediated by an 11 % increase in fat mass (FM) and 1 % increase in lean mass (LM). BMD at the spine, knee, and femur was unchanged over time. In the woman with acute SCI, distal femur BMD was increased by 10 % with training, yet proximal tibia (- 14 %) and total body leg BMD (- 10 %) were reduced. Dramatic losses in BMD were observed for the right/left femoral neck (6.8 – 11.4 %) and greater trochanter (19.2 – 21.9 %). She gained 6.4 kg of body weight, with the excess mass attributed to a 35 % increase in FM and minimal decrement (-1.5 %) in LM. Percent body fat increased from 33.5 – 41.2 %, with increased FM demonstrated in the arms (10 %), legs (27 %), and trunk (52 %). LM was increased in the legs (11 %), although attenuated in the arm (-14 %) and trunk (-7 %). Leg LM is typically decreased shortly after SCI, so this increase highlights the benefits of intense, multi-modal training to preserve muscle mass. Her marked bone loss has inspired modification of her current training to increase loading on the hip to potentially slow bone loss and reduce fracture risk.

9. USE OF THE VERSACLIMBER IN ASSESSING AEROBIC FITNESS OF FIREFIGHTERS

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The treadmill is the preferred testing mode to assess aerobic fitness of firefighters. A potential alternative is the VersaClimber, which utilizes upper and lower body exercise simulating specific firefighting tasks. To date, the VersaClimber has not been used to evaluate aerobic fitness in firefighters. The purpose of this study was to determine if the VersaClimber provides an alternative exercise mode in assessing aerobic fitness of firefighters. Fourteen healthy male firefighters ($M \pm SD$), age = 39.4 ± 6.9 y, height = 177.4 ± 5.8 cm, weight = 83.0 ± 6.3 kg, and body fat = $14.1 \pm 4.5\%$ were tested for maximal oxygen uptake ($\dot{V}O_{2max}$), on a VersaClimber and a treadmill to assess the validity of the VersaClimber protocol. The VersaClimber protocol consisted of a 3 min warm-up followed by 2 min stages, starting at $18.3 \text{ m}\cdot\text{min}^{-1}$ and increasing by $6.1 \text{ m}\cdot\text{min}^{-1}$ per stage. Participants were instructed to maintain a 30 cm step height through $36.6 \text{ m}\cdot\text{min}^{-1}$, after which they self selected step height. The treadmill test followed the Gerkin Protocol. Heart rate, oxygen uptake, ventilation, CO_2 production, RER, walking/climbing distance, and RPE were recorded at regular intervals throughout each test. A regression analysis using body weight (WT) and exercise time (ET) was used to develop prediction equations that estimate $\dot{V}O_{2max}$ for each protocol. VersaClimber: $\dot{V}O_{2max} = 60.528 - 0.514(\text{WT}) + 1.462(\text{ET})$, $R^2=0.614$, $SEE=4.399 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. Treadmill: $\dot{V}O_{2max} = 46.277 - 0.335(\text{WT}) + 2.284(\text{ET})$, $R^2=0.691$, $SEE=3.963 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. Results showed that mean VersaClimber $\dot{V}O_{2max}$ ($48.1 \pm 6.5 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) was significantly ($p<0.05$) lower than the mean treadmill $\dot{V}O_{2max}$ ($51.1 \pm 6.6 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$). The findings suggest that the VersaClimber is an acceptable alternative to test aerobic fitness of firefighters for tryouts or requalification examinations. However, it must be noted that the VersaClimber has shown consistently lower ($\sim 3\%$) $\dot{V}O_{2max}$ results than the treadmill.

11. EFFECTS OF FOUR WEEKS OF AN ARGININE-BASED SUPPLEMENT ON THE VENTILATORY THRESHOLD AND PEAK OXYGEN UPTAKE

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Arginine is a semi-essential amino acid involved in the synthesis of nitric oxide and dietary supplementation has been shown to increase peripheral blood flow and exercise tolerance in coronary artery disease patients. The purpose of the present study was to examine the effects of daily administration of an arginine-based supplement for four weeks on the ventilatory threshold (VT) and peak oxygen uptake ($\dot{V}O_{2peak}$). The study used a double-blind, placebo-controlled design. Forty one college-aged males (mean age \pm SD = 22.1 ± 2.4) were randomized into either the PLACEBO ($n = 20$) or ARGININE ($n = 21$) group. The placebo was microcrystalline cellulose. The ARGININE group ingested 3.0 gm of micronized, polyethylene glycosylated arginine and 300 mg of grape seed extract. All subjects performed an incremental test to exhaustion on a cycle ergometer prior to supplementation (PRE) and after 4 weeks of supplementation (POST). The VT was determined by noninvasive gas exchange using the V-slope method of the $\dot{V}CO_2$ versus $\dot{V}O_2$ relationship. The post-hoc planned comparisons indicated there were significant mean increases (PRE to POST) in VT for the ARGININE group (4.1%), but no change for the PLACEBO group (2.5%). In addition, there were no significant changes in $\dot{V}O_{2peak}$ for the ARGININE (-1.0%) or PLACEBO (-1.5%) groups. These findings supported the use of the arginine-based supplement for increasing VT and improving submaximal exercise performance without an increase in $\dot{V}O_{2peak}$ during cycle ergometry.
This study was funded by General Nutrition Corporation.

10. THE EFFECTS OF SPECIFIC RESISTANCE TRAINING AND EXTERNAL COUNTERPULSATION ON AN ADULT DIABETIC POPULATION

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Factors for developing type 2 diabetes mellitus (T2DM) include lack of fitness, overweight/obesity, and endothelial inflammation. Increased fitness (muscle strength and cardiovascular capacity) correlate with a decrease risk of T2DM. Measurements of increased body fat are correlated with an increase in T2DM risk. Endothelial inflammation is linked to reduction in nitric oxide (NO) production and response.

PURPOSE: To determine the effects of this protocol on body composition, resting blood pressure, aerobic fitness and strength performance and levels of triglycerides, cholesterol and glycosylated hemoglobin.

METHODS: The protocol was a 12 week, twice weekly regimen of resistance training and followed by a 30 minute session of external counterpulsation (ECCP). Twelve overt T2DM subjects were included (23 to 64 yrs.). Measurements were taken at baseline, 6 and 12 weeks, including resting blood pressure, serum analysis, body composition, muscle strength and aerobic power. Body composition was estimated by bio-impedance. Muscle strength was estimated by one repetition maximum effort. Aerobic power was estimated using a graduated bicycle ergometer test. T tests for correlated data was used for statistical analysis.

RESULTS: Mean fat loss was - 9.01 lbs. Mean lean tissue increase was +10.38 lbs. The mean reduction in resting systolic pressure was 17.2 mmHg and resting diastolic pressure was 13.5 mmHg. The mean increase in aerobic power was 3.2 Mets. The mean increase in upper body strength was 42% and lower body strength was 35%. The mean reduction in triglyceride was 26.00 mg/dL (-18.3%). The mean reduction in total cholesterol was 6.4 mg/dL (-3.8%). Glycosylated hemoglobin concentration did not change significantly. No detectable hypoglycemic events occurred.

CONCLUSION: This combination of exercise and ECCP produced statistically significant enhancements in body composition, muscle strength and level of aerobic fitness and statistically significant reductions in serum lipid concentrations and resting blood pressure in subjects exhibiting overt T2DM.

12. A COMPARISON OF DIAPHRAGM THICKNESS IN FEMALE SWIMMERS, RUNNERS, AND NON-ATHLETES

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Endurance training has been shown to result in both increased force production and decreased rate of fatigue in the diaphragm. It was hypothesized that within female collegiate athletes, those training for endurance swimming and running events would have significantly thicker diaphragms than those training for sprint swimming or non-athletic subjects. It was also hypothesized that maximal inspiratory pressures (MIPs) would correlate with diaphragm thickness. The diaphragm thickness (Tdi) of 25 healthy female subjects (age 18-24) was determined through two-dimensional ultrasonography. Sixteen of those subjects also gave MIP measurements. As determined through one-way ANOVA, the overall differences in the mean values of Tdi among the four groups (distance swim, distance run, sprint swim, and controls) were significant ($P=0.004$). Student-Newman-Keuls post-hoc analysis showed significant differences between the average Tdi of the distance swimmers and both the distance runners and the controls ($P=0.005$). Significant difference in Tdi was also shown between the distance swimmers and sprint swimmers ($P=0.022$). Pearson's analysis showed no significant correlation between Tdi and MIP. Differences in Tdi between the sprint and distance swimmers supports the hypothesis that endurance-based training has the ability to cause increased Tdi (evidence of hypertrophy) when compared to sprint training. However, a significant difference in Tdi between distance swimmers and distance runners raises questions as to the role of sport-specific training on athletes. Of potentially even more concern is that the mean Tdi of distance runners appeared less than that of the controls. Previous work has linked muscular atrophy to female distance runners, as they have shown symptoms similar to patients suffering from anorexia nervosa. Additional work would need to be done to assess the direct links between these athletes and decreased Tdi.

13. MALES AND FEMALES COMPARISONS OF BIOELECTRICAL IMPEDANCE ANALYSIS DEVICES WITH DUAL ENERGY X-RAY ABSORPTIOMETRY

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As the prevalence of obesity increases in the United States, it becomes crucial to find a quick and easy way of monitoring the changes in body composition with more accuracy than body mass index. A simple method of assessing body composition is bioelectrical impedance analysis (BIA). The purpose of this study was to compare four different types of BIA machines that are widely used with dual energy x-ray absorptiometry (DEXA) and to compare the results between males and females. Forty nine males and fifty one females between 18 – 35 years were recruited. Data are reported as mean±SEM. The average age was 22.92±0.33 years, the average height was 168.40±0.948 inches, the average weight was 70.74±1.71 kg, and the average BMI was 24.75±0.45 kg/m², and the average total body water was 55.93±0.65 %. The average total body water showed that participants were hydrated during testing. Measurement of percent body fat was taken using four BIA machines: Omron HBF-306C (O-306), Omron HBF-514 (O-514), Tanita BF-350 (Tanita), and Bodystat 1500 (Bodystat), and General Electric Lunar (DEXA). In males, all BIA machines gave different results compared to the DEXA (19.63±8.644 %), with the exception of the Tanita (18.76±1.08 %). In females, all BIA machines gave different results compared to DEXA (33.58±1.17 %), except for the O-514 (33.59±1.00). The difference between the highest and the lowest measurements was less in leaner males (6.1%) compared with females (9.4%), who generally have higher percent body fat. In conclusion, Tanita was the same as DEXA in males, while O-514 was the same as DEXA in females. Although BIA machines may be useful in detecting the change in body composition, the accuracy of these machines is questionable due to a large variance shown in the results.

15. GENDER DISPARITIES IN PHYSICAL ACTIVITY AT PUBLIC PARKS IN LOS ANGELES COUNTY

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Physical inactivity has contributed to rising obesity rates in the United States. Individuals living in lower income communities are less likely than those living in affluent communities to meet physical activity recommendations. Public parks offer a space for residents to participate in physical activity at no cost. This study was conducted to determine whether or not the public parks in Los Angeles County equally promote physical activity for all park visitors. Over the course of 6 weeks, physical activity was assessed in three Los Angeles public parks each containing different resources and park equipment. A total of 111 and 1186 adult subjects were randomly surveyed and directly observed, respectively. Results indicate that men and women have similar intentions to use the park for physical activity ($P>0.05$). However, in agreement with previous research, it was found that women and adults with children are less likely than men and adults without children to be physically active ($P<0.05$). In addition, the frequency of park visits was positively correlated with the total time spent exercising in a given week for men ($P<0.05$), but not for women ($P>0.05$). Men were more likely to be observed performing vigorous intensity physical activity and were less likely to be sedentary when at the park with their children ($P<0.05$). Survey results indicate that gender differences in park physical activity behavior are in part due to the proximity between playground equipment and other park resources ($P<0.05$). The lack of well-defined jogging paths compared to the abundance of sport-specific facilities such as basketball courts further exacerbates the disparities between the genders. The results of this study suggest that the design of public parks in Los Angeles County may not be effective in promoting physical activity for women.

14. SUPPRESSION OF RECEPTOR INTERACTING PROTEIN 140 (RIP140) EXPRESSION IN L6 CELLS IMPAIRS THE REGULATION OF INSULIN-SENSITIVE FA UPTAKE AND OXIDATION BUT NOT THAT OF INSULIN-SENSITIVE GLUCOSE UPTAKE

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Receptor interacting protein 1 (RIP140) is a negative transcriptional regulator of nuclear receptors which is involved in the regulation of oxidative metabolism. However, the role of RIP140 expression in the regulation of insulin-sensitive muscle metabolism is not known. To elucidate whether a reduction in RIP140 expression would impair regulation of insulin-sensitive FA uptake (FAU) and oxidation (FAO) and glucose uptake (GU) in muscle cells, L6 myotubes were transfected with RNAi to genetically silence RIP140 (RIP) using standard transfection protocols. Control cells were transfected with a silencer negative (SN) control sequence (SN). Untransfected cells (Control) and RIP and SN cells were then incubated ± insulin (I: 1000 nM) before measurement of glucose and FA kinetics using [2-³H]-deoxyglucose] or [1-¹⁴C]-palmitate. Insulin increased GU by 40.6±11.8% and FAU by 26.9±4.9% in control cells. Similar insulin-induced increases in GU (31.7±8.1%) and FAU (26.6±5.2%) were measured in SN cells. In line with this, the decrease in FAO induced by insulin was not significantly different between control (50.6±6.4%) and SN (47.7±13.6%) cells. These data show that transfection with the SN control sequence did not affect basal and insulin-stimulated muscle metabolism. Basal and insulin-stimulated GU were not significantly different between RIP and SN cells. Basal FAU was significantly ($P<0.05$) higher (29%) in RIP vs SN cells but insulin had no effect ($P>0.05$) on FAU in RIP cells (132.9±16.7 vs 116.9±11.8%). Basal FAO was not significantly different ($P>0.05$) between RIP and SN cells and, as shown for FAU, insulin had no effect on FAO in RIP cells. **CONCLUSION:** Our data show that while reduced RIP140 expression in muscle has no impact on the regulation of GU, it is associated with high rates of FAU and reduced sensitivity to insulin as it pertains to FA metabolism. Together, these metabolic changes may promote the development of insulin resistance in muscle.

16. VARYING TREADMILL SPEED AND INCLINATION AFFECTS UNINTENTIONAL SYNCHRONIZATION DURING SIDE BY SIDE WALKING

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Unintentional synchronization of gait occurs when individuals walk side by side and varies in relation to differences in leg length between partners. This behavioral phenomenon may be useful in a rehabilitation setting, but potential benefits appear to be dependent upon the quality of synchronization. Passive dynamic walking simulations suggest that synchronization might be improved in individuals with differing leg lengths by altering the speed and slope of a subject's treadmill relative to their partner's. The purpose of this experiment was to examine unintentional synchronization under such conditions, and to compare simulation data with empirical data. Sixteen pairs of subjects (age=22.18±2.30, mean leg length difference=6.71±3.49cm) performed one independent walking trial and fourteen paired walking trials. Paired trials consisted of one trial with both subjects at the same speed and inclination, four trials with differing relative speeds of ±0.2 and ±0.4 mph, and eight trials in which one treadmill was declined at 3° or 6°, or inclined at 3° or 6°. An optical motion capture system was used to track a marker placed over the right lateral malleolus of each subject. Consistent with simulation data, the results demonstrated that altering the speed and/or slope of one treadmill with respect to the other resulted in significant differences in the amount of unintentional synchronization that occurred between pairs (RM ANOVA, $p<0.001$). Further analysis revealed that inclining the taller subject's treadmill and increasing the speed of the shorter subject's treadmill resulted in significant decreases in synchronization (0.146 vs 0.373, $p=0.005$). Declining and increasing the speed of the taller subject's treadmill resulted in overall increases in synchronization, but these changes were not significant (0.622 vs. 0.373, $p=0.103$). These results provide further evidence for the relationship between the passive dynamics of walking and unintentional synchronization, suggesting that synchronization might be increased by manipulating treadmill speed and/or inclination.

17. COMPARING RPE & PAIN DURING RESISTANCE EXERCISE ACROSS GENDERS

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The primary aim of this study was to examine the effect of gender on ratings of perceived exertion (RPE) and relative muscle pain intensity (PI) during resistance exercise. Thirteen healthy men and women (age = 23.70 ± 5.43 yr) familiar with resistance training participated in this study. Initially, a 10-repetition maximum (RM) for the bench press, preacher curl, and leg extension was identified. At least 48 h later at the same time of day, subjects completed two sets of each exercise at this intensity, during which leg pain (0 – 10 scale) and RPE (Borg 0 – 10 scale) were assessed at five repetitions into the first set and immediately after the second set. Heart rate (HR) was also assessed via telemetry across each exercise. It was hypothesized that men would express greater values of RPE and PI versus women. Results demonstrated that men revealed significantly higher ($p < 0.05$) values of RPE and PI during resistance exercise compared to women. Males expressed the highest RPE (6.86 ± 1.21) and PI (6.43 ± 1.40) during preacher curls; whereas, women expressed the highest RPE during the bench press (4.50 ± 1.05) and greatest pain during knee extension exercise (3.50 ± 1.76). In men and women, RPE and PI increased ($p < 0.05$) during each exercise from set 1 to set 2, with the exception of PI in women during the preacher curl exercise. Overall, RPE and muscle pain were greater in men than women, although an explanation for this result is unknown. Previous studies have been unable to determine the potential mechanisms for explaining this gender discrepancy, although they suggest that physiological variables (personality, behavior patterns, cognitive style, and motivation) and previous athletic experience may influence RPE and PI.

19. THE EFFECTS OF VARYING LANDING CONDITIONS ON THREE-DIMENSIONAL IMPACT FORCES

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Introduction: Previous research has shown that impact loading is an effective means to stimulate bone adaptation. Little research has been done on using various directions as a strategy to elicit large ground reaction forces in multiple directions. **Purpose:** The purpose of this study is to determine how different landing conditions affect peak vertical, medial, lateral, anterior and posterior forces on each leg. **Methods:** Thirty subjects aged 18-24 years with no previous landing training performed landings onto two force plates from a set height (0.61 m) and set horizontal distance (0.44 m) in five different directions: forward (F), to the left (L), to the right (R), diagonally to the left (DL) and diagonally to the right (DR). Directions were randomly assigned and five landings per condition were collected. Motion analysis was used to determine maximum knee flexion for each leg to define the end of the force absorption (FA) phase. Peak forces made on the lead and trail leg during the FA phase were compared using repeated measures ANOVA with $p < 0.05$. **Results:** There was no difference in peak Fz values for the lead leg. The peak medial and the peak lateral forces displayed significant differences in the lead leg with the F condition different than all other conditions and the R and DR values differing. The peak anterior and posterior forces for the lead leg for the R and L landings were statistically different than the F, DR and DL landings. The trail leg exhibited similar findings. **Conclusions:** Altering landing directions can significantly alter the peak forces that are exerted on the lower extremity. A landing protocol which utilizes landings to the right and/or left may be most effective in stimulating bone adaptations.
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18. EQUAL INCREASES IN BMD DESPITE DIFFERENCES IN RESISTANCE TRAINING VOLUME IN GROWING RATS

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The purpose of this study was to determine if there was an exercise threshold in stimulating an elevation in bone mineral density (BMD), via resistance training, during the growth period in male rats. The total volume of work performed between the two resistance training programs was significantly different by design. Twenty-seven male rats were randomly divided into Control (Con, n=9), 3 ladder climb resistance trained group (3LC, n=9), and 6 ladder climb resistance trained group (6LC, n=9). The 3LC and 6LC groups were conditioned to climb a vertical ladder with weights appended to their tail 3 days/wk for a total of 6 wks. All exercised animals initially carried 30% of their body mass (BM) and progressed to 150% BM by wk 6. Serum osteocalcin (OC), urinary deoxypyridinoline (DPD), tibial BMD (using dual energy x-ray absorptiometry), and bone strength (via 3-point bending tests) were determined in all groups. Left tibial BMD was significantly greater for 3LC (0.225 ± 0.002 g/cm²) and 6LC (0.234 ± 0.003 g/cm²) when compared to Con (0.202 ± 0.004 g/cm²). Further, OC (in ng/ml) was significantly greater for 3LC (50.5 ± 3.2) and 6LC (41.7 ± 2.6) compared to Con (25.0 ± 3.4). In contrast, the urinary DPD was not significantly different between Con, 3LC, or 6LC groups. Bone strength (force to failure in Newtons) was significantly greater for 3LC (132.7 ± 4.6) and 6LC (130.0 ± 7.6) compared to Con (102.0 ± 3.4). There was no significant difference in BMD, serum OC, or bone strength between 3LC and 6LC groups. The results indicate that both resistance training programs were equally effective in elevating BMD and bone strength during maturation in rats. These data suggest that, during growth, there is a stimulation threshold where more work per exercise session is not effective in stimulating additional bone formation.

20. RELATIONSHIP BETWEEN HEART RATE RECOVERY VALUES AND BODY COMPOSITION IN CHILDREN AND ADOLESCENTS

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Introduction: Post-exercise heart rate recovery values (HRRV) predict all-cause mortality and sudden cardiac death in adult and pediatric populations. Little research compares HRRV in normal vs. overweight youth. **Purpose:** To determine the relationship between HRRV and body fat percent (bf%) in youth. **Methods:** Participants (6-16 years old) included 8 overweight (BMI >85th percentile) and 12 normal weight (BMI <85th percentile) youth subjects. Subjects performed an incremental bike test (McMaster's protocol) until volitional exhaustion. Investigators measured resting HR (rHR), peak HR (pHR), HR 30 seconds after exercise (HR30), HR 1 minute after exercise (HR60) through telemetry. HR recovery values were computed: pHR-HR30 (HRRV30), and pHR-HR60 (HRRV60). BF% was determined by DXA. **Results:** As expected overweight youth had larger ($p < 0.05$) BF% than normal weight youth (35.55 ± 2.89 vs. 18.15 ± 5.55). ANOVAs revealed no significant differences between groups in rHR (76 ± 10 vs. 81 ± 7), pHR (180 ± 13 vs. 184 ± 8), HR30 (157 ± 15 vs. 166 ± 20), HR60 (136 ± 14 vs. 143 ± 12), HRRV30 (23 ± 10 vs. 18 ± 16) and HRRV60 (38 ± 11 vs. 41 ± 8). Observed power for each of these variables were 0.28 ($\eta^2 = 0.10$), 0.11 ($\eta^2 = 0.03$), 0.20 ($\eta^2 = 0.08$), 0.13 ($\eta^2 = 0.04$), and 0.08 ($\eta^2 = 0.15$), respectively. HR30 correlated with pHR ($r = 0.67$, $p < 0.05$) and HR60 ($r = 0.80$, $p < 0.05$); HR60 correlated with pHR ($r = 0.75$, $p < 0.05$) and HRRV30 ($r = -0.49$, $p < 0.05$). None of the HR variables, including the HRRV at 30 and 60 showed significant correlations with bf%. **Conclusion:** Results showed no significant differences in HRRV because of bf%; however, statistical power was low. Literature suggests that the mechanisms regulating HR30 and HR60 differ. Though, a higher recovery during initial 30 seconds post-exercise (HRRV30) related to HR after 60 seconds. Based on these pilot results it appears premature to suggest a relationship, or lack of, between bf% and HRRV in youth.

21. VOLUNTARY WATER CONSUMPTION IN HUMANS: EFFECT OF BOTTLE TYPE ON WATER INTAKE AND DRINKING SATISFACTION

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Daily ingestion of sufficient water is necessary to optimize cellular, cardiovascular and thermoregulatory function. Little is known, however, regarding volume of water intake via bottled water and whether bottle type affects water consumption. The purpose of this study was to assess human water consumption behavior and to determine whether bottle design had any effect on water consumption. Sixty physically active participants, 26 males (32.5 ± 10.9 yr; 273 ± 126 min/wk) and 34 females (30.4 ± 11.1 yr; 257 ± 150 min/wk) enrolled and completed the study. Participants were randomized to one of four bottle conditions; disposable plastic screw-cap bottle (DS), metal screw-cap bottle (MS), wide-mouth plastic screw-cap bottle (WS), and bite-valve plastic bottle (BV). Participants recorded daily water intake for 14 days, and following a one-week washout, were randomized to the next bottle treatment. Following each bottle condition, participants answered 8 bottle/drinking satisfaction questions using a 10cm visual analog scale (VAS). Based on repeated measure ANOVAs, participants drank significantly more water from the BV bottle than from any of the other three water bottles ($F = 28.26$, $p < 0.0001$). There were no gender differences in fluid intake ($F = 0.32$, $p = 0.57$) but there was a significant interaction of gender and bottle type on fluid intake ($F = 36.57$, $p < 0.0001$). The composite result of the satisfaction questions (total VAS score for all eight questions) indicated that the BV was significantly preferred when compared with the other three bottles ($F = 10.31$, $p < 0.001$). We conclude that the participants in this study preferred drinking from a BV bottle, and that their weekly water intake via the BV bottle was higher by 24% vs. DS bottle, 18% higher vs. a MS bottle, and 15% higher vs. a WS bottle.

23. THE KINEMATIC DETERMINANTS OF BALL VELOCITY IN BASEBALL CATCHERS

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Previous research has identified several kinematic variables responsible for increased ball velocity in baseball pitching; however, similar variables have not been identified for catchers attempting to throw out base runners. Catchers must be able to minimize the time from the arrival of the ball into their glove to its arrival in the glove of the second baseman, known as pop-to-pop time. The purpose of this study is to investigate which kinematic variables best predict ball velocity, reducing pop-to-pop time for baseball catchers throwing to a simulated target. Subjects were seventeen elite male baseball catchers (21 ± 2.52 years, 178.98 ± 5.05 cm, 84.38 ± 8.26 kg). Twenty retro-reflective markers were placed on specified anatomical landmarks. Each subject started in the squat position, received the ball from a pitcher, performed a "pop-up" and threw the ball to a target for maximum velocity. Each subject performed ten repetitions. Ball velocity was captured with a radar gun. A seven camera system captured the 3D movement sequence at 250 Hz. Variables were extracted from the fastest trial for each subject. Subjects were then grouped based on ball velocity. Those who threw at the mean velocity or faster were categorized into the fast throw group (33.83 ± 1.29 m/s) and those who threw below the mean velocity were categorized into the slow throw group (30.4 ± 1.22 m/s). Discriminate analysis was used to identify variables best able to separate the fast vs. slow throwers. The groups had significantly different ($p < 0.05$) pop-to-pop times (1.86 ± 0.11 sec, 2.095 ± 1.78 sec) and discriminate analysis revealed that combining X-factor, Pop-up time, ball air time, total motion time, Pop-to-pop time, peak knee extension velocity, and peak internal shoulder rotation velocity, correctly identified 88.9% of subjects in group 1, and 62.5% of subjects in group 2. The results indicate that these variables are associated with achieving greater ball velocity.

22. EFFECT OF WEIGHTED JUMP WARM-UP ON VERTICAL JUMP IN DIVISION II MALE BASKETBALL PLAYERS

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Research suggests that warm-ups which elicit a post-activation potentiation (PAP) effect via high intensity muscular contractions may increase performance in subsequent activities requiring strength and power. We investigated if a basketball specific, dynamic warm-up that included weighted jumps would elicit a PAP effect and increase subsequent vertical jump height. Fourteen male college basketball players participated (age = 20.4 ± 2.7 yrs; mass = 90.1 ± 11.8 kg; ht = 192.4 ± 7.7 cm). Subjects were at week 3 of their comprehensive pre-season conditioning program. Two different warm-ups were employed at two practices: 1) a functional warm-up of jogging and basketball specific drills, and 2) an identical warm-up plus 10 maximal vertical jumps while wearing a vest loaded with 20% of bodyweight. At 4-minutes post warm-up, maximal vertical jump was assessed in two conditions: 1) counter-movement vertical jump (CMVJ), and 2) 2-step approach vertical jump (AVJ). Three trials each were employed. Paired Samples T-test was used to determine if there was a significant difference ($p < 0.05$) in vertical jump height between the two conditions. A significant 3.3% decrease ($p < 0.05$) occurred in vertical jump height in the CMVJ condition between the two different warm-ups (73.2 vs. 70.8 cm, warm-up vs. warm-up with weight vest, respectively). No significant difference in jump height occurred in AVJ. These results do not support the addition of weighted jumps to a dynamic warm-up to increase vertical jump in male collegiate basketball players during the pre-season. These results may be explained by a dampening of the neuromuscular response to the overload stimuli as a result of accumulated fatigue due to the overall volume and intensity of the conditioning stimulus imposed on players at this phase of pre-season, plus the acute fatigue of the weighted warm-up.

24. DELETION OF MUSCLE AMPKA2 ABROGATES HIGH FAT DIET-INDUCED IL6 EXPRESSION IN ADIPOSE TISSUE

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Dysregulation of fuel metabolism in skeletal muscle has been implicated in the development of insulin resistance. Since AMP-activated protein kinase (AMPK) has been shown to be involved in the regulation of fuel metabolism, we sought to determine if deletion of muscle AMPK α 2 would exacerbate the development of high fat diet (HFD)-induced insulin resistance. Male C57BL/6 mice (-10 wks), either wild-type (WT) or dominant negative (DN) AMPK α 2 in heart and skeletal muscle, were divided into control diet (CD; 12% fat; n=8) or HFD (60% fat; n=8) groups. After 6 weeks, CD and HFD mice were anesthetized and intra-abdominal adipose tissue (AT) was freeze-clamped with liquid N₂ and removed for Western Blot analysis. Although not significantly different, total food intake (kcal) was 27% higher in the HFD vs. CD mice. This is in line with the fact that body weight was 23 and 34% higher ($P < 0.05$) in WT+HFD and DN+HFD, respectively, over CD mice. Fat pad weight was not significantly different between any of the groups ($P > 0.05$). Plasma insulin levels were higher ($P < 0.05$) in both HFD groups when compared to CD groups by weeks 2-6. At week 6, plasma insulin levels were 500 and 582% higher ($P < 0.05$) in WT+HFD and DN+HFD, respectively, over CD mice. Plasma glucose levels increased similarly, although no statistical significance was obtained. In WT mice, IL6 expression in AT increased by 107% ($P < 0.05$) with HFD. However, the stimulatory effect of HFD on IL6 expression was not observed in AT of DN mice. Our data suggest that AMPK α 2 deletion in muscle does not affect insulin secretion or AT accumulation induced by 6 weeks of HFD. Conversely, AMPK α 2 deletion in muscle had a dramatic impact on HFD-induced IL6 expression in AT, suggesting that cross-talk between tissues may be part of a normal physiological response to HFD.

25. HEIGHT-TO-WAIST RATIO AND CARDIOVASCULAR DISEASE RISK FACTORS IN US ADOLESCENTS

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Although height-to-waist (HtW) ratio is strongly linked to cardiovascular disease (CVD) mortality in adults, the association between HtW and CVD risk factors in children and adolescents remain less unexplored. The purpose of this study was to examine the association between HtW and CVD risk factors in US adolescents (N = 9493), aged 12 to 17 years, from the NHANES (1999-2006). Waist circumference, body weight, height were assessed with standardized protocols for body composition measurement. High blood pressure (BP) was defined as a value at or above the 90th percentile for age, sex, and height. Elevated fasting glucose level was defined using the American Diabetes Association guideline of 110 mg/dL or higher. Elevated total cholesterol level was classified as TC greater than 200 mg/dL. The CVD risk (yes/no) was defined as one or more of these 3 conditions (high BP, elevated glucose, high cholesterol levels). Multivariable logistic regression was used to investigate the association between HtW and CVD risk after adjustment for age, sex, race, physical activity, and dietary habits. We also used the area under a receiver operating characteristic (ROC curve) and a nadir point to define the lowest CVD risk for HtW in boys and girls, respectively. HtW was a strong risk factor for CVD risk in both boys and girls (All P<0.001). There was a strong inverse association between HtW and CVD risk in both boys and girls (All P<0.001), respectively. Minima on the receiver operating characteristics curves for boys and girls were 2.17 and 2.03, respectively. The HtW cutoff points of 2.17 (sensitivity = 67%; specificity = 59%; minimal distance = 0.51) and 2.03 (sensitivity = 64%; specificity = 55%; minimal distance = 0.57) in boys and girls were associated with the lowest CVD risk, respectively. Height-to-waist ratio was strong risk factor for CVD risk in boys and girls.

27. EFFECT OF SEX AND RELATIVE FORCE ON VERTICAL JUMP TAKEOFF VELOCITY AND JUMP HEIGHT

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Individuals differ on vertical jump performance due to varying strength levels and force production. The purpose of this study was to evaluate the effects of body mass adjusted peak force on takeoff velocity and vertical jump height. Forty-eight subjects (27 men: age 24.68 ± 5.05y, height 177.07 ± 8.42cm, body mass 79.40 ± 16.10kg; 21 women: age 25.63 ± 7.92y, height 167.24 ± 8.37cm, body mass 60.94 ± 11.68kg) were measured for isometric mid-thigh pull on a force plate to determine peak ground reaction force (GRF). Each subject then performed three countermovement vertical jumps with arm swing on a force plate. Data acquisition software provided values for vertical jump height (VJH) using the following equation: $(a \cdot t^2)/8$, where 'a' and 't' represent gravitational acceleration and flight time, respectively. By integrating the acceleration-time curve and identifying velocity at the instant force dropped below 2.20, takeoff velocity (TOV) was determined. Prior to statistical analysis, subjects were divided into four groups: men and women with relative GRF greater or less than their respective sex specific means (men 21.52 ± 4.34 N/kg, women 18.86 ± 3.32 N/kg). The results indicated that males possessing relative GRF greater than the mean had greater VJH (49.69 ± 5.55cm) than males with relative GRF less than the mean (39.01 ± 8.08cm), and greater TOV (2.82 ± 0.27ms) than males with less than the mean (2.52 ± 0.27ms). Females possessing relative GRF greater than the mean did not differ in vertical jump (31.44 ± 5.04cm) when compared with females less than the mean (30.29 ± 5.26cm) or in TOV (2.11 ± 0.39ms) when compared with females less than the mean (2.24 ± 0.29ms). Females probably did not differ significantly due to their belonging to a relatively homogeneous group. Technique and training history may have also influenced these outcomes.

26. PREDICTING VO₂MAX IN COLLEGE-AGED PARTICIPANTS USING CYCLE ERGOMETRY AND PERCEIVED FUNCTIONAL ABILITY

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The purpose of this study was to develop a multiple linear regression model to predict treadmill VO₂max scores using both exercise and nonexercise data. One hundred five college-aged participants (53 male, 52 female) successfully completed a submaximal cycle ergometer test and a maximal graded exercise test (GXT) on a motorized treadmill. The submaximal cycle protocol required participants to achieve a steady-state heart rate (HR) equal to at least 70% of age-predicted maximum HR (220-age), while the maximal treadmill GXT required participants to exercise to volitional fatigue. Relevant submaximal cycle ergometer test data included a mean (± SD) ending steady-state HR and ending workrate equal to 164.2 ± 13.0 and 115.3 ± 27.0, respectively. Relevant nonexercise data included a mean (± SD) body mass (kg), perceived functional ability [PFA] score, and physical activity rating [PA-R] score of 74.2 ± 15.1, 15.7 ± 4.3, and 4.7 ± 2.1, respectively. Multiple linear regression was used to generate the following prediction of cardiorespiratory fitness ($R = 0.91$, $SEE = 3.36 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$): $\text{VO}_{2\text{max}} = 54.513 + 9.752 (\text{gender}, 1 = \text{male}, 0 = \text{female}) - 0.297 (\text{body mass, kg}) + 0.739 (\text{PFA}, 2-26) + 0.077 (\text{work rate, watts}) - 0.072 (\text{steady-state HR})$. Each predictor variable was statistically significant ($p < .05$) with beta weights for gender, body mass, PFA, exercise workrate, and steady-state HR equal to 0.594, -0.544, 0.388, 0.305, and -0.116, respectively. The predicted residual sums of squares (PRESS) statistics reflected minimal shrinkage ($R_{\text{PRESS}} = 0.90$, $SEE_{\text{PRESS}} = 3.56 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) for the multiple linear regression model. In summary, the submaximal cycle ergometer protocol and accompanying prediction model yield relatively accurate VO₂max estimates in healthy college-aged participants using both exercise and nonexercise data.

28. FOOT SOLE PRESSURE-TIME INTEGRAL FLUCTUATIONS DURING WALKING: EFFECT OF GAIT WIDTH AND SHOE DESIGN

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The variability in the distribution of the pressure-time integral (PTI) over the sole of the foot during walking is a potential measure of gait stability. To test this hypothesis we custom fit a cardboard sole to the dominant foot and placed force sensing resistors (FSR, Interlink) under the pressure points located near the heel and the head of the 1st and 5th metatarsals. The standard FSR pre-amp circuit was modified to include a germanium diode to eliminate insignificant touch artifacts. The FSR was calibrated over a range of 60-1035 kPa by having a subject place their heel on the electrode and shifting their weight, using a force platform (Accusway, ATMI) to measure the weight on the electrode. It was found that a plot of the logarithm of the pressure versus voltage was linear: the slope for different FSR electrodes was approximately the same, but the intercept varied. PTI is the integral of the pressure with respect to time measured by the FSRs for each stride. Healthy subjects with no history of falling were asked to walk along an approximately 60 stride long closed-loop path composed of four indoor hallways. Two parallel lines of electric tape were placed on the trail 0.37m apart: subjects were asked to walk either with both feet on one line (narrow gait), with normal gait width, or with both feet placed outside the two lines (wide gait). Since the step-to-step coefficient of variation in PTI was greater for the toes than the heel, we estimated the medial-lateral variability in the distribution of PTI, D(PTI), as PTI (5th metatarsal) divided by the sum of PTI's for the 1st and 5th metatarsals. The standard deviation of D(PTI), a measure of variability, was greater for narrow gait versus normal gait ($P=0.008$ for 6 subjects), but not significantly different between normal and wide gait ($P > 0.5$). No significant effects of gait width on D(PTI) were observed when a piece of foam rubber (~1 cm thick) was inserted between the cardboard sole and the walking surface ($P > 0.05$). These observations suggest that the D(PTI) are sensitive to gait stability and that this sensitivity is influenced by shoe design.

29. VARIABILITY OF LOWER EXTREMITY FUNCTION IN A RUNNER PRESENTING WITH KNEE PAIN: A CASE STUDY

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Techniques to identify a healthy running state have recently focused on variability of performance (Hamill et al., 1999; Meardon et al., 2006). **Purpose:** The aim of this study was to assess bilateral variability in lower extremity function for a runner presenting with knee joint pain across time. **Methods:** One subject (29yrs;79.3kg;1.86cm), diagnosed with patellofemoral pain, was instrumented with 16 markers in accordance with the Plug-in Gait lower extremity model. After a treadmill run of 10 minutes, the subject ran overground at a self-selected speed over a 15m calibrated space making contact with a force platform. Kinematic (120 Hz) and kinetic (1080 Hz) data were obtained during 10 running trials (Pre). Eight months later (Post), during which time the subject reduced running mileage, the assessment was repeated. The coefficient of variation (CV) of range of motion of the lower extremity joints during support phase and of first maximum vertical ground reaction force (F1) were calculated and compared between conditions. **Results:** Visual inspection of the kinematic data suggested increased variability in the unaffected (L) vs. the affected (R) limb as evidenced by support phase joint motion patterns. Kinematic CV values are given in Table 1. CV results for F1 (LPre=3.1%, LPost=12.1%; RPre=0.6%, RPost=19.1%) identified greater variability for the post-test for both limbs. **Conclusion:** Lesser variability has been shown to be indicative of an injury state. The CV of F1 along with visual examination of the lower extremity joint kinematic patterns during the support phase supported the conjecture that lesser performance variability may be indicative of an injury state when running while the CV for range of motion resulted in a contrasting conclusion.

Table 1. CV Values (%) for Range of Motion

| | LEFT | | RIGHT | |
|-------|------|------|-------|------|
| | Pre | Post | Pre | Post |
| Hip | 3.0 | 2.9 | 10.4 | 7.2 |
| Knee | 10.8 | 3.9 | 11.9 | 7.6 |
| Ankle | 17.6 | 15.3 | 18.0 | 3.6 |

31. EFFECTS OF POLYETHYLENE GLYCOSYLATED CREATINE SUPPLEMENTATION ON MUSCULAR STRENGTH

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Creatine is one of the most commonly used supplements to improve muscular strength and anaerobic exercise performance. The purpose of this study was to examine the effects of supplementation with micronized polyethylene glycosylated (PEG) creatine on muscular strength and body weight. This study used a randomized, double-blind, placebo-controlled, parallel design. Twenty two untrained men (mean \pm SD; age = 22.1 \pm 2.1 yr; height = 181.6 \pm 6.5 cm; weight = 80.3 \pm 8.4 kg) were randomly assigned to either a supplement (SUPP; n = 10) or placebo (PLAC; n = 12) group. The SUPP group ingested 5 g of micronized PEG creatine daily for 28 days, while the PLAC group ingested 5 g of Maltodextrin. Measurements included body weight (BW), as well as one repetition maximum (1RM) dynamic constant external resistance strength for bilateral leg extension (LE) and free-weight bench press (BP) exercises. Testing was conducted before (PRE) and after (POST) the 28-day supplementation period. The 1RM BP increased significantly (p < 0.05) for the SUPP group (5.9 %), but not for the PLAC group. There were no between group differences, however, for 1RM LE strength. Furthermore, there was no change in BW for the Supp or PLAC group. These results indicated that the 5 g·d⁻¹ dose of PEG creatine increased upper body strength (1RM BP), but not lower body strength (1RM LE). Furthermore, the increase in BP strength was not associated with a change in BW and occurred without resistance training. **Acknowledgements:** This study was funded by a research grant from General Nutrition Corporation.

30. A COMPARISON OF LIFESTYLE RISK FACTORS AND PARTICIPATION RATES IN THE WELLNESS PROGRAM AT NU SKIN INTERNATIONAL

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This study describes various lifestyle related health risks of employees, in particular diet and exercise habits, in the Nu Skin worksite wellness program. Participants included 303 employees who completed a 23 item survey. Data were divided into frequent (participating in \geq 4 program components per year; n = 119) and infrequent (participating in \leq 3 program components per year; n = 184) wellness program users. ANOVA indicated that for both moderate and vigorous intensity activity time (min/week) there were significant differences between frequent and infrequent program participation. Infrequent users spent significantly (F = 6.67, p = 0.01) less time (127.86 min/week \pm 73.75) in moderate intensity activity than the frequent users (151.16 min/week \pm 77.10). Infrequent users also spent significantly (F = 4.40, p < 0.04) less time (107.65 min/week \pm 67.74) in vigorous intensity activity than the frequent users (127.98 min/week \pm 73.19). Consumption of fruit and vegetables was found to be inversely correlated with BMI (r = -.117, p < 0.05). Fruit consumption was also positively correlated with the consumption of grains and whole wheat (r = .318, p < 0.001). When comparing groups of frequent and infrequent users for fruit and vegetable, salad, and whole grain consumption, it was found that significant differences existed for fruit and vegetable servings (F = 4.02, p < 0.05). Significant differences also existed for salad consumption (F = 4.18, p = < 0.05). There were no significant differences for wheat and whole grains. In conclusion the Nu Skin wellness program appears to have a positive influence on employee dietary and exercise/physical activity habits. Because of the cross-sectional nature of this study it is impossible to determine the true impact on employee health behaviors. Future research with a pre-test / post-test design could better assess program effectiveness in changing employee health behavior.

32. VALIDITY OF THE GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE (GPAQ)

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Physical activity (PA) questionnaires are used to assess health outcomes in epidemiologic studies and for surveillance activities in public health. The Global Physical Activity Questionnaire (GPAQ) and International Physical Activity Questionnaire (IPAQ) are used by the World Health Organization to determine the prevalence of worldwide PA and determine risk for chronic diseases associated with physical inactivity. However, little is known about the validity of the GPAQ with measures of PA and fitness. The purpose of this study was to evaluate the convergent and concurrent validity evidence for the GPAQ and to evaluate its utility as a measure of fitness and fatness. Sixty nine participants (n = 12 men, n = 57 women; M age = 43 years, SD = 12) completed the GPAQ, IPAQ and wore an ActiGraph GT1M accelerometer for seven days. Correlation coefficients demonstrated significant relationships between the GPAQ minutes of moderate and vigorous activity with the ActiGraph minutes of moderate (r = .28, p = 0.04) and vigorous activity (r = .48, p < .01). The GPAQ and IPAQ were moderately correlated for sedentary minutes (r = .51, p < .01) and minutes of moderate-to-vigorous (r = .48, p < .01) and vigorous (r = .63, p < .01) intensity activity. A significant relationship was found between the GPAQ moderate-to-vigorous activity and percent body fat (r = -.32, p < 0.01) and estimated VO₂ max (r = .26 p = 0.04). Bland-Altman plots showed agreement between the GPAQ and IPAQ. However, a similar systematic bias was observed when comparing both the GPAQ and IPAQ to the accelerometer. Percent agreement between the GPAQ and IPAQ categories were 25% for low, 51.3% for moderate, and 61.3% for high. These data provide preliminary validity evidence for the GPAQ. Each instrument varies in scope and purpose and should be chosen to meet a specific need.

33. COMPARISON OF BONE STRENGTH IN ADULTS CLASSIFIED BY ACSM PHYSICAL ACTIVITY GUIDELINES

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Osteoporosis is a disease characterized by low bone mass and strength. Currently, the ACSM Position Stand (2007) recommends at least 150 minutes of moderate physical activity per week for health benefits. For increases or maintenance of bone, the Position Stand recommends resistance training. However, aerobic activities such as walking and jumping have also been shown to increase bone mass measured by DXA (Shibata, et al., 2003). The primary aim of this cross-sectional study was to determine if bone strength is influenced by meeting physical activity guidelines. We assessed both self-reported moderate and vigorous physical activity using the International Physical Activity Questionnaire (IPAQ) as well as the Actigraph accelerometer and heel bone stiffness (OCSI) measured by the Achilles Insight Ultrasound device. Right OCSI values were significantly higher in subjects meeting guidelines than those not meeting guidelines ($p=0.018$). There was a significant difference between the speed of sound (SOS) value when comparing groups based on IPAQ categories of low, moderate, and high active ($p=0.036$). Right OCSI was correlated with the Actigraph vigorous minutes of 600 or more (0.244). Right OCSI was correlated with the IPAQ moderate MET-min/wk, (0.226). Correlations were significant at the $p < 0.05$ level. It is important to note that self-reported physical activity of moderate or vigorous intensity was a predictor of OCSI values. The results from this study indicate that the ACSM guidelines of 150 minutes of physical activity or more may be appropriate for maintaining bone strength in a middle-aged population.

35. COMPARISON OF TOTAL BODY WATER IN HIGH SCHOOL WRESTLERS USING BIO-IMPEDANCE MEASURES

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Accurate and reliable means of predicting Total Body Water (TBW) and Minimum Wrestling Weight (MWW) in high school wrestlers (HSW) is critical for a safe competition environment. One of the most commonly accepted tools to predict MWW in HSW is Bioimpedance Analysis (BIA). Although BIA is not a criterion measure, it is a fast and easy to use device that requires minimal training to operate. Bioimpedance Spectroscopy (BIS) is emerging as a more precise impedance tool to predict TBW and thus better predict MWW but it has yet to be evaluated in HSW. This study evaluated the two devices to determine reliability in measuring TBW and assessing MWW in HSW ($N=108$; age 15.4 yrs). Average height, weight, fat percentage and urine specific gravity was 172.5 cm, 68 kg, 11.7%, 1.0145 g/dl respectively. TBW and MWW of the two impedance devices were compared within and between days with repeated measures ANOVA. There was no significant time effect for MWW or TBW. However, MWW and TBW were significantly different between machines ($p<0.001$) such that TBW for BIS was lower than BIA and thus MWW was also lower. Pearson correlation indicated a significant relationship between machines in TBW ($r = 0.92$) and MWW ($r=0.91$) ($p<0.001$). Cronbach's Alpha indicated strong intra and inter-day reliability for BIA and BIS. While BIA and BIS are reliable they are not interchangeable in regard to MWW predictions in HSW. Wrestlers, coaches and athletic trainers need to be cautioned not to choose the BIS device simply because it provides a lower MWW.

34. THE EFFECTS OF WATER TRAINING vs. FIELD TRAINING ON THE MAINTENANCE OF AEROBIC AND ANAEROBIC FITNESS IN SOCCER ATHLETES.

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Many soccer players suffer from injuries that require limited participation in practices and competitions and would greatly benefit from intermittent periods of partial weight bearing. This study measures the effects of water training on the maintenance of aerobic power (VO_2 peak), anaerobic power (AnPow), anaerobic capacity (AnCap), and intermittent recovery performance (IRP) in collegiate soccer athletes.

Sixteen males and females (age: 19 ± 1.095 years; wt: 71.13 ± 8.34 Kg; ht: 174.63 ± 10.29 cm) were randomly assigned to a water group (WG) ($N=8$) or field group (FG) ($N=8$). The WG exercised in a lap pool and wore flotation devices during the deep water running (DWR). Members of the FG exercised on an all weather track and soccer field. Subjects exercised 3 days a week for 4 weeks. The duration of exercise was 35 minutes. Exercise intensity was controlled in both groups by continuous heart rate monitoring throughout exercise. According to the soccer team training all subjects completed two days of full body weight training every week during the study.

Significant differences were found between pre and post IRP means for the FG, pre and post AnCap means for the FG and WG, and pre and post AnPow means for the WG ($p<0.05$). No significant differences were found between pre and post IRP means for the WG and pre and post AnPow means for the FG. No significant differences were found between WG and FG pre or post intervention.

These results support that IRP, AnCap, and AnPow can be maintained or increased by water running. Therefore, athletes who are unable to participate in fully functional weight bearing activities may be able to perform alternative training in the water without significant losses in aerobic and anaerobic fitness levels.

36. ARTERIAL OXYGEN SATURATION AS A PREDICTOR OF ACUTE MOUNTAIN SICKNESS

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The purpose of this study was to determine if SaO_2 , as measured by a finger pulse oximeter upon rapid arrival to 4260m, could be predictive of acute mountain sickness (AMS) or summit success on a climb to 5640m. In total 73 climbers volunteered to participate in the study. After excluding those taking drugs to counteract the effects of AMS and those with missing data, 48 participants (45 male, 3 female) remained. The average age of participants was $34.5 \pm 10.2y$. Climbers were transported from 2650m to the Piedra Grande hut at 4260m on Pico de Orizaba within 2h. After a median time of 9.88h at the hut, they would climb toward the summit (5640m) and return with a median trip time of 13.25h. The Lake Louise Self-assessment Questionnaire (LLSQ) for AMS, heart rate, and SaO_2 from a finger pulse oximeter were collected upon arrival at the hut and repeated immediately before the climbers departed for their summit attempts and immediately upon their return. The presence of AMS was defined as a LLSQ ≥ 3 with a headache and at least one other symptom being reported. 64.3% of the participants successfully reached the summit. Average SaO_2 for all participants at 4260m prior to their departure for the summit was $84.4 \pm 3.6\%$. 54.8% of participants met the criteria for AMS during their ascent. There was not a significant difference ($p > 0.05$) in SaO_2 between those who experienced AMS ($SaO_2 = 84.6 \pm 4.0\%$) and those who did not ($SaO_2 = 84.2 \pm 3.3\%$) during the ascent; neither was there a difference between summitters ($84.8 \pm 3.7\%$) and non-summitters ($83.3 \pm 4.0\%$). SaO_2 does not appear to be predictive of AMS or summit success.

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37. NO POSTACTIVATION POTENTIATION IN DIVISION II CROSS COUNTRY RUNNERS AFTER WEIGHTED VEST JUMPS

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Muscular performance may be acutely enhanced by warm-up strategies (i.e., an induced postactivation potentiation or PAP). Subject characteristics such as strength and power levels, fiber type, conditioning strategies (aerobic vs. anaerobic), and training levels may influence power output following a stimulus. Fatigue induced by the warm-up may also reduce any potential PAP. This study investigated if a weighted-vest overload would elicit a postactivation effect and thereby increase subsequent countermovement jump performance in endurance athletes. Ten (age = 20.4 ± 3.1 yrs; mass = 60.6 ± 5.6 kg; ht = 166.0 ± 7.6 cm) trained female Division II cross-country runners participated. Subjects were in their competitive racing season. Two different warm-up protocols were conducted on two separate days within one week: 1) cross-country running for ~ 15 min., and 2) an identical warm-up plus 10 maximal vertical jumps with countermovement (CMVJ) while wearing a weight vest loaded with 20% of individual bodyweight. At 4-minutes post warm-up in each condition, maximal CMVJ height was assessed over 3 trials. Results in CMVJ height = 41.7 ± 2.2 cm post standard warm-up, and 39.1 ± 3.4 cm post weight-vest overload warm-up. Paired Samples T-test was used to determine if there was a significant difference ($p < 0.05$) in vertical jump height between the two conditions. A significant decrease in CMVJ was observed post weighted-vest overload (-2.6 cm; $p < 0.05$). In conclusion, the addition of weighted jumps at 20% bodyweight did not enhance CMVJ in female endurance athletes. In fact, results appear to demonstrate substantial fatigue, decreasing jump height by 6.2%.

39. EFFECT OF ORAL SODIUM BICARBONATE SUPPLEMENTATION ON BUFFERING CAPACITY OF BLOOD DURING SHORT-TERM EXPOSURE TO HYPOBARIC HYPOXIA IN HIGH - INTENSITY, SHORT - DURATION CYCLING EXERCISE

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The purpose of this study was to assess the effect of sodium bicarbonate ingestion during 6 to 8 hours of simulated altitude (11,300 ft) exposure on blood lactate accumulation induced by high - intensity, short - duration cycling exercise. Thirteen trained males (age 28.82 ± 9.44 years; VO_{2max} 40 ± 5 ml/kg/min) participated in four time-trials (TT) consisted of completing 360 revolution of pedals on a cycle ergometer as fast as possible against a set resistance equivalent to 5 % of subjects' body weight. Three to five accommodation trials were conducted in 2 to 3 weeks prior to the testing. The TTs were conducted in four conditions sequence of which were randomized: normobaric/placebo (NBPO); normobaric/sodium bicarbonate (NBSB); hypobaric/placebo (HBPO); and hypobaric/sodium bicarbonate (HBSB). Altitude exposure resulted in a 15 % and 2.7 % reduction in VO_{2max} and HR_{max} , respectively ($P < .05$). Both peak and average HRs were significantly higher during the HBSB trials than during the HBPO trial while no differences were observed between the normobaric trials. Sodium Bicarbonate ingestion resulted in greater serum lactate accumulation in HB condition compared to normobaric condition (21.1 and 18.9 mMol/L, respectively $P < .05$). There was no significant difference in post-exercise blood lactate concentrations between the hypobaric and normobaric VO_{2max} tests (12.7 and 12.2 mMol/L, respectively). Sodium bicarbonate ingestion enhanced the capacity of blood lactate accumulation during high - intensity, short - duration cycling exercise performed in hypobaric hypoxia.

38. HOW MANY STEPS PER DAY ARE ENOUGH?

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Although it is recommended to accumulate at least 10,000 steps per day to improve health benefits, the validity of these guidelines associated with cardiovascular disease (CVD) morbidity and mortality remains not fully explored. The purpose of this study was to examine the association between number of steps per day and CVD risk in US adolescents (aged 12 to 17 years) and US adults (aged 20 to 85 years) from the NHANES (2005-2006). Physical activity monitor was used to assess physical activity status. Accelerometer data were obtained from 1883 adolescents and 4016 adults. Participants with one or more valid days were used for data analyses, computing average steps/day. The CVD risk (yes/no) was defined as one or more of the following 3 conditions (high BP, elevated glucose, high cholesterol levels). Multivariable logistic regression was used to investigate the association between average steps/day and CVD risk after adjustment for multiple risk factors. We also used the area under a receiver operating characteristic (ROC curve) and a nadir point to define the lowest CVD risk for average steps/day in adolescents and adults, respectively. Average steps/day was a strong risk factor for CVD risk in both adolescents and adults (All $P < 0.001$). There was a strong inverse association between average steps/day and CVD risk in both adolescents and adults (All $P < 0.001$), respectively. Minima on the receiver operating characteristics curves for adolescents and adults were 6849 steps/day and 7845 steps/day, respectively. The steps/day cutoff points in adolescents were 6849 (sensitivity = 55%; specificity = 56%; minimal distance = 0.67, c statistics = 0.57), and the steps/day cutoff points in adults were 7845 (sensitivity = 50%; specificity = 60%; minimal distance = 0.66, c statistics = 0.88). We observed that approximately 7000-8000 steps/day may reduce CVD risk in both adolescents and adults.

40. MUSCLE ACTIVITY DURING RUNNING AT REDUCED BODY WEIGHT

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Ground reaction forces (GRF) are reduced as body weight (BW) levels are reduced using a body-weight-support treadmill (Grabowski et al., 2008), suggesting that muscle activity will also decrease. The purpose of this study was to investigate how muscle activity of selected lower extremity muscles is influenced by BW support during running at different speeds. Ten subjects (5 male, 5 female; 24 ± 2 yo; 1.75 ± 0.12 m, 73.5 ± 15.7 kg) participated in the study. Muscle activity of the right bicep femoris (BF), rectus femoris (RF), tibialis anterior (TA) and medial gastrocnemius (GA) was recorded (1000Hz) using a surface electromyography (EMG) system (Noraxon, Myosystem 2000). Subjects were instrumented with a uniaxial electrogoniometer (Biometrics, SG150) placed across the lateral side of the right knee to record flexion and extension for each running trial. Each running condition (1-min) was completed using a lower-body positive pressure (LBPP) treadmill (G-Trainer Pro Version 1.20). Subjects ran at 100%, 115% and 125% of preferred speed at 100%, 90%, 80%, 70% and 60% of BW. EMG data for each muscle were reduced by removing any zero offset, full wave rectifying, and calculating the average (AVG) and root mean square (RMS) over the first 30-second period. AVG and RMS for each muscle were compared between speeds and BW using repeated measures ANOVAs ($\alpha = 0.05$). No interaction was observed between BW and speed ($p > .05$). AVG and RMS muscle activity increased across speeds for all the muscles ($p < .05$) except for RMS BF ($p > .05$). AVG and RMS muscle activity decreased as BW decreased for all the muscles ($p < .05$) except for AVG GA ($p > .05$). It was determined that muscle activity was lower when BW was effectively reduced. Furthermore, it was determined that muscle activity increased as running speed increased. LBPP devices have the ability to alter the amount of weight support and thereby the amount of active muscle.

41. PERFORMANCE CHANGES WITH THREE DIFFERENT TRAINING LOADS IN MASTERS LEVEL CYCLISTS

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PURPOSE: The purpose of this study was to determine the changes in performance in Masters level cyclists after eighteen weeks of prescribed training using a power meter. **METHODS:** Nine competitive male cyclists (44 ± 2.1 yrs) completed three 6-week phases of structured training using power meters. The first phase (P1) consisted of 6 weeks of training focused at a power below 80% of onset of blood lactate accumulation (OBLA), the 2nd phase (P2) consisted of training focused at a power between 84-94% of OBLA and the 3rd phase (P3) consisted of training focused at a power between 97-105% of OBLA. Testing occurred on 4 occasions, at baseline (P0) and after each phase of training. At each test session body composition was measured and subjects completed a maximal exercise test on a cycle ergometer. Heart rate, blood lactate, rating of perceived exertion, and oxygen consumption (VO_2) were recorded at each 3-minute stage throughout the exercise and at 3 and 6 minutes of an active recovery. A 16.1 km time trial (TT) performance test on a road course was performed the same week as each laboratory test. **RESULTS:** There was a 3% decrease in body weight and a 2% decrease in lean body mass ($p < 0.05$) from P0 to the end of P1. VO_2 peak increased 6% (52.0 ± 1.7 to 55.6 ± 1.9 ml·kg⁻¹·min⁻¹) and peak power 6% (330.0 ± 15.0 to 350.0 ± 14.1 watts) from P0 to P1. Power at LT increased significantly from P0 to P1 and power at OBLA from P0 to P2. TT times improved from P1 to P2 (28.2 ± 1.1 to 26.1 ± 0.7 min). **CONCLUSION:** The initial 6 weeks of specific power based training resulted in the majority of the improvements in VO_2 peak, peak power and TT performance in Master level cyclists.

43. EFFECT OF AGE, GENDER AND BOTTLE TYPE ON WATER INTAKE IN PHYSICALLY ACTIVE ADULTS

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Next to oxygen, water is the most essential element to human life. On average, water makes up 60 percent of your body weight. However, little is known about the effects of age, gender, or bottle type on water intake in physically active adults. Therefore, the purpose of this study was to assess the effects of age, gender, and bottle type on water consumption in adults. Sixty physically active participants, age range (18-56 yr), 26 males (32.5 ± 10.9 yr; 273 ± 126 min/wk) and 34 females (30.4 ± 11.1 yr; 257 ± 150 min/wk) enrolled and completed the study. Participants were randomized to one of four bottle conditions: disposable plastic screw-cap bottle (DS), metal screw-cap bottle (MS), wide-mouth plastic screw-cap bottle (WS), and bite-valve plastic bottle (BV). Participants recorded daily water intake for 14 days, and following a one-week washout, were randomized to the next bottle treatment. Two-way repeated measure ANOVAs were performed for age by bottle type and gender by bottle type. It was determined that there was a main effect for age ($F = 8.67$, $p < 0.00$) and bottle type ($F = 3.36$, $p < 0.02$), but no significant interaction ($F = 1.14$, $p < 0.33$). The older participants (≥ 30 yr of age) drank less water than the younger participants (7553 vs 11273 ml) and all the participants, irrespective of age, drank significantly more water from the BV bottle. There was no gender main effect ($F = 0.91$, $p = 0.34$) but there was a significant interaction of gender by bottle type ($F = 20.68$, $p < 0.00$). The females drank significantly more water from the BV bottle than the other 3 bottle types (BV=11066, DS=8980, WS=8070, MS=7424ml). Water intake for the males was similar across 3 bottle types (MS=11741, BV=10813, WS=10744ml) but was significantly greater than the DS (8676 ml). In conclusion, adults over 30 years of age drank less water than adults under 30 and bottle type and gender interacted to affect water intake.

42. PHYSIOLOGICAL AND MECHANICAL PARAMETERS OF CYCLING AT CRITICAL POWER IN TWO AGE GROUPS

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Introduction: A 3 min all-out cycling test has been successfully used to determine critical power in young cyclists. However, the physiological and mechanical parameters of critical power have not been well described in different age groups. **Methods:** Two groups of elite cyclists (young 21.8 ± 2.4 yr, $n=15$ and middle aged 53.0 ± 6.6 yr, $n=15$) performed a $\text{VO}_{2\text{max}}$ test and a 3 min all-out test on their own bicycle using the Computrainer Lab Ergometer. The 3 min all-out test was performed at the power associated with the midpoint between the ventilatory threshold and $\text{VO}_{2\text{max}}$. At four different time points during the 3 min all-out test ankle ROM, shoulder horizontal and vertical displacement, and horizontal knee displacement were obtained via motion analysis. **Results:** $\text{VO}_{2\text{max}}$ was significantly different between groups (67.2 ± 5.8 vs 56.6 ± 8.7 ml·kg⁻¹·min⁻¹, young vs. middle-aged, respectively, $p \leq 0.05$). There was a significant difference in critical power between the age groups (318 ± 36 W vs 283 ± 41 W, young vs. middle-aged, respectively, $p \leq 0.05$). All mechanical data illustrated a significant difference from the first time point to all other time points ($p < 0.05$). The only parameter that showed significant group differences was the ankle ROM ($28.8 \pm 8.4^\circ$ vs $25.0 \pm 8.4^\circ$, young and middle-aged, respectively). When reaching critical power subjects' lower extremity cycling mechanics became less varied ($p < 0.05$) implying the sustainability of this workload. **Conclusion:** A 3 min all-out cycling test appears to identify critical power in middle-aged cyclists. Critical power may be associated with optimal mechanical efficiency in elite cyclists. Research supported by the Swenson Summer Research Fellowship Program

44. EVALUATION OF THE ACTIVE KEY ACCELEROMETER

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Objective: To examine the concurrent validity of the Technogym Active Key accelerometer against objective and subjective Physical Activity (PA) measures. **Design:** Randomized, cross-sectional design with two phases. The laboratory phase compared the Active Key with the ActiGraph GT1M and the Yamax SW200 Digiwalker pedometer during treadmill graded walking increasing speed each minute. The free-living phase compared the Active Key with the ActiGraph, Digiwalker, Bouchard Activity Recall (BAR), and Global PA Questionnaire (GPAQ) for seven continuous days. Data were analyzed using Spearman rank-order correlation coefficients for all comparisons. **Setting:** Laboratory and free-living phases. **Participants:** Sixteen participants randomly stratified from 41 eligible respondents by sex ($n=8$ male; $n=8$ female) and PA levels ($n=4$ low), ($n=8$ middle), and ($n=4$ high active). **Results:** There was a strong association between the Active Key and the ActiGraph accelerometer during controlled graded treadmill walking ($r = 0.91$, $p < 0.01$) and in free-living settings ($r = 0.73$ to 0.76 for light to vigorous PA, respectively, $p < 0.01$). No associations were observed between the Active Key and the BAR and GPAQ. ($p > 0.05$). **Conclusions:** The Active Key has a high concurrent validity with the ActiGraph accelerometer to detect PA in both controlled laboratory and free living settings.

45. VALIDITY OF THE ePULSE PERSONAL FITNESS ASSISTANT®

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Purpose: The aim of the present investigation was to determine the validity of the ePulse Personal Fitness Assistant (PFA)® manufactured by Impact Sports Technologies, Inc.

Methods: Ten (10) healthy adults (age: 29.3±7 yr; 6 males, 4 females) engaged in 5-minute randomized stages of standing rest and treadmill exercise at 2, 4, 6 mph. Heart rate was recorded via a 3-lead EKG (*criterion*) and the PFA. Caloric expenditure was recorded from the ePulse PFA at 1-minute intervals and gas exchange data was collected using a Parvomedics Truemax 2400® metabolic cart (*criterion*). Criterion measures for heart rate and caloric expenditure were compared to the values recorded from the PFA. Correlation coefficients (*r*) and standard error of estimate (SEE) were calculated to determine the validity of the PFA. Total caloric expenditure during each stage was compared between the metabolic cart and ePulse PFA® by dependent t-tests. A significance level of 0.05 was used for all tests.

Results: Correlation coefficients for heart rate under each condition: standing rest: $r = 0.91$; SEE <5.0 bpm; 2 mph: $r = 0.96$; SEE <5 bpm; 4 mph: $r = 0.74$; SEE =12.5 bpm; 6 mph $r = 0.31$; SEE =12.1 bpm. Dependent t-tests revealed significant differences in caloric expenditure between the metabolic cart and the PFA during rest and walking. Additionally, the difference in caloric expenditure approached significance at 6 mph ($p = 0.097$).

Conclusion: The ePulse PFA® provides valid measures of heart rate at rest and during walking at 2 mph ($r \geq 0.91$; SEE <5.0 bpm). However, accuracy declined at 4 and 6 mph. Moreover, the PFA consistently underestimated energy expenditure and significant differences between the PFA and the metabolic cart were found at rest, 2, and 4 mph.

47. ASSESSING BODY COMPOSITION OF CHILDREN AND ADOLESCENTS USING DEXA, SKINFOLDS, AND ELECTRICAL IMPEDANCE

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The purpose of this study was to determine the validity and reliability of four methods of estimating body composition in 331 participants (177 boys, 154 girls) between 12-17 years of age. Percent body fat (%BF) was assessed once using DEXA and twice using the sum of two skinfolds and three bio-electrical impedance analysis (BIA) devices: OMRON hand-to-hand BIA, TANITA 521 foot-to-foot BIA, and TANITA 300A foot-to-foot BIA. The same assessments were repeated on 79 of the participants on a second day.

DEXA was used as the criterion method of estimating %BF. The agreement between the estimates of %BF from the sum of two skinfolds and the three BIA devices and DEXA was evaluated using Bland-Altman analyses. The bias, 95% Confidence Interval (CI), and 95% Prediction Interval (PI) were reported at different levels of body fatness since they are dependent on body fatness. The results of this study indicate that (a) all of the methods used in this study to estimate %BF were reliable within and between days, (b) the TANITA 300 BIA device performed poorly in both boys and girls and should not be used to assess body composition in children and adolescents, (c) none of the four prediction methods performed well in both boys and girls across the entire range of %BF values of the subjects in this study, (d) the sum of two SF, OMRON and TANITA 521 are acceptable for use in large population-based studies but are not recommended when the accurate assessment of body composition of an individual is critical, in which case (e) criterion methods of assessing body composition should be used.

46. CALORIC COSTS OF TRADITIONAL BENCH PRESSING COMPARED TO STABILITY BALL CHEST PRESSING IN COLLEGE-AGED MALES.

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Although unstable device training is a popular mode of resistance training, its effects on caloric expenditure and training volume (sets x repetitions) is still to be elucidated. Five college-aged males (Age = 26±4yrs, Height=186±6cm, Weight=93±7kgs) with at least one year of resistance training experience volunteered for the study. The study employed a crossover design wherein each participant performed a bout of traditional barbell bench pressing (BP) and a bout of stability ball barbell chest pressing (SB) separated by a minimum of 48 hrs. A 65cm stability ball (Hugger Muggger, Salt Lake City, UT) was used during each SB bout. Participants were familiarized with BP and SB before the study. One repetition maximum (1-RM) was determined using BP 48hrs before the BP or SB bout. Participants then performed three sets of 10 (and one warm up set) either BP or SB using a load 73.5% of 1-RM with a goal of 10 repetitions per set. All bouts included a cardiovascular warm up, an upper body dynamic warm up and one set of 10 repetitions at 50% of 1-RM. Caloric expenditure was analyzed from the beginning and 15mins post exercise for the BP and SB bouts using a metabolic cart (ParvoMedics, Salt Lake City, UT). Repetition rate was standardized with a metronome (one repetition per two seconds). Kilocalories expended per minute and training volume for BP and SB were compared using a paired t-test ($p = 0.05$). Kilocalories per minute (kcal/min) was greater ($p < 0.05$) in the SB bout than the BP bout (3.5±0.2kcal/min vs. 3.3±0.1kcal/min, respectively). Training volume was not significantly different between BP and SB bouts (101±1reps vs 97±3reps, $p = 0.64$). At a submaximal intensity, SB may provide a greater kcal/min during exercise than BP while not compromising training volume. However, the kcal/min difference between BP and SB bouts may not be practically meaningful.

48. EFFECT OF DRINK VOLUME ON THIRST AND MARKERS OF HYDRATION STATE

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Reduced total body water (hypohydration) increases thirst and plasma osmolality (P_{osm}). In a hypohydrated state, large drinking volumes decrease thirst to a greater magnitude and for a greater duration than small volumes; however, only large fluid volumes decrease P_{osm} . The purpose of this study was to investigate the effects of intermediate drink volumes on thirst and markers of hydration. Seven healthy, untrained males (age = 23 ± 5 y, height = 175.2 ± 5.1 cm, mass = 82.7 ± 15.4 kg, body fat = 15.2 ± 5.4%) completed five experimental visits, dehydrating via 24 hours of water deprivation prior to each visit. During each trial, subjects drank either 0.0 (V0.0), 2.5 (V2.5), 5.0 (V5.0), 7.5 (V7.5), or 10.0 (V10.0) mL·kg⁻¹ of water during three minutes using 19 swallows. Investigators obtained thirst measures and blood samples prior to water deprivation (BASE), immediately prior to (PRE), immediately post (IP), and 3 (+3), 5 (+5), 10, 15, 30 (+30), and 60 (+60) min post water consumption. Water deprivation significantly decreased mass from BASE to PRE by ~2.5%. At IP, +3, and +5, V0.0 thirst significantly exceeded V2.5 thirst, which significantly exceeded all other trials (i.e. V0.0 > V2.5 > V5.0 = V7.5 = V10.0). From +5 to +60, V0.0, V5.0, V7.5, and V10.0 thirst remained the same while V2.5 thirst gradually decreased, such that at +60, only V0.0 thirst significantly differed from other trials (i.e. V0.0 > V2.5 = V5.0 = V7.5 = V10.0). P_{osm} at +30 was significantly greater in V0.0 than V10.0; at +60, V0.0, V2.5, and V5.0 P_{osm} significantly exceeded V10.0. In conclusion, despite persistent hypohydration, moderate fluid volumes attenuate thirst to the same degree as large volumes but fail to significantly influence P_{osm} .

49. THE EFFECTS OF GROUND REACTION FORCES AND MUSCLE FORCES ON BONE PARAMETERS IN RUNNERS

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Bone tissue adapts to exercise training by changing architecture and increasing bone mineral density (BMD). Ground reaction forces and muscle forces are both known to load bone and increase bone strength. There is debate about which type of force makes the greatest contribution to bone strength. **Purpose:** The purpose of this study was to investigate the effects of typical ground reaction forces from running on bone parameters and explore the respective contributions of ground reaction forces and muscle forces to BMD. **Methods:** Twelve male runners (18-50yrs) training at least twice per week and at least 10 miles per week were chosen as subjects. Each subject completed a training questionnaire for volume, intensity and cross training. BMD was determined by DXA (Hologic Discovery D) for whole body, spine, and hip and by ultrasound (Hologic Sahara) for the calcaneus. Running kinematics and ground reaction forces were determined using motion capture and force plates. Lower extremity power and lower extremity strength were determined on a Keiser leg press. Data were analyzed by Pearson correlation. **Results:** Heel BMD was significantly correlated with hip BMD ($r=0.59, p<0.05$), but not with spine BMD. Vertical jump airtime was significantly correlated with hip BMD ($r=0.68, p<0.05$) and spine BMD ($r=0.62, p<0.05$). Finally, vertical jump airtime was inversely correlated with average running contact time ($r=-0.62, p<0.05$) and positively correlated with average vertical peak force during running ($r=0.72, p<0.05$). **Conclusion:** It appears that bone density is affected by both muscle and ground reaction forces and that the rate of force application may be the most important determinant of bone adaptation. Research supported by the Swenson Summer Research Fellowship Program

51. COMPARISON OF VARIOUS METHODS OF MEASURING BODY COMPOSITION TO UNDERWATER WEIGHING IN ADULT MEN AND WOMEN

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The accurate measurement of adipose tissue in the human body is of physiological and medical importance. Body fatness, in addition to fat distribution, may greatly influence mortality and morbidity. The accurate measurement of body fat is important since excess fat can increase the risk for metabolic disorders, cardiovascular disease, as well as the effect of various drug therapies on these disorders. As interest in measuring body composition increased, various methods to measure body composition were developed. However, the validity and reliability of these techniques needed to be determined. This study determined which method was most related to underwater weighing (considered the criterion method) and to rank order the techniques with underwater weighing. Body composition was determined by DEXA, BodPod, BIA, NIR, ultrasound, skinfold fat thickness (3, 4, and 7 site), and MRI, and compared to UWW. Subjects were 50 Caucasian men and women. Correlations between UWW and the other techniques were:

| | SF 4 | SF 7 | SF3 | Bod Pod | DEXA | Ultrasound | NIR | BIA |
|---------|------|------|------|---------|------|------------|------|------|
| Men R | .971 | .965 | .955 | .951 | .929 | .887 | .750 | .748 |
| Women R | .962 | .934 | .946 | .939 | .932 | .778 | .842 | .825 |

Results: 1. The variability in measures of body fatness supported the concept of population specific limitations for assessing body composition. 2. With an expert, trained technician, percent body fat obtained from the sum of four skinfold measurements using Jackson and Pollack equation correlates highest with UWW results for both sexes. 3. Magnetic resonance imaging should not be used for measuring body composition until automated software is developed to replace the manual analysis of the images, in order to eliminate subjective bias and reduce the time needed to analyze the images, in order to eliminate subjective bias and reduce the time needed to analyze the images.

50. QUADRICEPS ACTIVATION NORMATIVE VALUES AND THE AFFECTS OF SUBCUTANEOUS TISSUE THICKNESS

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Calculation of the central activation ratio (CAR) using the superimposed burst technique (SIB) is widely used to assess muscle activation. 0.95 is considered a normal value of the CAR, but it has not been objectively examined. Since an electrical stimulation penetrates the subcutaneous tissue to stimulate the motor neurons, the intensity of the electrical stimulation to the target muscles may vary depending on the subcutaneous tissue thickness. We asked: (1) what is the normal CAR value in healthy quadriceps muscles and (2) does the subcutaneous tissue thickness affect the measurement of the CAR? Fifty-six healthy subjects (37 male and 19 female; age = $23.2 \pm 3.9y$) volunteered in this descriptive study. Subjects sat on the Biodex and performed a maximal voluntary isometric contraction (MVIC) of the quadriceps with the knee at 90°. Once the MVIC reached a plateau, an electrical stimulation was manually delivered to the quadriceps via stimulating electrodes. Quadriceps activation (CAR) was quantified using the equation: $CAR=MVIC/MVIC+SIB$ force. Quadriceps subcutaneous tissue thickness was measured, between the two electrodes, using ultrasound imaging and pinch calipers. All measurements were performed three times and the mean utilized for data analysis. Based on our data, normal CAR values were estimated at 0.95 ± 0.04 for dominant and 0.93 ± 0.05 for non-dominant limbs. Skinfold measurements significantly underestimated quadriceps subcutaneous tissue thickness compared to ultrasound measurements ($P < 0.0001$ for all comparisons). There were significant negative slopes for normalized quadriceps MVIC and subcutaneous tissue thickness, except in the female dominant limbs. We found no relationship between CAR and subcutaneous tissue thickness. Our results are consistent with previous suggestions that the CAR value in healthy young adults is 0.95. Electrical stimulation generated by the SIB technique may not be dependent on subcutaneous tissue thickness.

52. THE EFFECTS OF WARM-UP ON POWER OUTPUT AND FATIGUE

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While no specific warm-up routine or duration has been developed, warm-up remains an important preparation before exercise. Research shows that an active warm-up can increase power output. The purpose of this study was to measure the effect of varying warm-up duration on peak power, mean power and fatigue index via the Wingate test (WAnT). Eleven men and seven women (mean/SD age and mass = 22.56 ± 4.71 yr and 71.73 ± 12.67 kg, respectively) participated in the study. They exercised at least 3 d/wk. On three separate days, each subject performed a WAnT with warm-up durations of 0, 5, or 10 min using a randomized, repeated measures crossover design. Preceding the warm up on day 1, maximal cadence was identified. During testing, subjects re-attained their maximal cadence, the calculated resistance (0.075 g/kg bw for women and 0.085 g/kg bw for men) was dropped, and subjects pedaled 'all-out' for 30 s. One-way ANOVA with repeated measures was used to identify differences in parameters across the warm-up durations. There was no difference in peak power across duration (9.25 ± 1.47 W/kg, 9.82 ± 1.71 W/kg, and 9.63 ± 1.55 W/kg), although it approached significance ($p = 0.11$). A similar non-significant trend ($p = 0.12$) was revealed for mean power (6.94 ± 1.18 W/kg, 7.28 ± 1.32 W/kg, and 7.22 ± 1.20 W/kg, respectively). Fatigue index was also similar ($p = 0.13$) across the three warm-up durations (52.61 ± 4.32 W/kg, 55.39 ± 6.36 W/kg, and 54.48 ± 4.39 W/kg, respectively). Results revealed that warm-up duration did not alter power output or fatigability in active men and women. Further study is merited in larger populations and in sport-specific settings to further elucidate the ergogenic role of warm-up in altering sport and athletic performance.

53. METABOLIC RESPONSES TO EXERGAMING AMONG OLDER ADULTS

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Video games that require physical activity ("exergames") have been growing in popularity among older adults. Despite the increased interest, there is a lack of research addressing physiological demands of game play in this population. The purpose of this study was to determine energy expenditure (EE), heart rate (HR) response, and perceived exertion (RPE) of older adults while playing different exergames. A convenience sample of 13 older adults (6 male, 7 female; aged 60 – 85 yr), performed three 5-min bouts of three selected exergames (Wii bowling, Xavix Boxing, & Dancetown) that had been identified as enjoyable in a prior 'taster session.' Participants rested between bouts until their HR returned to within 10bpm of their pre-exercise heart rate. The order of testing was not randomized (bouts went from the assumed least intense game to the most intense game). During each bout, oxygen consumption (VO_2) and HR were assessed continuously and recorded every minute. The last 4 minutes of each bout were averaged for analysis. RPE (6-20 scale) was recorded at the end of each game. Group means (\pm SD) for Bowling, Boxing, and Dancetown, respectively, were: $VO_2 = 5.57(2.2)$, $10.89(5.8)$, $10.37(3.4)$ ml/kg/min; $EE = 1.5$ (0.68), $3.22(2.91)$, $2.67(1.02)$ kcal/min; $HR = 84$ (13), $104(13)$, $108(17)$ bpm; and $RPE = 9.4(1.3)$, $12.7(1.78)$, $13.9(1.8)$. Repeated measures ANOVA revealed Boxing and Dancetown to increase VO_2 , EE, HR, and RPE to a greater extent than bowling (all comparisons $p < .01$), although all games were of light to moderate intensity in terms of metabolic equivalents (METs). These findings suggest that if older adults use exergames as an alternative to sedentary behaviors, they may provide them with a mild cardiovascular stimulus.

55. A COMPARISON OF THE ACTIGRAPH AND MULTIPLE WIRELESS ACCELEROMETERS FOR ESTIMATING ENERGY EXPENDITURE AND CLASSIFYING ACTIVITY INTENSITY

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Purpose: To compare the Actigraph to a new system of wireless accelerometers for estimating energy expenditure and classifying physical activity intensity and duration. **Methods:** Physical activity was measured with an Actigraph placed on the hip, a system of seven wireless accelerometers (MITes) and the Oxycon Mobile portable metabolic unit. Twenty-four subjects completed twenty steady state activities in two clinic visits. The Actigraph and the MITes were compared to METs using the Oxycon to estimate energy expenditure and classify activity intensity. **Results:** A regression analysis revealed improved energy expenditure estimation for all activities combined with the MITes ($R^2=0.77$) compared to the Actigraph ($R^2=0.54$). Measured energy expenditure classified 57% of the activities as light, 32% of the activities as moderate, and 7% of the activities as vigorous. The Actigraph classified the activities at 81%, 16%, and 2% respectively (Freedson), 63%, 35%, and 2% (Hendleman), and 72%, 24%, and 4% (Swartz). Whereas a MITes count from three of the seven sensors classified the activities as 60%, 38% and 2%. **Conclusions:** Several wireless accelerometers markedly improve both energy expenditure estimates and activity classification compared to a single Actigraph mounted on the hip, and show promise for improving objective measurement of physical activity.

54. OXYGEN CONSUMPTION DURING UNLOADED WALKING AND RUNNING

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Introduction: Unloaded exercise is known to decrease oxygen consumption (VO_2), but no study has investigated both walking and running simultaneously or at different speeds. Understanding VO_2 changes during walking and running is important for the application of unloaded treadmill exercises in clinical settings. The purpose of this study was to quantify VO_2 , heart rate (HR) and Borg rating of perceived exertion (Borg RPE) during unloaded walking and running. We hypothesized that VO_2 will be lowered more with running than walking during unloaded exercise. **Methods:** After IRB approval, we studied 10 healthy subjects (5 males and 5 females, aged 23 ± 3 years and body mass index 21.8 ± 2 kg/m²) who were physically active and non-smokers. Subjects walked and ran at three body weight (BW) conditions: 100%, 66% and 33% and at four treadmill speeds (slow walking at 0.4 m/s, comfortable walking at 1.3 m/s, slow running at 2.2 m/s and moderate fast running at 3.1 m/s). VO_2 , HR and Borg RPE were determined at each condition. The protocol was randomized by condition with a break of 30 minutes between each condition. Unloading was achieved with a Lower Body Positive Pressure (LBPP) chamber. **Results:** VO_2 decreased significantly by 26% (SE 5.1) from 100% BW to 33% BW at 0.4 m/s and by 28% (SE 4.7) at 1.3 m/s. Importantly, at running speeds, there was greater decline: VO_2 decreased by 54% (SE 4.1) at 2.2 m/s and by 53% (SE 3.2) at 3.1 m/s. Also, HR and Borg RPE decreased significantly at all conditions. All p values < 0.001 . **Conclusions:** VO_2 , HR and Borg RPE all decreased with unloaded exercise at all unloaded BWs, with a greater decrease during running. Therefore, unloaded exercise involves lower exertion at higher treadmill speeds which may help motivate obese populations to exercise at lower HR and VO_2 .

56. PREDICTION OF METABOLIC SYNDROME IN US ADOLESCENTS

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The purpose of this study was to develop the prediction model for metabolic syndrome in US adolescents (N = 9493), aged 12 to 17 years, from the National Health and Nutrition Examination Survey (1999-2006). Body weight, height, and waist circumferences were assessed with standardized protocols for body composition measurement. Height-to-waist circumference (HtW) ratio was calculated using centimeters. The metabolic syndrome was defined as 3 or more of the following abnormalities using the modified version of Adult Treatment Panel III definition: abdominal obesity ($\geq 90^{\text{th}}$ percentile for age and sex), hypertriglyceridemia (≥ 110 mg/dL), low high-density lipoprotein cholesterol (≤ 40 g/dL), high fasting glucose (≥ 110 mg/dL), and hypertension ($\geq 90^{\text{th}}$ percentile). Multivariable logistic regression was used to develop the prediction model for metabolic syndrome. C statistic (analogous to the area under a receiver operating characteristic, ROC) was used to measure the model accuracy. The Hosmer and Lemeshow (HW) χ^2 test was used to measure model calibration. The overall prevalence of metabolic syndrome was 2.9%. Boys had a higher prevalence of metabolic syndrome (62.2%) as compared with girls (37.8%) ($P < 0.001$). HtW, waist girth, and body mass index were significant risk factors for metabolic syndrome. The prediction equation for metabolic syndrome was derived by HtW after adjustment for age, sex, and race. The equation provided good discrimination capacity as indicated by a c statistic of 0.90 (all boys and girls), 0.91 for boys, and 0.90 for girls. The HW χ^2 test also indicated good discrimination ability: boys (HW χ^2 test = 6.06; $P = 0.64$); girls, 12.5 (HW χ^2 test = 12.5; $P = 0.13$); all boys and girls (HW χ^2 test = 8.73; $P = 0.37$), respectively. Height-to-waist ratio has a high prediction accuracy and good discrimination ability to predict metabolic syndrome in US adolescents.

57. AN ATYPICAL CASE OF BRACHIAL PLEXOPATHY IN AN 18 YEAR OLD FOOTBALL PLAYER

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RG is an 18 year old right-handed male football player who presented to clinic with left arm weakness and numbness. RG, who has no significant past medical history, states that during a varsity football game, he was struck by an opponent's helmet in the left upper back/neck area and fell to the ground. The player immediately noticed numbness in his left arm but continued to play the rest of the game. The player did not perform any activities for the rest of that day and went to sleep. After awakening, the player attempted to grab a gallon of milk but dropped it due to a weak hand grip.

RG initially started seeing a chiropractor for what was believed to be a "stinger". The player's symptoms of weakness and numbness in his left arm improved for 1-2 months from a self-reported 5% of baseline strength to 50% after treatment. He then had a nerve conduction study three months after his initial injury due to lingering symptoms which was reported as normal, despite being trouble several times due to "trouble with equipment."

Exam: 2-12 Cranial nerves intact. Motor LE bilat 5/5. RUE 5/5. LUE grip 4+/5, LUE hand intrinsics 4/5, left WE 4/5, left biceps 5/5, left triceps 4+/5, left deltoid 4/5. Reflexes: 0 in biceps and triceps bilat. 1+ patellar bilat. 1+ achilles bilat.; Sensory: decreased PP along patchy portions of left hand and forearm.

An MRI c-spine and follow up MRI brachial plexus were unremarkable. The player was then referred for a nerve conduction study and electromyography – which revealed a moderate sensorimotor polyneuropathy with demyelinating features in all four extremities. Further workup was conducted.

59. PERCENT BODY FAT IS POSITIVELY CORRELATED TO WALKING AND RUNNING ECONOMY/EFFICIENCY IN HEALTHY MEN AND WOMEN

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PURPOSE: Results from a number of studies suggest that obesity is associated with an increased relative energy cost of walking. It is unclear whether higher body fat levels in general predict reduced walking economy. We examined the relationship between % body fat and exercise VO_2 during treadmill walking/running.

METHODS: 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 speed, 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 VO_2 obtained during the last two min of exercise for both exercise sessions was used to determine linear and quadratic regression coefficients for the curvilinear relationship between VO_2 and walking/running speed. % body fat was assessed by air displacement plethysmography.

RESULTS: Both linear ($r = -0.394$; $p < 0.05$) and quadratic ($r = -0.451$; $p < 0.01$) coefficients of the VO_2 -treadmill speed relationship were inversely correlated with % body fat. These findings are consistent with our finding of an inverse relationship between % body fat and VO_2 at each speed, particularly at 6.0 mph ($r = -0.436$; $p < 0.01$).

CONCLUSION: These results suggest that, in healthy men and women, walking and running economy/efficiency increase as % body fat increases, and contrast with the notion that the relative energy cost of locomotion increases with higher levels of body fat.

58. IMPACT OF HIGH-VELOCITY VERSUS LOW-VELOCITY RESISTANCE TRAINING ON THE FUNCTIONAL FITNESS OF OLDER ADULTS

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Muscular power has recently gained considerable attention as an important physiological characteristic essential for older adults' functional performance. The purpose of this study was to determine the impact of high-velocity compared to low-velocity resistance training using the Resistance Chair™, an exercise chair incorporating resistance cables, on various functional fitness (FF) measures among older adults. Twenty-three older adults (85.7 ± 1.62 years; males = 7, females = 16) participated in a 12-week, full body resistance training program. Participants were randomly assigned to a high-velocity (HV, $n = 12$) or low-velocity (LV, $n = 11$) training program. Training was performed twice a week separated by one day. Participants performed a single-set of twelve repetitions initially, and progressed to two sets of twelve after six weeks. Initial training intensity was determined individually using the ratings of perceived exertion (RPE) scale and increased progressively based upon reported RPE and repetitions completed. Prior to and after the training program participants' FF was assessed using the Senior Fitness Test (SFT). One way ANOVA was performed to determine if training groups differed in FF post training. In addition, paired samples t-test was performed to determine if the sample as a whole improved in FF. Changes in FF measures post training between the HV and LV training groups were statistically insignificant. However, the whole group significantly improved FF post training according to the following SFT measures: Arm Curl Test, a measure of arm strength/endurance ($p = .009$), 2-Minute Step Test, a measure of aerobic endurance ($p = .001$), and the Back Scratch Test, a measure of upper body flexibility ($p = .02$). This is the first study to compare the impact on FF between a HV and a LV resistance training program using resistance cables. Further research is warranted.

60. COMPARISON OF 1RM STRENGTH AND MUSCLE ACTIVATION BETWEEN THE SMITH MACHINE AND FREE WEIGHT BENCH PRESS IN EXPERIENCED AND INEXPERIENCED LIFTERS

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PURPOSE: The purpose of this study was to compare 1RM strength and muscle activation of the anterior deltoid, medial deltoid, and pectoralis major during the Smith machine and free weight bench presses in experienced and inexperienced lifters. **METHODS:** Fourteen experienced (age, 19.9 ± 2.1 years; height, 176.3 ± 7.5 cm; mass, 88.5 ± 19.4 kg) and twelve inexperienced (age, 20.5 ± 2.1 years; height, 179.8 ± 8.0 cm; mass, 75.5 ± 10.4 kg) men completed two testing sessions. The first testing session consisted of determining each subject's 1RM on either the Smith Machine or free weight bench press. Surface EMG electrodes were placed superficial to the anterior deltoid, medial deltoid and pectoralis major muscles prior to 1RM testing to measure muscle activation. One week later, subjects completed the same 1RM testing protocol for the mode not tested during the first session. **RESULTS:** Both experienced and inexperienced lifters had a significantly higher ($p < 0.05$) 1RM on the free weight bench press, but experienced lifters had a larger difference in 1RMs between the two modes. Activation of the medial deltoid was significantly higher ($p < 0.05$) on the free weight bench press compared to the Smith machine bench press, regardless of experience level. There was no difference in the activation of the anterior deltoid or pectoralis major between modes. **CONCLUSION:** The results suggest that the instability caused by the free weight bench press necessitates a greater response by the medial deltoid as a stabilizer of the humerus in the glenohumeral joint. Also, the free weight bench press might allow for a greater expression of strength due to its reverse "C" bar path which may be more familiar and natural to experienced and inexperienced bench pressers than the linear bar path offered by the Smith machine.

61. CARDIOVASCULAR AND PERCEPTUAL RESPONSES TO AN OPEN WATER CHANNEL SWIM: A CASE STUDY

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Channel swimming presents many challenges, including duration, hypothermia, and exhaustion. Little research focuses on physiological function and perceptual responses of this unique sport. The purpose of this case study was to describe the cardiovascular and perceptual responses during an open water channel swim. One female (age = 24, height = 158.4 cm, mass = 58.2 kg, body fat = 25.0%) participated as she swam 21 miles from Doctor's Cove (Catalina Island) to Palos Verdes, California. The subject observed Catalina Channel Swimming Federation Rules which prevent 1) the use of insulating or buoyant material (e.g. wetsuits), and 2) unnatural assistance to the swimmer (e.g. drafting, touching a kayak). A telemetric monitor recorded heart rate (HR) at five second intervals. At 24 minute intervals, the subject rested and refueled for one minute, during which she reported perceived pain (0-10), rate of perceived exertion (RPE, 6-20), perceived thermal sensation (0-8), and perceived thirst (1-9). Investigators tracked air and water temperature, distance remaining (DR), and average velocity at identical intervals. The subject completed the swim in 9:02:48; water temperature averaged 19.1 °C (66.4 °F) and air temperature averaged 18.6 °C (65.5 °F). Heart rate and thermal sensation remained consistent across the channel, ranging from 148-155 bpm and 3-4, respectively. Pain inconsistently varied from 0-5 during the swim. RPE remained between 12-14 for the first eight hours, but increased dramatically in the final 40 minutes, reaching 18 at swim completion. Thirst sensation steadily increased throughout the swim, again reaching maximal values upon completion. Physiologically and statistically significant correlations existed between thirst and DR ($r = -0.905$), RPE and HR ($r = 0.741$), RPE and DR ($r = -0.694$), and pain and DR ($r = -0.671$). Efforts to understand physiological and perceptual responses during endurance swimming might aid in preparation and performance of future channel swimmers.

63. CAUSES, CONSEQUENCES, AND FEARS OF FALLING IN OLDER ADULTS: A QUALITATIVE STUDY

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In older adults, preventing falls is a public health priority. Falls and fear of falling are associated with negative health problems including decreased activity and mobility and higher medication use (Delbaere et al., 2004). Purpose: To qualitatively examine perceptions regarding falls among older adults prior to participation in a community-based falls prevention program. Methods: Four focus groups were conducted with older adults (age 65+). Trained moderators led discussions using a standard guide. Focus group data were transcribed verbatim, coded, and themes were identified. Results: Thirty-one individuals (93.5% Caucasian; 87% Female; mean age 84.2 ± 7.4 years) participated in the groups. Thematic analysis revealed that participants considered injuries and surgery the major consequences of falling. Specifically, they identified broken bones including the hip, wrist or ankle as the primary consequence of falls and often indicated that surgery was necessary to repair broken bones. Fear of falling was also identified as a consequence of falling. Participants identified both personal reasons (e.g., side effects of medications and hurrying or not paying attention) and environmental hazards (e.g., throw rugs, uneven ground, and awareness of surroundings) as the primary causes of falls. However, participants in four groups also perceived that falls "just happen" and could not identify underlying causes. Salient strategies for reducing falls included removing throw rugs, cords, and other objects in pathways, using handrails or grab bars, being aware of one's surroundings (i.e. "look where you're going"), being careful and not rushing, and participating in regular exercise. Identified topics of interest for falls prevention programs included "how to fall", balance exercises, and a better understanding of risk factors for falling. Conclusion: Participants identified several modifiable risk factors and causes of falling that could be easily incorporated into community-based falls prevention programs. Supported by an Arizona Area Health Education Center Small Research Grant.

62. THE CORRELATION OF POSTURAL SWAY TO LOWER EXTREMITY MAXIMAL MUSCLE STRENGTH

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Purpose: The purpose of this study was to determine the correlation of lower limb muscle strength with the various methodologies of measuring postural sway. Methods: 42 healthy subjects (age range from 4 to 74 years) were recruited to participate in the study and measurements were taken after subjects signed a university-approved consent form. Two Kistler force plates collecting at 500 Hz were used to compute the whole body center of pressure during 40 second trials of static balance. Each subject completed four trials with eyes open and four trials with eyes closed. This data was then used to quantify the subject's postural sway creating the following parameters: (1) mean displacement velocity, (2) sway path (total, mediolateral and anteroposterior), (3) total sway area, (4) 95% confidence ellipse area, and (5) mean amplitude for low and high frequency transform ations. The 30 adult subjects' lower extremity isometric joint peak torque was determined by using the Biodex System 3 to measure values at the hip and ankle. After normalizing for body weight, gender specific T-scores were computed for dorsiflexion (DF), plantar flexion (PF), hip flexion (HF) and hip extension (HE). Correlation coefficients were computed between all postural sway measurements for the group of all 43 subjects. Results: Of the 45 comparisons that were made, 18 pairs showed a statistically significant relationship with $p < 0.01$ and an additional 11 pairs with $p < 0.05$ for the trials with eyes open. The same comparisons with eyes closed found 18 pairs and 15 pairs, respectively. A simple correlation test did not find many strong relationships between the strength values and the postural sway values. A more complex analysis may reveal other relationships. Conclusions: Various measures of postural sway can be compared, however, it is not advisable to use them interchangeably without careful consideration.

64. ER α IS ELEVATED WITH ENDURANCE EXERCISE AND IS CRITICAL FOR NORMAL SKELETAL MUSCLE OXIDATIVE METABOLISM AND INSULIN ACTION

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Aim: The estrogen receptor (ER) α is highly expressed in muscle and fat, and is purported to play an important role in regulating adiposity and insulin sensitivity given that mutations in the ER α gene or reductions in mRNA are associated with obesity and insulin resistance. Thus, the purpose of the present study was to further delineate the role of ER α in the regulation of cellular metabolism and insulin action, and investigate whether ER α is upregulated with chronic exercise.

Methods: The Cre Lox system was used to generate mice with a muscle-specific deletion of ER α (mER α KO). Exercise adaptations were assessed in freely running female wildtype (WT) and mER α KO mice after 21 days. Sedentary mice of both genotypes were phenotyped to determine the effect of ER α on insulin sensitivity (hyperinsulinemic-euglycemic clamp) and substrate metabolism. Cellular respiration and tracer determined rates of palmitate metabolism were determined in myocytes with lentiviral-mediated ER α knockdown (KD).

Results: WT mice ran 7.5 ± 0.74 km per day. Muscle ER α mRNA was elevated 2-fold in trained vs. sedentary mice ($p=0.01$), and this correlates well with exercise-induced adaptations in oxidative metabolism. In contrast, myocytes with ER α KD showed diminished oxygen consumption (66%; $p=0.01$), reduced palmitate oxidation (39%; $p=0.02$), and a 3.4 fold increase in palmitate esterification ($p=0.01$). Defects in muscle metabolism resulting from ER α KD manifested *in vivo* in the accumulation of bioactive lipid intermediates (\uparrow diacylglycerol 54%; $p=0.001$, \uparrow ceramide 58%; $p=0.02$), tissue inflammation (\uparrow p-JNK134%; $p=0.03$), impaired insulin-mediated glucose disposal (\downarrow 45%; $p=0.01$), and increased adiposity (\uparrow periovarian fat mass 2.5-fold; $p=0.01$) in mER α KO compared with WT.

Conclusion: Reduced ER α in muscle is causal for impaired oxidative metabolism, tissue inflammation, insulin resistance and obesity; all features of the metabolic syndrome. Importantly, we find that chronic exercise elicits a marked elevation in muscle ER α mRNA, which may be associated with reduced disease risk.

65. NO ERGOGENIC EFFECT OF CAFFEINE ON PAIN DURING SHORT TERM, HIGH INTENSITY EXERCISE

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This study examined the effect of caffeine (CAF) on leg muscle pain during short-term, high-intensity exercise. Eleven active young men (mean \pm SD age and physical activity = 27.7 ± 4.2 yr and 5.1 ± 1.3 hr/wk) ingested one of two CAF solutions or placebo over three separate trials conducted a week apart. CAF (2 mg/kg and 5 mg/kg) was ingested using a randomized, single-blind, crossover design. Subjects refrained from intense exercise, caffeine, and alcohol consumption 48 hr pre-trial. Exercise consisted of two all-out bouts of 40 repetitions of knee extension/flexion on an isokinetic dynamometer at 180 deg/sec. Perceived pain intensity was assessed utilizing a category-ratio scale with verbal anchors (Cook et al., 1998). Rating of perceived exertion (RPE) was also recorded using a standard scale (Borg, 1982). During exercise, pain perception was recorded at 15 and 35 repetitions and in recovery. RPE was recorded after 25 repetitions. Two-way ANOVA with repeated measures was used to assess differences in pain and RPE across time and treatment. Compared to 15 repetitions, pain sensation (mean \pm SD) at 35 repetitions was higher ($p < 0.05$) in the 5 mg/kg (3.55 ± 1.86 to 5.91 ± 1.87), 2 mg/kg (3.27 ± 1.56 to 6.09 ± 2.02), and placebo condition (3.46 ± 1.64 to 6.00 ± 2.45). RPE was also enhanced ($p < 0.05$) from bout 1 (5.45 ± 1.50 , 5.36 ± 1.60 , and 5.27 ± 1.80) to bout 2 (6.55 ± 1.3 , 6.36 ± 1.1 , and 6.36 ± 1.7) in the 5 mg/kg, 2 mg/kg, and placebo condition, respectively. However, no effect of caffeine ($p > 0.05$) on RPE or pain was observed. Data suggest that CAF ingestion does not alter pain or RPE responses during maximal knee extension and flexion in men who are regular caffeine consumers.

67. PREVALENCE OF OBESITY AMONG SAN LUIS OBISPO COUNTY PRESCHOOL CHILDREN

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Background: Obesity rates continue to rise in all age groups, including the preschool aged population where 1 in 5 four year olds in the United States are overweight or obese. The current study was conducted to assess the prevalence of underweight, normal weight, overweight and obese preschool children in San Luis Obispo County, California. The study also compared body mass index (BMI) classification by sex, ethnicity, and geographic location among preschoolers enrolled in the years 2007 and 2009. **Method:** In 2007, 622 preschoolers were measured and in 2009, preschoolers ($n=512$), ages 3-5 years, from 18 preschools participated. The height of each participant was measured with a stadiometer and weight was measured through the use of a portable, electric digital scale. Sex and perceived ethnicity were recorded by the data collectors and date of birth was provided by the preschool staff. The Center for Disease and Control's (CDC) BMI calculator for children and adolescents ages 2-20 years was used to determine percentile for age and sex. **Results:** Of the 512 preschoolers, 37.1% were overweight or obese. A significant difference found in overweight and obese preschoolers between Hispanic/Latino and White/non-Hispanic preschoolers (42.3% vs. 29.5%, $P = 0.017$), but there was no significant difference found in weight classes between sexes and geographic location. The percentage of preschoolers overweight or obese increased from 28.8% in 2007 to 37.1% in 2009. **Conclusion:** The results from this study indicate that over a 2 year span there was an 8.3% increase in the prevalence of overweight and obese preschoolers. The findings support the critical need to focus on understanding the behavioral, environmental and societal factors that contribute to the rapid increasing trend toward overweight and obesity in preschool aged children.

66. EFFECT OF CAFFEINE SUPPLEMENTATION ON CYCLING PERFORMANCE DURING COLD STRESS

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Numerous studies demonstrate caffeine supplementation improves and cold stress impairs exercise performance. Some major physiological effects of caffeine supplementation during exercise directly oppose cold stress; however, no studies examined whether caffeine improves exercise performance or physiological function in cold environments. Therefore, the purpose of this study was to investigate whether moderate or high doses of caffeine altered thermoregulatory function, perceptual responses, and cycling performance in cold environments. Eight competitive male cyclists (age = 26 ± 6 yrs, height = 179.3 ± 5.3 cm, body mass = 73.4 ± 9.4 kg, body fat = $8.4 \pm 3.1\%$, $VO_{2max} = 63.2 \pm 2.9$ ml \cdot kg $^{-1}\cdot$ min $^{-1}$) completed three cycling trials comprised of a 10 min warm-up (45% of VO_{2max} power), 90 min endurance ride (60% of VO_{2max} power), and 20 km simulated time-trial. Subjects cycled in a cold environment (5 °C, 56% RH) with fan-induced wind-chill (18.3 m \cdot s $^{-1}$) after consuming placebo (C0), 5 mg \cdot kg $^{-1}$ caffeine (C5), or 10 mg \cdot kg $^{-1}$ caffeine (C10) in a double blind randomized fashion. Investigators measured thermoregulatory variables (heart rate, core temperature and skin temperatures), perceptual responses (ratings of perceived exertion and thermal sensation), and performance (20 km simulated time-trial). Caffeine supplementation significantly increased core temperature during the latter portion of the endurance ride and throughout the time-trial (time-trial average: C0 = 37.92 ± 0.45 °C, C5 = 38.26 ± 0.29 °C, C10 = 38.19 ± 0.43 °C). No consistent significant differences existed for heart rate, skin temperatures, and perceptual variables. Caffeine supplementation also failed to influence 20 km time-trial performance (C0 = 41.21 ± 2.89 min, C5 = 40.65 ± 2.03 min, C10 = 41.16 ± 1.45 min). In conclusion, supplementation of 5 and 10 mg \cdot kg $^{-1}$ of caffeine increased core temperature during cycling in the cold without affecting heart rate, skin temperature, perceptual sensations, and 20 km time-trial performance.

68. INFLUENCE OF TRAINING STATUS AND POTENTIATING EXERCISE VOLUME ON VERTICAL JUMP RATE OF FORCE AND VELOCITY DEVELOPMENT

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Using a high force activity to generate postactivation potentiation (PAP) might enhance subsequent whole body performance. The mechanism that elicits PAP is considered to be phosphorylation of myosin regulatory light chains, which causes more sensitivity to Ca^{++} released from the sarcoplasmic reticulum. However the optimal factors associated with successful outcomes requires identification. The purpose of this study was to investigate influence of training status and potentiating exercise volume on vertical jump rate of force and velocity development. Sixteen college age men with a minimum of 1-year of back squat experience completed five testing sessions separated by 72 hours. The initial visit started with a five-minute warm-up on a cycle ergometer at 50 rpm (25W). The warm-up was followed by three maximum vertical jumps (VJs), five-minute seated rest, and then three additional VJs. Upon completing the control condition, subjects completed 1RM back squat testing. The following four visits began with the same five-minute warm-up, followed by three maximum VJs, a randomly assigned experimental condition (1x2, 1x3, 1x4, or 1x5) at 85% 1RM back squat, five-minute of seated rest, then three additional jumps. Subjects executed all VJs using a countermovement with arm swing on a force platform. Subjects were also separated into two groups prior to statistical analysis: those with body mass adjusted back squat 1RM greater or less than the mean. Analysis of variance revealed no significant ($p>0.05$) interactions or main effects for vertical jump rate of force or velocity development. These results suggest that training status and various back squat volume had no potentiating effect for vertical jump rate of force and velocity development in college age men.

69. THE ROLE OF MACROPHAGE MATURATION IN SKELETAL MUSCLE RECOVERY

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A skeletal muscle injury can take weeks to months to recover. Macrophages have been associated with muscle recovery, but a greater understanding of the role of macrophages in the repair process is needed to develop therapies to expedite recovery. To investigate the role of macrophages in the skeletal muscle recovery process, we are conducting an in vitro study using stimulated mouse macrophages (PU5-1.8 cells) and proliferating mouse skeletal muscle cells (C2C12 cells). Immature and mature macrophages are stimulated with high-dose (200 ng/ml) lipopolysaccharide (LPS) for a total of 48 hours. During the 48-hour incubation period, samples of media are harvested at 0, 6, 12, 24, and 48 hours and assayed for nitrite and tumor necrosis factor (TNF). Additionally, proliferating muscle cells are treated with 24-hour harvested LPS- treated macrophage media for 48-72 hours and then stained with methyl green to quantify the number of multinucleated muscle cells. Our preliminary findings show higher TNF levels in the media of mature macrophages than in immature macrophages treated with LPS at varying time points. The highest nitrite levels were detected in the media of LPS- treated mature macrophages at 48 hours. Statistical analysis of these results is pending. Distinct morphological changes, including multinucleated cells and elongation, were observed when proliferating muscle cells were exposed to media from LPS-treated mature macrophages. The number of multinucleated muscle cells will be quantified and compared to the number observed in proliferating muscle cell cultures. These morphological changes were not observed when proliferating muscle cells were treated with media from LPS- treated immature macrophages. These preliminary results suggest that stimulated immature and mature macrophages produce different amounts of cytokines and other substances. Also, the maturation stage of the macrophage may play a direct role in the repair process of injured muscle.

71. ASSESSING THE RECOVERY-STRESS STATE: AN EXAMINATION OF RESTQ-SPORT QUESTIONNAIRE RESPONSES AND TRAINING PERFORMANCE IN DIVISION-1 FOOTBALL PLAYERS

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Purpose: To determine the relationship between RESTQ-Sport questionnaire responses and changes in sport testing performance throughout a pre-season training period in Division-1 NCAA collegiate football players. **Methods:** 24 male, Division-1 NCAA collegiate football players (ages 20 ± 1) submitted RESTQ-Sport responses, which were collected at least once per week (Tuesday/Thursday [n=7] and/or both days [n=17]), for 6 weeks, immediately subsequent to combined resistance training and sport conditioning sessions. Partial Pearson's Correlations were made between weekly scores for each RESTQ-Sport Scale (19 scales total) and the overall change in performance parameters, controlling for pre-performance test scores. **Results:** There were significant relationships between various stress-oriented scales (Fatigue, Lack of Energy, Disturbed Breaks, Fitness/Injury, Burnout/Emotional Exhaustion) and/or various recovery-oriented scales (Social Relaxation, Somatic Relaxation, General Well-Being, Sleep Quality, and Self-Efficacy), and change in training/testing performance (40-Yard Dash, Pro-Shuttle, L-Test, Broad Jump, Vertical Jump, Power Clean, Back Squat, Bench Press, 225lb. Bench Rep. Test). **Conclusions:** Higher stress scale scores appear to relate to smaller improvements in performance, and vice versa. Conversely, higher recovery-oriented scale scores may relate to greater improvements in performance, and vice versa. Weekly administration of the RESTQ-Sport appears to serve as an effective tool to assess and monitor the recovery-stress state in collegiate football players.

70. EFFECT OF CREATINE LOADING WITH AND WITHOUT ACUTE CAFFEINE INGESTION ON LOWER BODY MUSCULAR STRENGTH AND NEUROMUSCULAR FUNCTION

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Purpose: We examined the effect of creatine monohydrate loading with and without acute caffeine ingestion on lower body muscular strength and neuromuscular function. **Methods:** Lower body muscular strength (MS) was determined from 10 resistance-trained men (ages 21.4 ± 2.5 years), based on the maximum number of repetitions (REP) completed during a single set load equal to 87.5% of their 1-repetition maximum (1RM) for the BBS under different treatment conditions: placebo (PL), creatine plus caffeine (CC), creatine only (CR), and caffeine only (CAFF). Surface electromyography (EMG) (mean frequency (MeanF), median frequency (MedF), and integrated EMG) were collected from the vastus lateralis (VL) and gluteus maximus (GM) muscles of the left leg during the barbell back squat exercise (BBS). One week prior to each test, the 1RM was predicted from a 3-8 RM test. Subjects supplemented for 7 days with either creatine (5 grams, 4 times daily) or placebo (corn starch). Following day 7 of supplementation, subjects reported to the lab and ingested either placebo (dextrose) or caffeine (5 mg/kg body weight) 1 hour prior to testing. Testing sessions were separated by 4 weeks. **Results:** One-way ANOVA revealed no significant differences among treatment groups for the PL REP (5.66 ± 2.07), CC REP (8.49 ± 5.28), CR REP (5.64 ± 2.57), and CAFF REP (5.3 ± 2.64), suggesting caffeine supplementation had no significant effect on MS (p > 0.05). ANOVA revealed significant differences among treatment groups for the VL MedF (p = 0.018). Tukey Post-Hoc Test indicated significant differences between PL VL MedF and CAFF VL MedF (91.19 ± 15.82 and 71.98 ± 8.01, respectively [p = 0.045]). **Conclusions:** Creatine supplementation with and without caffeine supplementation elicited no significant effect on lower-body strength and minimally affected neuromuscular function as indicated by surface EMG.

72. EFFECTS OF THE HOLIDAY SEASON ON BODY COMPOSITION AND WEIGHT CHANGE

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This study was done to determine the change in weight and body composition over a 6-week holiday period. Change in body composition was measured using air displacement plethysmography (Bod Pod®). Thirteen men and 21 women ranging in age from 23-61 y were participants for this study. Baseline testing occurred the Monday or Tuesday prior to Thanksgiving Day (November 24 or 25), and the post-holiday assessment was the Monday or Tuesday after New Year's Day (January 5 or 6). Results from a nutrition and exercise questionnaire revealed a significant difference between pre-holiday and post-holiday consumption of vegetables (8.6 ± 8.3 vs. 6.2 ± 4.0), special holiday foods (1.6 ± 1.9 vs. 2.5 ± 2.1), regular soda (1.5 ± 2.2 vs. 2.2 ± 2.6), and social gatherings attended (1.6 ± 1.5 vs. 2.2 ± 1.7). There was also a statistically significant decline in the number of days per week individuals exercised pre-holiday (3.7 ± 2.0 d/wk) versus post-holiday (2.6 ± 2.3 d/wk). The majority of participants (71%) perceived that they had gained weight, and 12% of the sample did gain ≥ 2 kg. However, on average there was no statistically significant difference between pre-holiday weight (74.0 ± 17.8 kg) and post-holiday weight (73.9 ± 18.1 kg), nor between pre-holiday body fat percentage (25.4 ± 9.0%) and post-holiday body fat percentage (25.4 ± 8.9%).

73. COMPARING BODY COMPOSITION AND FITNESS MEASURES TO MINDFULNESS AND STRESS IN A UNIVERSITY WALKING INTERVENTION (ASUKI STEP)

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Various components of stress, specifically allostatic load, have been cited as contributors to weight gain and lack of physical activity (McEwen & Lasley, 2003). It has been shown that increased stress could illicit physiological responses that can affect health (Logan & Barksdale, 2008). Mindfulness (a way to self-regulate one's attention to the present moment) may reduce cognitive vulnerability to stress and act as a moderating variable in the intention-behavior relationship for physical activity. The purpose of this study was to evaluate the relationships between body composition, physical activity, dispositional mindfulness and perceived stress in men and women entering a social walking competition (n=167). Participants completed a battery of fitness tests and online questionnaires. Questionnaires included: Mindfulness Attention Awareness Scale (MAAS), Perceived Stress Scale (PSS) and International Physical Activity Questionnaire (IPAQ). Relationships between BMI, Fat%, VO₂ max, IPAQ, MAAS and PSS were computed. Participants were also divided into standard BMI categories [Obese, OB (n=40), Overweight, OW (n=48), Normal, N (n=79)]. The data indicated that MAAS and PSS were inversely correlated in both N (r=-0.69 p<.0001) and OW (r=-0.63, p<.005) but not OB. Average sitting time measured by IPAQ and MAAS scores were also inversely associated in N and OW (p<.02) but not OB. Across all BMI groups, fat% was inversely correlated (p < 0.02) with VO₂ max. These associations indicate that perceived stress and dispositional mindfulness are correlated with BMI, fitness and activity parameters. However, these factors may play a diminishing role in individuals with higher BMI values due to the heterogeneity of obesity. Future research will need to explore the influence of these variables for maintenance and adoption of healthy lifestyle behaviors across all BMI levels.

75. THE EFFECTS OF CREATINE SUPPLEMENTATION ON ANAEROBIC PERFORMANCE AND LEG EXTENSION STRENGTH

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Creatine monohydrate (CM) is the most common supplement used by athletes to improve performance during anaerobic exercise. The purpose of this study was to examine the effects of 7 days of supplementation with CM on anaerobic exercise performance from the Wingate test, lower body strength, and body weight. This study used a double-blind, placebo-controlled design. Twenty two men (mean ± SD age = 22.1 ± 2.0 yr; height = 178.0 ± 5.8 cm; weight = 77.6 ± 7.6 kg) were randomly assigned to either a supplement (SUPP; n = 10) or placebo (PLAC; n = 12) group. The SUPP group ingested 20 g of CM powder for 7 days, while the PLAC ingested 20 g of maltodextrin powder. Measurements for the PLAC and SUPP groups included body weight (BW), average peak power (PP) and average mean power (MP) from two 30-second Wingate tests (separated by 7 min), and one repetition maximum (1RM) dynamic constant external resistance strength for bilateral leg extension (LE). Testing was conducted before (PRE) and after (POST) 7 days of ingesting either the supplement or placebo. The results of the present study indicated that there was a significant (p < 0.05) increase from PRE to POST testing in MP for the SUPP group (5.4%), but not the PLAC group. There were no between group differences, however, for 1RM LE strength. Furthermore, there were no changes in PP or BW for either group. These findings indicated that daily ingestion of 20 g of CM for 7 days increased anaerobic glycolytic capacity during the Wingate test with no changes in lower body strength (1 RM LE) or BW.

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74. THE ADDITION OF VARIABLE WEIGHT LOADS IN WARM-UP HAS NO EFFECT ON VERTICAL JUMP

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Dynamic warm-up strategies are designed to positively impact performance. Research suggests that warm-ups which elicit a post activation potentiation (PAP) effect via high intensity muscular contractions may increase performance in subsequent activities requiring strength and power. However, the potential of eliciting a PAP may be influenced by training level (i.e., recreational vs. competitive) and intensity and volume of loading stimuli. This study investigated the effects of the addition of various weight loads to a standard warm-up on subsequent countermovement vertical jump (CMVJ) performance in recreationally trained individuals. Seven recreationally trained (resistance and aerobic training) individuals participated (age = 23.0 ± 3.0 yrs; mass = 82.3 ± 18.7 kg; ht = 179.3 ± 9.7 cm). Four different dynamic warm-up protocols were employed randomly on four separate days before assessing maximal CMVJ in 3 trials. All four started with a 4 minute treadmill jog. Then, the following conditions were used: 1) 1 minute seated rest followed by a CMVJ test (VJ); 2) 1 minute seated rest, then 10 maximal CMVJ's with bodyweight followed by 4 minutes rest, then a CMVJ test (BWVJ); 3) 1 minute seated rest, then 10 maximal CMVJ's while wearing a vest loaded with 20% bodyweight followed by 4 minutes rest, then a CMVJ test (20VJ); and 4) 1 minute seated rest, then 10 maximal CMVJ's while wearing a vest loaded with 40% bodyweight followed by 4 minutes rest, then a CMVJ test (40VJ). No significant difference (p<0.05) occurred in CMVJ between any warm-up condition; results (cm): VJ = 59.1 ± 8.1; BWVJ = 59.5 ± 8.1; 20VJ = 58.8 ± 10.2; 40VJ = 59.1 ± 8.5. In conclusion, no PAP effect was elicited by weighted jumps and variation in warm-up load had no effect on the CMVJ performance of these recreationally trained individuals.



| | | | | | |
|--------------|----|------------|-------------|----|------------|
| Nguyen | D | 28, 52, 54 | Tran | T | 28, 52, 54 |
| Nichols | JF | 45 | Trone | DW | 45 |
| Nittolo | JM | 36 | Tudor-Locke | C | 2, 57 |
| Noffal | GJ | 28, 54 | Uhrinak | A | 53 |
| Obregon | K | 18 | Uribe | BP | 28, 52, 54 |
| Ohira | T | 23 | VanLoan | M | 22 |
| Parker | DL | 44 | VanNess | JM | 47 |
| Pencheva | M | 37 | Villanueva | MG | 56 |
| Perkins | C | 53 | Villanueva | M | 56 |
| Peterson | BM | 38 | Volland | L | 61 |
| Pierce | RA | 39 | Wagner | DR | 7, 11, 55 |
| Plato | P | 15 | Wagner | CL | 36 |
| Poarch | H | 17 | Washington | TL | 2, 57 |
| Pomichowski | M | 40 | White | AC | 58 |
| Quintana | R | 44 | Whitehill | J | 59 |
| Ragan | BG | 25 | Whitley | CR | 60 |
| Ramirez | DA | 8, 13, 30 | Wilkin | LD | 14, 27, 42 |
| Rapisura | KP | 41 | Williams | DW | 29 |
| Rauh | MJ | 45 | Wimer | GS | 29 |
| Richter | JW | 42 | Witzke | KA | 6, 18 |
| Roberts | CK | 16 | Wong | K | 61 |
| Rohmann | RL | 61 | Woolf | K | 24 |
| Ruckstuhl | H | 43 | Young | J | 37 |
| Salgado | RM | 44 | | | |
| Sanchez | A | 16 | | | |
| Sanders | ME | 59 | | | |
| Schachtsiek | LM | 6 | | | |
| Schmied | EA | 45 | | | |
| Schroeder | J | 35, 46, 62 | | | |
| Schroeder | E | 35, 46, 62 | | | |
| Scott | CB | 25 | | | |
| Shaffer | RA | 45 | | | |
| Shoeppe | TC | 8, 13, 30 | | | |
| Siegel | S | 42 | | | |
| Silver | H | 36 | | | |
| Sims | TD | 27 | | | |
| Singh | H | 47 | | | |
| Smelinski | LR | 48 | | | |
| Snell | C | 47 | | | |
| Spilsbury | MG | 29 | | | |
| Stevens | S | 47 | | | |
| Sumida | KD | 39 | | | |
| Sunderland | K | 49 | | | |
| Swan | P | 26 | | | |
| Talavera | G | 45 | | | |
| Tandy | RD | 12 | | | |
| Tanner | D | 50 | | | |
| Teeter | M | 36 | | | |
| Teramoto | MJ | 20 | | | |
| Thigpen-Lane | J | 6 | | | |
| Thomas | LN | 51 | | | |
| Thomason | K | 6 | | | |

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