SOUTHWEST CHAPTER

AMERICAN COLLEGE OF SPORTS MEDICINE

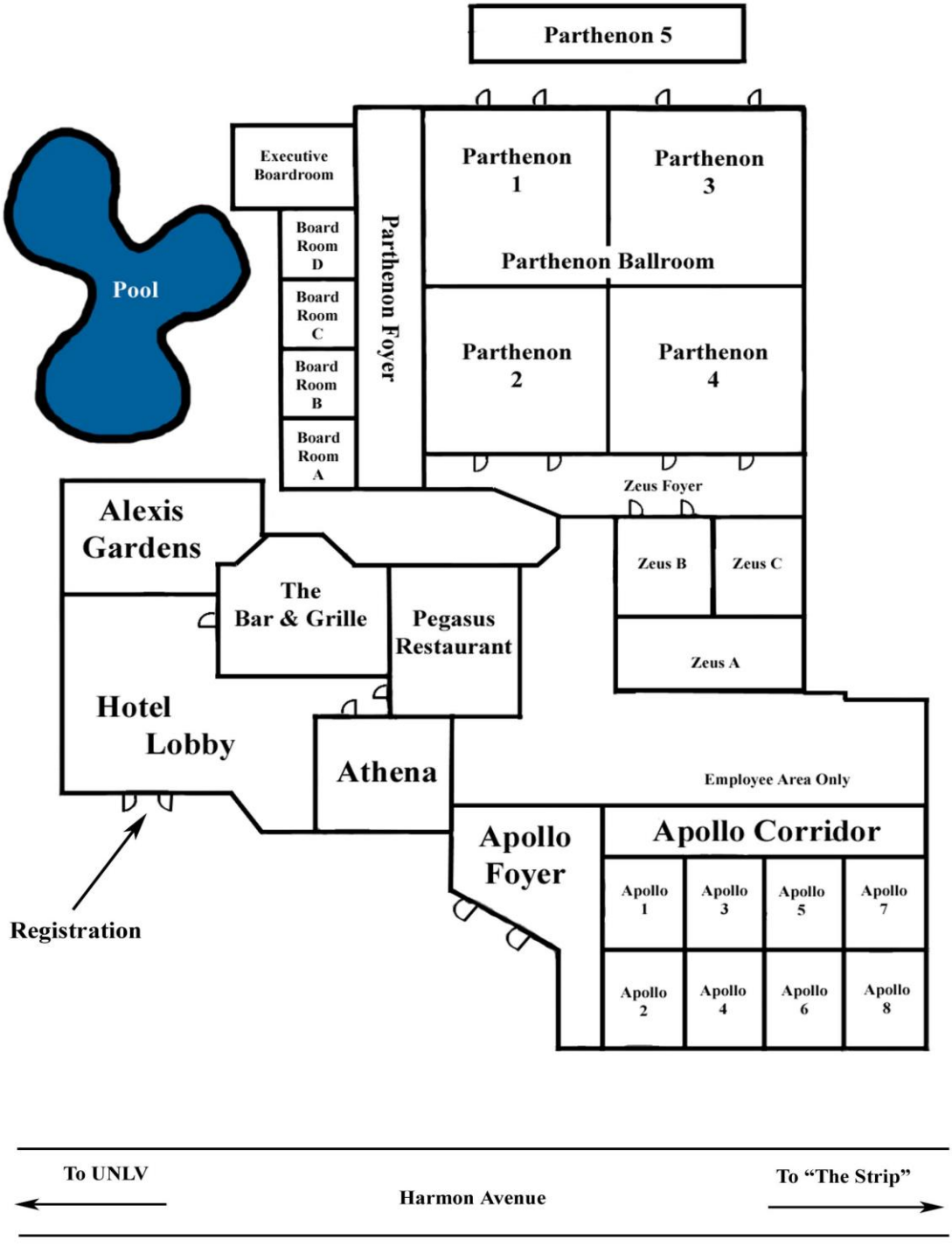
2005 ANNUAL MEETING

November 11-12, 2005

Alexis Park Resort
Las Vegas, Nevada

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

Alexis Park Resort



Welcome to the

25th Annual Meeting

of the

Southwest Regional Chapter

of the

AMERICAN COLLEGE of SPORTS MEDICINE SM

November 11-12, 2005

Alexis Park Resort
Las Vegas, Nevada

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

Exhibitors and Sponsors – Thank you!!!

Parvo Medics, Inc.
(www.parvo.com)

Vacumed
(www.vacumed.com)

FUTREX INC
Measuring Health and Fitness
At The Speed of Light

Futrex, Inc.
(www.futrex.com)

AAP
AMERICAN COLLEGE OF SPORTS MEDICINE
ACTIVE AGING PARTNERSHIP

Thera-Band

SPECIFIT – FOUNDATION FOR WOMEN'S WELLNESS

AMERICAN COLLEGE OF SPORTS MEDICINE
FOUNDED 1954

The American College of Sports Medicine
(www.acsm.org)

FRIDAY, 11 NOVEMBER 2005

Registration **7:30 am - 4:00 pm** **Apollo Foyer**

Tutorial Lectures **8:00 am – 9:15 am**

1. ***Practical Body Fat Testing.*** **Apollo 1**
   Marta van Loan, Ph.D., FACSM, USDA Western Nutrition Research Center, Davis, CA

2. ***Lactate Shuttle What's New?*** **Apollo 3**
   George Brooks, Ph.D., FACSM, University of California, Berkeley, CA

3. ***Exercise ECG Assessment*** **Apollo 5**
   Jennifer Blevins, Ph.D., University of Texas-Arlington

4. ***Personal Training 101: Everything You Need to Know but Didn't Know to Ask*** **Apollo 7**
   Daniel Dodd, M.S., C.S.C.S., Arizona State University – East, Mesa AZ

General Session # 1 **10:00 am – 11:30 am** **Apollo 1-8**

Moderator: Jack Azevedo, Ph.D., President, SWACSM
California State University - Chico

SWACSM Recognition Award

Preview of Meeting: Jack Azevedo, Ph.D.

D.B. Dill Lecture ***Exercise Prescription the Easy Way: The Talk Test***
Carl Foster, Ph.D., FACSM
President, ACSM
Professor
Department of Exercise and Sport Science
University of Wisconsin - LaCrosse
LaCrosse, WI

POSTER PRESENTATIONS **4:30 pm – 7:00 pm** **Apollo 5-8**
(Authors Present 5:00-7:00 pm)

FRIDAY, 11 NOVEMBER 2005, continued

Symposium # 1 **1:00 pm – 3:00 pm** **Apollo 1 & 3**

Advances in Body Composition Research

Moderator: Tim Lohman, Ph.D., FACSM, University of Arizona, Tucson, AZ

1:00 – 1:40 ***Recent Developments in Body Composition Assessment and Its Relation to Chronic Disease***
Tim Lohman, Ph. D., FACSM, University of Arizona, Tucson, AZ

1:40 – 2:20 ***Body Composition Assessment in Acute Disease***
Marta van Loan, Ph.D., FACSM, USDA Western Nutrition Research Center, Davis, CA

2:20 – 3:00 ***Physical Activity, Body Composition, and Systemic Inflammation: Implications for Modifying Chronic Disease***
Dan Williams, Ph.D., University of Utah, Salt Lake City, UT

SPONSORED BY FUTREX, INC.

Symposium # 2 **1:00 pm – 3:00 pm** **Apollo 5 & 7**

Muscle Plasticity: Factors Regulating Muscle Mass and Contractile Phenotype

Moderator: Ken Baldwin, Ph.D., FACSM, University of California - Irvine

1:00 – 1:40 ***Signaling Pathways Regulating Muscle Mass***
Gregory Adams, Ph.D., FACSM, University of California - Irvine

1:40 – 2:20 ***Myosin Heavy Chain Polymorphism in Skeletal Muscle: Implications for Muscle Performance and Adaptation***
Vince Caiozzo, Ph.D., FACSM, Unicersity of California - Irvine

2:20 – 3:00 ***Molecular Mechanisms Regulating Myosin Gene-Gene Switching***
Ken Baldwin, Ph.D., FACSM, University of California - Irvine

FRIDAY, 11 NOVEMBER 2005, continued

Applied Lecture # 1 **1:00 pm – 2:15 pm** **Apollo 2 & 4**

Research in Practice: Obesity Interventions for Native Americans

Jeremy Pomeroy M.S., R.C.E.P., Director of Primary Prevention Demonstration Project, HIS Special Diabetes Program Competitive Grant Project, Phoenix, AZ

Applied Lecture # 2 **1:00 pm – 2:30 pm** **Apollo 6 & 8**

Update on High Protein Diet Intervention Research for Health and Weight Loss – Adkins vs Zone

Carol Johnson, Ph.D., R.D., C.N.S., Arizona State University – East, Mesa, AZ

Free Communications
Student Research Award **3:00 pm – 4:30 pm** **Apollo 2 & 4**

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

3:00 **ERK1/2 inhibition prevents the contraction-induced increase in muscle FA metabolism and plasma membrane CD36 content, without affecting AMPK activity, in a dose-dependent manner**. M. Raney and L Turcotte, FACSM. Department of Kinesiology, University of Southern California, Los Angeles, CA

3:15 **Acute exercise increases arterial Akt/Protein Kinase B mediated endothelial nitric oxide synthase phosphorylation in mice.** McMillin, S. and J. D. Symons FACSM. College of Health, University of Utah, Salt Lake City, UT

3:30 **Potassium channel regulation of vascular tone.** K. Onishi, S. Achanti and J. L. Jasperse. Department of Sports Medicine, Pepperdine University, Malibu, CA

3:45 **Total creatine profoundly influences oxygen consumption rate kinetics of isolated skeletal muscle mitochondria** Glancy, B., T. Barstow, FACSM, and W. Willis, FACSM. Department of Kinesiology, Arizona State University and Department of Kinesiology, Kansas State University

4:00 **Effects of a protease enzyme supplement on muscular strength and selected markers of delayed-onset muscle soreness following high-intensity eccentric exercise.** T.W. Beck, T.J. Housh FACSM, G.O. Johnson FACSM, R.J. Schmidt, D.J. Housh, J.W. Coburn, and M.H. Malek. Department of Nutrition and Health Sciences, University of Nebraska-Lincoln, NE

4:15 **Effect of a high protein diet on glucose tolerance in rats.** Sanchez, R.M., Young, J.C. FACSM, Golding, L.A. FACSM, Kruskall, L.J. FACSM, Benyshek, D.C. Department of Kinesiology, University of Nevada Las Vegas, Las Vegas, NV.

FRIDAY, 11 NOVEMBER 2005, continued

Symposium # 3 **3:00 pm – 4:30 pm** **Apollo 1 & 3**

Research Update: Exercise Assessment and Prescription for NBA Officials

Moderator: Brent Alvar, Ph.D., Arizona State University – East & Chandler-Gilbert Community College, Mesa, AZ

3:00 – 3:45 ***Activity, Injury, and Needs Assessment***
Brent Alvar, Ph. D., Arizona State University – East, & Chandler-Gilbert Community College, Mesa, AZ

3:45 – 4:30 ***Exercise and Dietary Prescription***
Matt Rhea, Ph.D., Southern Utah University, Cedar City, UT

SOCIAL EVENT 5:00-7:00 PM Apollo 5-8

Poster Presentations **Exhibits**
Career Exchange **Silent Auction**

No Host Wine/ Cheese Reception

SATURDAY, 12 NOVEMBER 2005

Registration	**7:30 am - 11:00 am**	**Apollo Foyer**
Exhibits	**8:00 am – 11:00 am**	**Apollo Foyer**
Panel Discussions	**8:00 am – 9:30 am**	**Apollo 1 & 3**

Clinical & Applied Career Choices: Options, Ways and Means

Moderator: Gabe Shaibi, University of Southern California

Nursing
Melissa Benton, M.S.N., R.N., A.P.R.N., B.C. Arizona State University
Cardiac Rehabilitation
Kathy Campbell, Ed.D., FACSM, CES. Advanced Cardiac Specialists, Apache Junction, AZ
Athletic Training
Mack Rubley, Ph.D., A.T.C., University of Nevada, Las Vegas
Corporate Fitness
Janet Schumacher, M.S., Health Fitness Corporation, San Jose, CA
Physical Therapy
Stefany Spears, D.P.T., Westside Spine & Joint Rehabilitation, Los Angeles, CA
Personal Training
Kristen Fisher, M.A., fit ONE Athletic Club, Chico, CA

Attaining & Maintaining Success in Academia **Apollo 2 & 4**

Richard Coast, Ph.D., FACSM, Northern Arizona University
Ben Yaspelkis, III, Ph.D., FACSM, California State University – Northridge

Symposium # 4 **8:00 am – 10:00 am** **Apollo 5 & 7**

ACSM Healthy Aging Initiative: Strength Training and Health

Moderator: Wayne Phillips, Ph.D., FACSM, Arizona State University

8:00 – 9:00 ***Strength Training and Functional Fitness: Relevance and Application to Everyday Life for Older Adults***
Wayne Phillips, Ph.D., FACSM, Arizona State University

9:00 – 10:00 ***Strength Training and Bone Health: Relevance and Application to Everyday Life for Older Adults***
Jeanne Nichols, Ph.D., FACSM, San Diego State University

SPONSORED BY THE AMERICAN COLLEGE OF SPORTS MEDICINE HEALTHY AGING INITIATIVE AND THERABAND

Symposium # 5 **8:00 am – 10:00 am** **Apollo 6 & 8**

Assessment of Walking for Health Research

Moderator: Catherine Tudor-Locke, Ph.D., FACSM, Arizona State University

8:00 – 9:00 ***Protocols for Pedometer-determined Activity***
Catherine Tudor-Locke, Ph.D., FACSM, Arizona State University

9:00 – 10:00 ***Capturing Self-reported Walking***
Barbara Ainsworth, Ph.D., FACSM, San Diego State University

SPONSORED BY PARVO MEDICS, INC.

SATURDAY, 12 NOVEMBER 2005, continued

Symposium # 6 **9:30 am – 11:30 am** **Apollo 2 & 4**

Metabolic Consequences and Interventions in Pediatric Obesity

Moderator: Martha Cruz, DVM, D.Phil., University of Texas at El Paso

9:30 – 10:10 ***Insulin Resistance, Metabolic Syndrome, and Cardiovascular Disease in Children***
Martha Cruz, DVM, D.Phil., University of Texas at El Paso

10:10 – 10:50 ***Exercise for Preventing and Treating Childhood Obesity and Associated Co-morbidities***
Gabe Shaibi, M.S., University of Southern California

10:50 – 11:30 ***Nutritional Aspects of Childhood Obesity and Metabolic Syndrome***
Carol Johnson, Ph.D., RD, C.N.S., Arizona State University

Colloquium **10:00 am – 11:30 am** **Apollo 5 & 7**

Examining the ACSM Position Stand on Resistance Exercise Utilizing the Dose Response Literature

Brent Alvar, Ph.D., Arizona State University – East and Chandler-Gilbert C.C.
Matt Rhea, Ph.D., Southern Utah University

Clinical Lecture **10:00 am – 11:30 am** **Apollo 6 & 8**

Female Athlete Triad – Update

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

SPONSORED BY SPECIFIT – FOUNDATION FOR WOMEN'S WELLNESS

SATURDAY, 12 NOVEMBER 2005, continued

General Session # 2 **12:00 – 2:30** **Apollo 1-8**

Moderator: Jack Azevedo, Ph.D., President, SWACSM
California State University - Chico

Student Awards
Recognition of Host School: Arizona State University - East
Business Meeting

Special Presentation: Sponsored by Gatorade

Childhood Obesity and Physical Activity
Michael Goran, Ph.D.
Professor, Preventive Medicine, Physiology & Biophysics
Associate Director, Institute for Health Promotion and Disease Prevention Research
University of Southern California

Southwest Regional Chapter of the
AMERICAN COLLEGE of SPORTS MEDICINE
2005-06 Administrative Council Members

Past President	J. Richard Coast, Ph.D., FACSM
President	John L. Azevedo, Jr., Ph.D.
President-Elect	Pamela Swan, Ph.D., FACSM
Executive Director	John C. Young, Ph.D., FACSM
Member-at-Large (Abstracts)	Ben B. Yaspelkis, III, Ph.D., FACSM
Member-at-Large (Public Relations)	Len Kravitz, Ph.D.
Member-at-Large (Exhibits)	Steven A. Hawkins, Ph.D., FACSM
Member-at-Large (Continuing Education)	Jennifer Blevins, Ph.D.,
Member-at-Large (Membership & Program Development)	Pat Vehrs, Ph.D., FACSM
Regional Chapter Representative	J. Richard Coast, Ph.D., FACSM
Student Representative	Gabriel Q. Shaibi
Finance Chair	David Arnall, Ph.D., FACSM
Newsletter Editor	Amy Philips, M.S.
Founders	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)

2005 SWACSM

Annual Meeting

ABSTRACTS

Free Communications & Posters

FREE COMMUNICATIONS – STUDENT RESEARCH AWARD

1 **ERK1/2 INHIBITION PREVENTS THE CONTRACTION-INDUCED INCREASE IN MUSCLE FA METABOLISM AND PLASMA MEMBRANE CD36 CONTENT, WITHOUT AFFECTING AMPK ACTIVITY, IN A DOSE-DEPENDENT MANNER**

Marcella Raney and Lorraine Turcotte, FACSM

Department of Kinesiology, University of Southern California, Los Angeles, CA

Data collected in our lab has shown that both AMPK and ERK1/2 may be involved in the regulation of FA uptake and oxidation during low to moderate intensity muscle contraction and that CD36 translocation to the plasma membrane may be one of the mechanisms by which FA uptake is increased during muscle contraction. Furthermore, it has been suggested that in skeletal muscle AMPK may be located upstream of ERK1/2 (Chen et al, 2002). To further delineate the AMPK-ERK1/2 signaling cascade and its role in the regulation of FA uptake and oxidation, we perfused rat hindlimbs with 8mM glucose, 550µM palmitate, and no insulin during moderate intensity electrical stimulation and dose-dependent pharmacological inhibition of ERK1/2 using increasing concentrations of the MEK1/2 inhibitor PD98059 (P1=none, P2=10µM, P3=20µM, P4=50µM). PD98059 decreased ERK1/2 phosphorylation as well as fractional and total FA uptake and FA oxidation in a dose-dependent manner ($P<0.05$) whereas the inhibitor had no effect on total AMPK or AMPKalpha2 activity ($P>0.05$). Fractional and total FA uptake and FA oxidation each shared a significant positive correlation with ERK1/2 phosphorylation ($R2=0.68$, 0.66, 0.71 respectively, $P<0.05$), which was paralleled by the positive correlation between total FA uptake and plasma membrane CD36 content ($R2=0.85$, $P<0.05$). These results strongly suggest that during moderate intensity muscle contraction, ERK1/2 phosphorylation is required for the contraction-induced translocation of CD36 to the plasma membrane and the subsequent increase in FA uptake. In addition, this study suggests that ERK1/2-regulated FA uptake is an important factor regulating FA oxidation in perfused muscle contracting at moderate intensity. Finally, our results agree with the notion that AMPK may be located upstream of ERK1/2 in the signaling pathway regulating FA uptake and oxidation during moderate intensity muscle contraction.

Supported by NIH AR-45168 and the USC Women in Science and Engineering (WiSE) program.

3 **POTASSIUM CHANNEL REGULATION OF VASCULAR TONE**

Kentaro Onishi, Sireesha Achanti and Jeffrey L. Jasperse

Department of Sports Medicine, Pepperdine University, Malibu, CA

Pressurized arteries develop active resting tone that is endothelium-independent and appears to result from activation of stretch-activated Ca++ channels and voltage-gated Ca++ channels. In cerebral and coronary arteries, activation of Ca++ activated K+ channels (KCa) and voltage-dependent K+ channels (KV) acts as a negative feedback mechanism to limit Ca++ induced depolarization and contraction (Hypertension 35:173, 2000). The role of K+ channels in regulating resting tone in skeletal muscle resistance arteries is not known. Therefore, we tested the hypothesis that KCa, KV, inward rectifier K+ channels (KIR), and the Na+-K+ pump contribute to regulation of resting tone in soleus feed arteries (SFA). SFA from male Sprague-Dawley rats (n=16) were isolated and cannulated with two glass micropipettes for in vitro videomicroscopic observation, and pressurized at 90 cmH2O. After development of resting tone (35.7±0.5%), various blockers of K+ channels were applied in randomized order to determine the effect of specific K+ channels on resting tone. Inhibition of KCa with either tetraethylammonium (1 mM) or iberiotoxin (10 nM) did not significantly alter resting tone. Inhibition of KV with 4-aminopyridine (1 mM) also did not alter resting tone significantly, although there was a tendency for tone to be enhanced by Kv inhibition (diameter 129.7±2.6 vs. 106.1±2.1 um; $p=0.07$). Inhibition of KIR with barium chloride (30 uM) did not alter resting tone nor did inhibition of the Na+-K+ pump with ouabain (100 uM). However, combined inhibition of KIR and the Na+-K+ pump significantly increased resting tone (diameter 164.7±9.7 vs. 108.3±10.2 um). These data indicate that KV, KIR, and the Na+-K+ pump each contribute to regulation of resting tone in SFA. Unlike cerebral and coronary arteries, KCa channels do not significantly regulate tone in SFA. These data suggest that these K+ channels are important contributors to the regulation of blood flow in skeletal muscle.

2 **ACUTE EXERCISE INCREASES ARTERIAL AKT/PROTEIN KINASE B MEDIATED ENDOTHELIAL NITRIC OXIDE SYNTHASE PHOSPHORYLATION IN MICE.**

McMillin, S. and J. D. Symons FACSM

College of Health, University of Utah, Salt Lake City, UT

The precise mechanism(s) whereby exercise training improves vascular function is (are) unclear. In vitro experiments using cultured endothelial cells and isolated blood vessels indicate that shear stress activates the intracellular signaling kinase Akt/protein kinase B (Akt) which contributes to endothelial nitric oxide synthase (eNOS) phosphorylation. To our knowledge, the hypothesis that exercise-induced functional hyperemia/shear stress increases Akt and eNOS phosphorylation in the vasculature has not been examined. Mice completed 50 min @ 18 m / min (70-85% VO2 max; EX, n=2) on the treadmill or were exposed to treadmill noise/vibration for the same time (SED, n=2). Immediately following exercise animals were anesthetized using 3-5% isoflurane, their chest was opened, and the entire aorta was excised, placed in homogenization buffer, and sonicated. Akt phosphorylation at serine 473 (Akt-Ser473) and threonine 308 (Akt-Thr308), and eNOS phosphorylation at serine 1177 (eNOS-Ser1177) were analyzed via Western blot using arterial tissue from SED and EX mice. Akt-Ser473 and Akt-Thr308 were normalized to alpha-tubulin, while eNOS-Ser1177 was expressed relative to total eNOS protein. Akt-Thr308 and eNOS-Ser1177 increased by 16% and 30%, respectively, in EX vs. SED mice. Akt-Ser473 was not detected in arterial tissue from either group. Insulin (100 U i.v., n=2) was used as a positive control and markedly increased Akt-Ser473, Akt-Thr308 and eNOS-Ser1177. These preliminary findings indicate that Akt-Thr308 but not Akt-Ser473 contributes to phosphorylating eNOS at Ser1177 in response to acute exercise. As such, chronic, repeated exposure to elevated arterial shear stress via exercise training may stimulate Akt-mediated eNOS phosphorylation to an extent that improves nitric oxide bioavailability and vascular function.

4 **TOTAL CREATINE PROFOUNDLY INFLUENCES OXYGEN CONSUMPTION RATE KINETICS OF ISOLATED SKELETAL MUSCLE MITOCHONDRIA**

Glancy, B., T. Barstow, FACSM, and W. Willis, FACSM

Department of Kinesiology, Arizona State University and Department of Kinesiology, Kansas State University

Constant-load exercise elicits an increasing oxygen consumption rate (Jo) which rises exponentially toward the steady state level. This delay in the attainment of steady state aerobic energy turnover at exercise onset has been termed "metabolic inertia." Meyer and others have advanced the concept that the total creatine pool (TCr = PCr + Cr) of skeletal muscle acts as a metabolic capacitor, and thus may account for the vast majority of this so-called inertia. The purpose of this study was to evaluate Jo kinetics in isolated skeletal muscle mitochondria (SMM) given 1 mM pyruvate and 1 mM malate in the presence of various levels of TCr. While Jo was followed continuously in a polarography chamber, SMM were subjected to various rates of ATP demand by additions of hexokinase in the presence of 20 mM glucose. SMM were isolated from rat quadriceps (n = 5 mitochondrial preparations). Isolated SMM exhibited high functional integrity (state 3 = 574 +/- 94 nmol O2 x min^1 x mg^1, respiratory control ratio = 10.8 +/- 1.2 , ADP/O = 2.41 +/- 0.02). In the absence of added TCr, hexokinase addition elicited a transition to steady state Jo that was so rapid as to prohibit accurate assessment of the rate constant (k). Addition of TCr greatly extended the time course to steady state Jo. The relation between k and TCr was roughly hyperbolic. Within the range of physiologic ratios of TCr to mitochondrial protein, the relation of k to TCr was nearly linear ($R^2 > .9$). These results support the concept that the delay in the achievement of steady state Jo can largely be attributed to the magnitude of the total creatine pool.

Supported by the National Science Foundation, IBN-0116997.

FREE COMMUNICATIONS – STUDENT RESEARCH AWARD

5

EFFECTS OF A PROTEASE ENZYME SUPPLEMENT ON MUSCULAR STRENGTH AND SELECTED MARKERS OF DELAYED-ONSET MUSCLE SORENESS FOLLOWING HIGH-INTENSITY ECCENTRIC EXERCISE

T.W. Beck, T.J. Housh (FACSM), G.O. Johnson (FACSM), R.J. Schmidt, D.J. Housh, J.W. Coburn, and M.H. Malek (Sponsor: T.J. Housh, FACSM)

Department of Nutrition and Health Sciences, University of Nebraska-Lincoln

This investigation examined the effects of a protease enzyme supplement on muscular strength and selected markers of delayed-onset muscle soreness (DOMS) following high-intensity eccentric exercise. The study used a double-blinded, placebo-controlled, crossover design. Twenty males (mean ± SD age = 21.0 ± 3.1 yrs) were randomly assigned to one of two groups: a supplement group (SUPP) group, or a placebo group (PLAC). All subjects were tested for unilateral isometric forearm flexion strength, hanging joint angle between the arm and the forearm, relaxed arm circumference, a subjective pain rating, and blood levels of creatine kinase and myoglobin. The testing occurred before (TIME1), immediately following (TIME2), and 24 (TIME3), 48 (TIME4), and 72 (TIME5) hours after a bout of maximal eccentric muscle actions of the forearm flexors. These tests took a total of five days, during which, the subjects in the SUPP group ingested a protease enzyme supplement, while the subjects in the PLAC group took microcrystalline cellulose. After testing at TIME5 and two weeks of rest, the subjects were crossed-over into the opposite group (either SUPP or PLAC) and performed the same tests as during the first five visits, but with the opposite limb. The SUPP and PLAC groups demonstrated similar changes in hanging joint angle, arm circumference, subjective pain, and blood levels of creatine kinase and myoglobin from TIME1-TIME5. Overall (TIME1-TIME5), forearm flexion strength was greater for the SUPP group than the PLAC group, despite the fact that the average strength values for the two groups were nearly identical at TIME1. These findings suggested that the protease enzyme supplement did not affect the perception of pain associated with DOMS or the blood markers of muscle damage. It may, however, reduce strength loss immediately after high intensity eccentric exercise, as well as aid in the short-term (24-72 hrs) recovery of strength.

6

EFFECT OF A HIGH PROTEIN DIET ON GLUCOSE TOLERANCE IN RATS

Sanchez, R.M., Young, J.C. FACSM, Golding, L.A. FACSM, Kruskall, L.J. FACSM, Benyshek, D.C.

Department of Kinesiology, University of Nevada Las Vegas, Las Vegas, Nevada

A rationale for diets high in protein and fat content and severely limited in carbohydrate intake emphasize that excess carbohydrate intake results in elevated plasma insulin which promotes the storage of energy as fat. By reducing carbohydrates, it is proposed that insulin levels will be lowered and storage of fat will be decreased. However, this fails to consider that certain amino acids also stimulate insulin secretion. The purpose of this study was to determine the effects of a high protein diet – low carbohydrate diet on glucose tolerance. Nine Sprague Dawley rats received a high protein (HP) diet (65% protein, 35% fat) and eight rats consumed a standard chow (SC) diet over the course of eight weeks. An oral glucose tolerance test (OGTT) was performed at the end of the third and the seventh week to measure blood glucose and plasma insulin concentrations. The diet did not affect glucose tolerance in the first (10357 $\pm$ 294 mg/dl/120 min for the SC group and 9846 $\pm$ 300 mg/dl/120 min for the HP group) or the second OGTT (10134 $\pm$ 395 mg/dl/120 min for the SC group and 10721 $\pm$ 438 mg/dl/120 min in the HP group) as reflected by the area under the glucose concentration curve. Similarly, the high protein diet did not effect the area under the insulin concentration curve during the first (49.21 $\pm$ 8.46 ng/ml/120 min in SC animals and 41.75 $\pm$ 10.54 ng/ml/120 min) or the second OGTT (96.63 $\pm$ 13.68 ng/ml/120 min in SC animals and 92.77 $\pm$ 17.44 ng/ml/120 min in HP animals). Body weight increased to the same extent in each group from the initial to final weighing (159 $\pm$ 2 g to 254 $\pm$ 7 g in the SC group vs. 157 $\pm$ 2 g to 242 $\pm$ 7 g in the HP group). These findings suggest that glucose tolerance and body weight were neither adversely nor positively affected by a high protein diet.

Supported by a UNLV Graduate Student Association grant.

POSTER PRESENTATIONS

1 AGE DIFFERENCES IN THE PREVALENCE OF THE FEMALE ATHLETE TRIAD AMONG HIGH SCHOOL CROSS COUNTRY RUNNERS

Michelle Barrack, Mitchell Rauh, Kylie Edwards, Hava-Shoshana Barkai, Jeanne Nichols

Department of Exercise and Nutritional Sciences, San Diego State University

Prevalence estimates of the female athlete triad have been primarily reported in collegiate athletes, but rarely in high school runners. Age group differences in this population are of interest given the period of rapid bone growth. PURPOSE: To determine the prevalence of the female athlete triad in female high school cross country runners and identify age group differences. METHODS: One hundred forty eight female cross country runners ages 13-18 from 12 high schools in southern California participated. The Eating Disorder Examination Questionnaire was used to assess disordered eating (DE) risk. Menstrual function was determined by interviewer-assisted questionnaire. Bone mineral density (BMD) of the spine (L1-L4), proximal femur (total hip), and total body were assessed by dual energy x-ray absorptiometry (DXA). The International Society for Clinical Densitometry (ISCD) criteria of ≤ -2 was used to classify athletes as having low BMD for age. RESULTS: Among all runners, 14.9% were at risk for DE, 25.9% for menstrual irregularity, and 9.5% had low lumbar spine BMD. DE frequencies by age group were: 13-14 y, 30%; 15 y, 7.5%, 16y, 13.5%, and 17-18 y, 12.2%. Menstrual irregularity prevalence was 48.1%, 32.4%, 14.3%, and 13.9% for the 13-4, 15, 16, and 17-18 y age groups, respectively. Lumbar spine BMD frequencies for the same age groups were 0%, 16.2%, 2.9%, and 15.0%. Chi-squared analysis revealed significant differences among age groups for menstrual irregularity ($p < 0.01$), with DE ($p = .059$) and BMD ($p = .051$) values nearly significant. CONCLUSION: The higher prevalence of menstrual irregularity and the strong trend toward higher DE among the 13-14 year old group are of concern, given this critical time for bone mineral accrual. Additionally, the overall prevalence of low spinal BMD is alarming given the increase risk of fracture and osteoporosis with failure to reach optimal peak bone mass.

2 INFLUENCE OF SHORT-TERM ISOKINETIC TRAINING ON RAPID STEP PERFORMANCE

Bera, S.G., L.E. Brown, FACSM, S.M. Zinder, G. Noffal, D.P. Murray and N. Garrett

Movement Analysis Laboratory, Department of Kinesiology, California State University Fullerton, Fullerton, CA

A deficiency in the ability to rapidly step can dramatically increase risk of falling and subsequent injury. Previous models had looked at rapid stepping in a uniplanar direction. This investigation focused on peak torque (PT), peak power (PP), rate of velocity develoment (RVD), and Rapid Step Test (RST) measurements before and after multiplanar testing and training. Seven male (23.14 years ± 2.97; 175.09 cm ± 4.90; 79.51 kg ± 12.55) and sixteen female (23.75 years ± 23.17; 164.94 cm ± 8.59; 60.16 kg ± 7.97) students were tested before and after training for peak torque production and rate of velocity development (at speeds of 60, 180, 300 and 400 deg/sec) on an isokinetic dynamometer, along with total RST time and number of errors. Participants in the training group went through 8 training sessions over 4 weeks, consisting of 3 sets of 5 repetitions of unilateral hip flexion/extension and hip abduction/adduction for both legs. Exercises were performed on a Biodex System 3 isokinetic dynamometer beginning at a speed of 60 deg/sec, gradually increasing in speed every week up to 180, 300, and 400 deg/sec, respectively. A repeated measures factorial ANOVA revealed no significant differences betweens groups on any measure. However, a main effect ($p<0.05$) was found for all measures, although there were no between group interactions. The data suggests a general improvement on RST time (pre-50.87 sec ± 4.41; post-49.20 sec ± 4.28) and number of errors (pre-4.13 errors ± 2.87; post-2.75 errors ± 1.81). Short-term isokinetic training did not necessarilly translate into significant results. The open chain training (on the dynamometer) did not lead to improvements on a functional test (RST). General improvements imply that a learning effect took place on the RST for all individuals. In addition, it was concluded that the RST may not be an applicable measure of rapid step performance for a young and healthy population.

3 EVALUATION OF MULTIPLE 1RM STRENGTH TRIALS IN UNTRAINED FEMALES

Melissa J. Benton, MSN and Pamela D. Swan, Ph.D., FACSM

Dept. of Exercise and Wellness, Arizona State University, Mesa, AZ

Background: In field testing where time and resources are limited, it is advantageous to obtain a consistent measurement of maximal strength as expeditiously as possible. Untrained populations present a unique challenge due to their lack of familiarity with test procedures. Purpose: The purpose of this study was to evaluate differences between trials of one repetition maximum (1RM) strength measures in healthy, previously untrained females (n =20) between the ages of 24 – 54 (35 ± 9 years). Methods: Participants completed three trials of 1 RM chest press and leg press with at least 24 hours rest between trials. Familiarization was incorporated into trials 1 and 2 for both tests. Differences in maximal strength between individual trials were analyzed for significance using repeated measures ANOVA. Paired t-tests were performed to identify specific differences. An alpha level was set at $p < 0.05$. Results: Data are presented as mean ± SE. For 1RM chest press, strength increases between trials 1-2 and 2-3 were 2.6 ± 1.6 kg ($p = 0.13$) and 2.8 ± 2.0 kg ($p = 0.17$) respectively, while the increase between trials 1-3 was 5.5 ± 2.7 kg ($p = 0.06$). For 1RM leg press, strength increases between trials 1-2 and 2-3 were 15.2 ± 7.3 kg ($p = 0.05$) and 16.0 ± 5.6 kg ($p = 0.01$) respectively, while the difference between trials 1-3 was 31.3 ± 9.9 kg ($p < 0.01$). Conclusions: In this study of untrained females, increases in maximal strength were significantly different between trials of lower body strength but not of upper body strength. A series of three 1RM tests was sufficient to obtain a consistent measurement of maximal upper body strength (chest press) but not of lower body strength (leg press). These findings may be of assistance for efficient field testing of untrained adult females.

4 KINEMATIC ANALYSIS OF THE LOWER EXTREMITY DURING A HANG CLEAN IN NOVICE FEMALE LIFTERS

L.C. Bufkin and M. LeBlanc

Exercise Science and Sports Medicine Department, California Lutheran University, Thousand Oaks, CA

Many weight lifting coaches believe that the hang clean Olympic lift is an effective training tool to increase power and angular velocity in the lower extremity joints (Garhammer, 1984). The purpose of this study was to investigate kinematic changes at the hip and knee joints in a hang clean lift over a three week training period. The short time was chosen to determine neurological changes during the early learning phase of the skill. Six female intercollegiate soccer players with no Olympic-style weight lifting experience were trained in a progressive manner how to perform a hang clean lift. Each participant practiced hang clean lifts with the researcher two times a week for three weeks (a total of six practice sessions). Once the subject could perform more than five repetitions in a set, weight was added to the barbell. Sagittal plane kinematics were obtained by videotaping at 60 Hz. The best trial from the first and last practice session (T1 and T6, respectively) were analyzed and compared using paired t-tests with $\alpha = 0.05$. The actual weight lifted and the weight adjusted for subject weight was statistically greater in T6 than in T1, however there were two subjects who lifted the same weight during both trials. The maximum height the bar lifted was statistically greater in the T6 lift than the T1 lift. The maximum hip angular velocity during T6 was statistically greater than in T1, however, there was no statistical difference in the hip angle at the maximum hip angular velocity. There was no difference in the maximum angular velocity obtained at the knee joint during T1 and T6. Changes in the knee joint kinematics may be observed with longer training time. Further study with a larger sample size and longer training time would be beneficial.

POSTER PRESENTATIONS

5 PHYSIOLOGICAL RESPONSES OF COMPETITIVE MOUNTAIN BIKERS TO THE USE OF MOUNTAIN BIKES WITH DIFFERENT SUSPENSION SYSTEMS ON A SIMULATED CROSS-COUNTRY RACE COURSE

M. E. Fonda, S. M. Puhl, R. D. Clark, & S. C. Davis

Department of Kinesiology, California Polytechnic State University, San Luis Obispo

One of the most popular advances in mountain bike technology is the development of dual suspension systems – suspension for both the front and back wheels. While people in the sport believe suspension systems have a physiological performance enhancing effect, there is little research on the efficacy of dual suspension for competition settings. The purpose of this study was to investigate the physiological responses of competitive male and female mountain bikers riding mountain bikes with front and dual suspension systems on terrain similar to mountain bike cross-country race courses. It was hypothesized that there would be no difference in oxygen consumption, heart rate, rating of perceived exertion, average speed, or vertical displacement in competitive male and female mountain bikers when using front suspension, dual suspension, and no-suspension on the same mountain bike. The participants were fitted to ride a mountain bike on a 355 m loop with 38 fixed log bumps averaging 9 cm during three randomly assigned trials: no-suspension, front suspension, and dual suspension. Four 80-second controlled speed laps were completed, followed by 6 race intensity laps. The distance and time of each trial were less than what is commonly found in mountain bike racing. There were no significant differences in oxygen consumption, heart rate, perceived exertion, or average speed with the use of the three suspension systems during the controlled pace and race intensity laps. There were, however, significant differences in the vertical displacement of the rider and the bike while riding with each system. These data support the findings of previous studies in that the use of mountain bike suspension does not have a significant effect on physiological variables, despite the visually-anticipated benefits. There is evidence showing that there is a difference in the vertical movement of the bike/rider system while riding with the three different systems.

6 THE EFFECT OF GENDER, MUSCLE GROUP AND SPEED ON RATE OF VELOCITY DEVELOPMENT

Garrett, N.M., L.E. Brown FACSM, S.M. Zinder, D. Nguyen, S.G. Bera, L.M. Gardner, S.B. Kelly, Wood NR and D.P. Murray

Movement Analysis Laboratory, Department of Kinesiology, California State University Fullerton, Fullerton, CA

Rate of velocity development (RVD) is a measure of how quickly a person can reach speed, analogous to acceleration. Examining the critical variables associated with RVD may assist in prescribing the correct speeds and exercises for specific muscle groups. The purpose of this study was to evaluate the effects of gender, muscle group, and speed on RVD. Fifty-nine male (n=25) and female (n=34) university kinesiology students (age 23.13±2.11 yrs, height 170.94±10.68 cm, weight 71.19±15.33 kg) performed 5 maximal concentric knee extension/flexion repetitions on an isokinetic dynamometer at 13 random speeds ranging between 30 and 400 d/s. ANOVA analysis revealed significant ($p<0.05$) main effects for gender, muscle group, and speed. Males demonstrated significantly ($p<0.05$) less RVD (marginal means; 12.18°±0.39) than females (15.56°±0.34). RVD was also found to significantly increase with speed, while knee extension exhibited significantly less RVD than that of knee flexion. Furthermore, there was a significant interaction of speed by gender by muscle group. Collectively, these results represent a male bias in speed which became more evident as the speed increased. This is especially apparent in the fact that females were unable to attain speeds greater than 400 d/s. Distinct neuromuscular activation patterns may explain the difference seen between males and females. Exercise physiologists and coaches should be aware of the gender and muscle group differences associated with high velocity exercise and prescribe training exercises accordingly.

7 THE EFFECT OF GENDER ON RATE OF VELOCITY DEVELOPMENT

Gardner L.M., L.E. Brown FACSM, S.M. Zinder, S.B. Kelly, S.G. Bera, D. Nguyen, N.M. Garrett, D.P. Murray and NR Wood.

Movement Analysis Laboratory, Department of Kinesiology, California State University Fullerton, Fullerton, CA.

Differences in strength between genders has been widely demonstrated in the past, however little research has been done on variations in velocity. The purpose of this study was to evaluate gender differences in the rate of velocity development (RVD) of the quadriceps at various speeds. Twenty five male and thirty five female university kinesiology students (age 23.13+2.11 yrs, height 170.94+10.67 cm, weight 71.19+15.32 kg) performed 5 maximal concentric knee extension repetitions on an isokinetic dynamometer at 15 random speeds between 30 and 500 d/s. Differences between males and females were determined at each speed using ANOVA with gender as the independent variable. Males demonstrated a significantly ($p<0.05$) lower RVD when compared to females at every speed tested. At 30 d/s males exhibited a mean peak RVD of 0.68°±.19 compared to females of 0.81°± 0.22, while at 500 d/s males had a mean of 34.86°±6.08 compared to females of 44.97°± 5.42. These results demonstrate that males have faster acceleration than females across a range of speeds. This may be due to anthropometric factors such as CSA. In addition, males may have differing amounts of fast twitch muscle fibers or differences in muscle recruitment patterns. Understanding RVD differences between genders may have practical implications not only for exercise and sports specific training, but for injury and rehabilitation as well. The knowledge that females accelerate more slowly than males may alter the selection of training speeds, and raise the question of the practicality of training females at extremely high velocities.

8 LOWER EXTREMITY GEOMETRY AS A PREDICTOR OF SHOCK ATTENUATION DURING RUNNING

Griffin, J.R., Dufek, J.S., FACSM, Mercer, J.A., FACSM, Teramoto, K., DeLion, D., Bestwick, A.

Biomechanics Laboratory, Department of Kinesiology, University of Nevada, Las Vegas, Las Vegas, NV

Experimental manipulation of natural / preferred running via speed or stride length variations appears to result in a pattern to maintain impact attenuation values experienced at the head of the runner, represented as “shock attenuation” (SA). We sought to explore a possible mechanism for this observation. The purpose of the study was to predict SA from lower extremity geometry (kinematics) during running. Seven female subjects volunteered to run at two speeds (preferred, -10% preferred) over three surface conditions (soft, medium, hard) on a treadmill. Ten footfalls per subject-condition were evaluated kinematically using a 12-camera Vicon motion capture system (120 Hz) and via leg and head accelerometers (1008 or 1082Hz). Selected lower extremity kinematic variables (n=41) were evaluated using a cross-correlation matrix to identify and eliminate any correlated ($r \geq 0.707$) independent variable (IV) pairs, resulting in 24 non-correlated lower extremity predictor variables. These 24 IVs were used to predict SA for the entire group of subjects (n=1), for the group by-condition (n=6) and within-subject across condition (n=10). Results of the regression analyses ($\alpha = 0.05$) indicated that SA was not well-predicted under any of these circumstances, resulting in 45.4, 54.3, and 42.4% average explained variance for the group, condition, and subject models, respectively. To better understand these results, regression analyses were also conducted to predict leg peak acceleration (LgPk), a parameter used to calculate SA. Results of LgPk predictions were stronger than those for SA, resulting in 64.8, 74.4, and 49.1% average explained variance for the group, condition, and subject models, respectively. The stronger predictions obtained for LgPk compared to SA combined with the overall poor prediction results for SA suggest that SA is not related to lower extremity geometry during support for female runners. It is suggested that researchers explore alternative explanations for the observed SA (head stabilization) phenomena.

POSTER PRESENTATIONS

9 EFFECTS OF AN ENDURANCE TRAINING PROGRAM ON MUSCLE OXYGEN SATURATION ON-KINETICS

Gabe G. Guerrero, Chris A. Garcia, Eric M. Sickinger, Dustin R. Weim, Aaron D. Schenone, Michael J. Buono, FACSM, Fred W. Kolkhorst, FACSM

Department of Exercise and Nutritional Sciences, San Diego State University

INTRODUCTION: Previous studies have reported faster oxygen consumptions (VO_2) on-kinetics following short-term endurance training. However, no studies have investigated the effects of training on the muscle saturation (StO_2) kinetics, thus the purpose of this study. This would be of potential value as a novel marker of training adaptations. METHODS: Seven inactive subjects (23.4 ± 1.5 yr; 73.9 ± 7.8 kg; VO_{2max} = 3.303 ± 0.618 L □ min^{-1}) who participated in less than 15 min of aerobic training per week completed a 2 week cycling training program. Subjects cycled at 70% of maximal heart rate for 30 min on alternate days for a total of 7 training bouts. StO_2 was measured during a 6-min bout of cycling at 50% the delta from the ventilatory threshold (VT) and maximal VO_2 (VO_{2max}). The data were averaged into 10-s bins and the data modeled using non-linear regression. To maintain consistency with the length of the phases, phase 2 was modeled using data from 10 to 120 s. The slow component was estimated from the difference of StO_2 between minutes 6 and 3 ($\Delta StO_{2\ 6\text{-}3}$). Data are reported as mean ± SE. RESULTS: The time constants for the rapid phase were 21.6 ± 7.1s and 18.1 ± 3.3s for pre- and post-training, respectively. The slow components were 0.5 ± 3.0 and -3.6 ± 1.4 % for pre- and post-training, respectively. Neither of the comparisons were different (P > 0.05). Although VO_{2max} and VT did not change after training, the end-exercise HR was lower indicating that some adaptations did result from the training. The lack of changes in the StO2 on-kinetics may be because the training was not adequate to induce adaptations or that training does not affect StO_2 kinetics. CONCLUSION: Short-term endurance training does not affect the StO_2 on-kinetics.

11 THE MOTIVATIONAL CHANGES OF FIRST TIME MARATHON RUNNERS

Havenar, J and B.J. Stone

Department of Exercise and Wellness, Arizona State University

Prior research demonstrated that marathon runners have participation motivations that vary between individuals. This variance results from individually unique motivational typology. Ogles & Masters (1993, 2000) developed the Motivations of Marathoners Scales (MOMS) with specific domains focused on health orientation; weight concern; personal goal achievement; competition; recognition; affiliation; psychological coping; life meaning; and self-esteem. They stratified a sample of runners into three groups based on marathon experience. Groups consisted of veterans (more than three marathons), mid-level (second or third marathon) and rookies (first marathon). Veterans were motivated by competition, recognition and health orientation. Mid-levels were motivated by psychological coping, self-esteem and life meaning. Rookie motives included health orientation, weight concern and self-esteem. The purpose of the present study was to ascertain what motivates first time marathoners discrepant on prior running experience (novice or no running experience vs. any running experience). Subjects were recruited from two marathon training organizations. Twenty-seven first time female marathon runners (N=27) completed the MOMS. Eleven novice runners' average age (years) was (35.6 ± 10.5) and ran (2.4 ± 4.2) miles/week. Sixteen experienced runners' average age (years) was (34.0 ± 12.9) and ran (10.6 ± 7.6) miles/week. Novice mean values for each MOMS domain were similar to corresponding domain values found for novice groups in previous research. There was a significant difference between novices and experienced for miles/week (t = -3.380, p < .01). Independent sample t-tests were used to compare novice (2.4 ± 4.2) vs. experienced (10.6 ± 7.6) runners' miles/week and each of the domains of the MOMS. There were no significant differences found for any of the nine domains. First time marathoners share similar motivations regardless of previous running experience. These baseline data serve as a foundation for follow up exploration of changes in motivation during training and post-event.

10 COMPARISON OF AIR DISPLACEMENT PLETHYSMOGRAPHY WITH THE OMRON® BODY FAT ANALYZER

Heather Hayes, Marialice Kern, C. Matthew Lee

Department of Kinesiology, San Francisco State University

The purpose of this study was to compare the accuracy of a hand-held bioelectrical impedance device, the Omron® Body Fat Analyzer HBF-306 (Omron), against an air displacement plethysmography system, commonly known as the BOD POD® Body Composition System (BOD POD). Data on 29 males and 29 females was analyzed after they had their body composition measured with the BOD POD and then by the Omron. While there was a significant difference in both men and women between percent body fat measurements taken with the BOD POD and with the Omron ($p < 0.05$), the Omron estimated the percent body fat of 62% of the men and 45% of the women in this sample within ± 3.5% body fat. From the data, regressions equations were developed for both males and females. The female regression equation predicted the measurement taken by the BOD POD (within ± 3.5%) in 69% of the females tested – a 24% increase from using the Omron without the use of a regression equation. The male regression equation predicted the measurement taken by the BOD POD (within ± 3.5%) in 62% of the males tested – the same number as seen from using the Omron without the use of a regression equation. The ease of use, the reliability, and the cost make the Omron a piece of equipment that is accessible to corporate and public fitness centers and the everyday consumer who normally wouldn't have access to expensive research-type measuring instruments such as the BOD POD or a hydrostatic weighing system. No piece of equipment is infallible, but by following standard pre-testing procedures to minimize errors that can occur due to fluctuations in a person's hydration state, the Omron may be a reliable tool when combined with validated prediction equations.

12 SKIN BLOOD FLOW AFFECTS IN VIVO NEAR-INFRARED SPECTROSCOPY MEASUREMENTS IN HUMAN SKELETAL MUSCLE

Clifford Hom (2), Robert S. Pozos (2), Michael J. Buono, FACSM (1,2), Paul W. Miller (1) and Fred W. Kolkhorst, FACSM(1)

1)Department of Exercise and Nutritional Sciences and (2)Department of Biology, San Diego State University San Diego, CA

The purpose of this study was to determine the effect of changes in skin blood flow (SkBF) on tissue oxygen saturation (StO2) as measured by near-infrared spectroscopy (NIRS). The subjects (n = 8) reported to the laboratory (22-23 C) and sat in a semi-reclined position with both legs resting on a footstool and parallel to the floor. A NIRS probe with a 25-mm probe spacing, which measured StO2, was placed on each vastus lateralis muscle approximately 12 cm above the top of the patella. SkBF was measured using a laser-Doppler probe attached 4-cm proximal to the NIRS probe. In one leg, SkBF was decreased using intradermal 3-cc injections of 1% lidocaine with 1:100,000 epinephrine. In the other leg, SkBF was increased using an electric heating pad. The treatment administered to each of the legs was randomly assigned. SkBF and StO2 data were measured in each leg prior to and 20-30 min following heat or epinephrine administration. Prior to treatment, SkBF in both legs was approximately 1.2 ml × 100 ml/min. Intradermal injection of epinephrine caused a significant reduction of SkBF to 0.4 ± 0.1 ml × 100 ml/min (P = 0.002). Conversely, local skin heating increased SkBF significantly to 9.8 ± 2.6 ml × 100 ml/min (P = 0.005). The pre-treatment StO2 in both legs was approximately 71%. Intradermal injection of epinephrine decreased the StO2 to 59 ± 6% (P = 0.011) while heating the leg increased StO2 to 83 ± 4 % (P = 0.003). The results of the study strongly suggest that changes in SkBF can significantly affect resting StO2 measured by NIRS. Thus, NIRS users may need to consider that under resting conditions, changes in SkBF can affect NIRS values.

POSTER PRESENTATIONS

13 **ACUTE EFFECTS OF ISOCALORIC SUCROSE AND HIGH FRUCTOSE CORN SYRUP BEVERAGES ON SATIETY, TRIGLYCERIDE, INSULIN, AND GLUCOSE CONCENTRATIONS**

Janelle Johnson, Pamela Swan

Exercise and Wellness at Arizona State University East

Increased consumption of dietary fructose in the form of high-fructose corn syrup (HFCS) may be an important contributor to the obesity epidemic. Two theories exist that may explain this relationship. First, the consumption of fructose predisposes the body for increased liver fatty acid synthesis and increased fat storage, and second, fructose ingestion may instigate lower concentrations of insulin production, leading to elevated caloric consumption. This study was a preliminary investigation of the acute response to either a HFCS or sucrose based beverage on satiety, insulin, glucose, and triglyceride concentrations using a double blind, cross-over design, with a six-week wash out period. Eight normal-weight, healthy males, ages 18-35, were randomly assigned to one of two treatment groups: isocaloric quantities (240 kcal) of HFCS based beverage, Sunny Delight (SD), or a sucrose based beverage, Orange Juice (OJ). At baseline, body mass, height, percent body fat, and 3-day food records were collected, as were insulin, glucose, and triglyceride concentrations. Insulin and glucose levels were measured 30-minutes post-drink and triglyceride concentrations were measured 90-minutes post-drink. Subjects were then fed an ad libitum breakfast meal preceded and followed by a satiety questionnaire. Food intake was also recorded for the remainder of test day. Significant differences were found in body mass ($p = .045$, 85.4 ± 12.8 kg vs. 83.3 ± 11.4 kg) and in the remainder of test day dietary recall ($p = .05$, 2358 ± 808 kcal vs. 1698 ± 731 kcal) in OJ and SD respectively. No significant differences were reported in satiety, baseline blood parameters, nor were there any significant treatment by time interactions. Results from this preliminary study suggest that HFCS does not adversely affect acute appetite or health risk factors in men, however longitudinal assessments are warranted.

15 **THE EFFECT OF GENDER ON ABSOLUTE AND RELATIVE PEAK POWER**

Kelly, S.B., L.E. Brown FACSM, S.M. Zinder, L.M. Gardner, N.R. Wood, S.G. Bera, D. Nguyen, N.M. Garrett and D.P. Murray

Movement Analysis Laboratory, Department of Kinesiology, California State University, Fullerton, Fullerton, CA.

There is speculation that men and women have similar lower body power when controlling for body weight and cross-sectional area (CSA). The purpose of this study was to evaluate the effects of gender and body mass on absolute and relative peak power. Sixty male (n=25) and female (n=35) university kinesiology students (age 23.13+2.11 yrs, height 170.94+10.68 cm, weight 71.19+15.34 kg) performed 3 maximal concentric knee extension repetitions on an isokinetic dynamometer at 15 random speeds between 30 and 500 d/s. Muscle CSA was estimated via the Housh equation derived from the anterior thigh skinfold and circumference. Differences between males and females were determined at each speed using ANOVA. Males were significantly heavier (males=81.51+11.64 kg; females=63.83 + 13.34 kg) and had greater thigh CSA (males=143.12 +18.17 cm2; females 114.55 + 21.56 cm2) than females. Males also demonstrated significantly ($p<0.05$) greater power across all speeds when compared to females in terms of absolute peak power (males=119.20+27.18; females=81.06+21.09 at 30 d/s, males=792.54+192.68; females=531.41+107.07 at 500 d/s), peak power relative to body weight (males=1.47+0.27 W/kg; females=1.27+0.26 W/kg at 30 d/s, males=9.66+2.17 W/kg; females=8.04+1.32 W/kg at 500 d/s), and peak power relative to CSA (males=1.61+0.26 W/cm2; females=1.43+0.28 W/cm2 at 30 d/s, males=10.52+1.89 W/cm2; females=8.75+1.21 W/cm2 at 500 d/s). These results demonstrate that the greater body mass or thigh muscle mass of males may not completely explain power differences between genders. Although body size plays a large role in power expression, other factors must be influencing the male bias such as neuromuscular efficiency or female inhibition.

14 **DO SELF-ASSESSED OSTEOPOROSIS RISK, PHYSICAL ACTIVITY, AND DIET DIFFER BETWEEN POSTMENOPAUSAL KOREAN AMERICAN AND NATIVE KOREAN WOMEN?**

Lee, N., D. P. Williams, P.A. Eisenman, FACSM J. E. Benson, J. M. Shaw, FACSM

Department of Exercise and Sport Science, University of Utah, Salt Lake City, UT

Asian Americans gradually acculturate to a Western lifestyle, which in turn, may reduce their risk for osteoporosis (OP). We examined whether self-assessed OP risk, physical activity (PA), and selected dietary patterns differed between Korean American (KA) and native Korean (NK) women. We hypothesized that KA women would have a lower self-assessed OP risk than NK women primarily due to their acculturation to a Western lifestyle. All participants were >44 y and were postmenopausal by self-report. The KA women (n=181, age=55.0+/-10.4y, BMI=23.3+/-2.6 kg/m2) lived in Orlando, FL and Salt Lake City, UT. The KA women lived in the United States (US) for 11.5+/-8.1 y, but they were born in Korea. By contrast, the NK women (n=201, age=56.4+/-7.7y, BMI=23.3+/-2.6 kg/m2) lived in Soeul, South Korea, and they were born in Korea. OP risk was assessed by age and weight with the OP Self-Assessment Tool for Asians. PA was assessed with the International PA Questionnaire. Dietary frequencies for fruit and vegetable, calcium and vitamin D, and soy protein consumption were assessed with a questionnaire. Acculturation was assessed with a questionnaire of native language preference in four different situations. There was no difference in self-assessed OP risk between KA and NK women. However, KA women reported more days of light activity ($p=0.014$) and walking ($p<0.001$) and a higher frequency of consuming calcium- and vitamin D-rich foods ($p<0.001$) than NK women. Although there was some evidence of lower OP risk and of a higher frequency of consuming calcium- and vitamin D-rich foods among the most acculturated KA women, the most acculturated KA women were also younger than the least acculturated KA women (52.0+/-6.8y vs. 56.8+/-11.7 y). We conclude that KA women, who reside in the US but were born in Korea, may have a similar age- and weight-derived OP risk, a higher level of PA, and a higher frequency of consuming calcium- and vitamin D-rich foods than NK women, who reside and were born in Korea.

16 **THE EFFECTS OF HIGH-INTENSITY AND LOW-INTENSITY RESISTANE TRAINING ON SERUM MARKERS OF BONE MINERAL DENSITY IN MALE RATS**

Smith, MZ, Goettsch, BM, Van Ramshorst RD, O'Brien, JA and Sumida, KD, FACSM

Department of Biological Sciences, Chapman University, Orange, CA

The purpose of this study was to examine the effects of low-intensity (LI = light weight, high repetitions) and high-intensity (HI = heavy weight, low repetitions) resistance training on serum biochemical markers of bone mineral density (BMD). Twenty-four male rats were randomly divided into Control (Con, n=9), LI (n=7) and HI (n=8) groups. LI and HI were conditioned to climb a vertical ladder with weights appended to their tail 4 days/wk for 6 wks. LI initially carried 5% of their body weight (BW) and progressed to 25% BW by wk 4 while HI initially carried 30% of their BW and progressed to 150% BW by wk 4. Both groups maintained the final carrying weight for 2 wks. The total volume of work was equivalent between LI and HI throughout the training period. There were no significant differences in the initial BW between groups (253.6 ± 1.6 g). After the 6 wk training period, HI weighed significantly less (402.7 ± 4.4 g) than both LI (448.5 ± 3.8 g) and Con (443.4 ± 9.0 g). Forty-eight hrs after the last training bout both HI (45.16 $\pm$ 1.69 ng/ml) and LI (39.10 $\pm$ 2.16 ng/ml) had significantly higher levels of serum osteocalcin (OC, a marker of osteoblast activity) compared to Con (30.42 ± 0.96 ng/ml). In addition, the serum OC levels for HI were significantly higher than LI. There were no significant differences in levels of serum pyridinoline cross-links (a marker of osteoclast activity) between groups. The results indicate that both LI and HI are effective in elevating serum OC suggesting an augmentation in osteoblast activity and a potential increase in BMD. Further, the greater elevation in OC from HI vs. LI despite an equivalent volume of work suggests that HI may be a more effective resistance training regimen for increasing BMD.

POSTER PRESENTATIONS

17 **QUALITATIVE KINEMATIC COMPARISON OF HIND LIMB TECHNIQUES ON FORELIMB FLEXION OF MOUNTED EQUINE SHOW JUMPERS**

Kori Malyszek B.A; Guillermo Noffal, FACSM; Andrew Hennebelle

California State University at Fullerton, Department of Kinesiology

INTRODUCTION: The study of specific kinematic variables can have tremendous implications on success in equestrian show jumping, as well as determining the cause and effect of specific injuries. Numerous studies have linked the landing force on the trailing forelimb to be a major cause of career ending tendon injuries in show jumpers. Hock injury and degeneration is also in the forefront of career ending injury. **PURPOSE:** To kinematically describe two specific styles of the hind limbs of show jumpers: The "heel flick" vs. the "classic tuck" and to describe the effects of each style on forelimb during landing. **METHODS:** Six mounted experienced horses were video taped jumping a square oxer (jump with two elements; Width: 1.89M; Height: 1.142M). Reflective tape was used to mark critical points on horse to be used as a reference for digitizing. Hu-man Software was used for motion analysis of the trials. The relative hock angle was tracked throughout take off, midpoint and landing to determine technique. The relative angle of the trailing forelimb at greatest moment of flexion after landing was calculated. **RESULTS:** Two of the horses were determined to have apparent "heel flick" technique (hock angles staying above 90˚ between take off to landing. Four horses had apparent "classic tuck" technique (hock angles below 90˚ between take off and landing). Forelimb flexion upon landing varied among all individuals, regardless of technique (trailing forelimb range 83˚ - 106˚) The two individuals with the most excessive "tuck" and "heel flick" had the greatest amount of trailing forelimb flexion after landing (84˚ and 83˚ respectively). **CONCLUSION:** The hind limb technique did not affect the amount of forelimb flexion during landing in horses with "classic tuck" vs. "heel flick". However, the excessiveness of the technique influenced the amount of forelimb flexion. This suggests the "athleticism" of the animal including the amount of individual flexibility, may determine the amount of forelimb flexion upon landing. This degree of flexion being related to the amount of stress placed on the tendons and joint of the forelimb.

19 **THE EFFECTS OF SPEED AND SURFACE STIFFNESS ON SHOCK ATTENUATION FOR MALE RUNNERS**

Melcher, G., Griffin, J.R., Teramoto, K., Dufek, J.S., FACSM, Mercer, J.A., FACSM

Biomechanics Laboratory, Department of Kinesiology, University of Nevada, Las Vegas, Las Vegas, NV

Various perturbations to natural running can cause changes in the impact generated when the foot contacts the ground, and may affect how the body accommodates the shock wave generated. The purpose of this study was to examine the effects of different surfaces and speeds on shock attenuation (SA) characteristics for male runners. Subjects (n = 6 Males; 24.1+/- 3.2 yr) ran at a preferred running pace and 10% below pace on an adjustable-bed treadmill across three surface stiffnesses (hard, medium, soft) with the soft being 1.5 times softer than medium and medium being 1.0 times softer than hard. Light-weight accelerometers were securely mounted to the forehead and distal aspect of the tibia. Data were collected (minimum1004 Hz) for 17 seconds for each subject-trial with ten stance phase head and leg acceleration profiles analyzed per subject per condition. The magnitude of the leg impact peak acceleration (LgPk) and the head impact peak acceleration (HdPk) values were identified for each left foot contact. SA was calculated using the formula: SA = [1-(HdPk/LgPk] *100. Dependent variables (SA, LgPk, HdPk) were compared across conditions using three 2 x 3 (speed x surface) repeated measures ANOVAs. Level of significance was set at $p \leq 0.05$ for all statistical comparisons. Results identified no significant differences for SA. Significant surface effects were identified for HdPk and LgPk, with no significant interaction or speed effects. LgPk values were statistically significant for soft vs hard and medium vs hard with observed differences of 0.40 g and 0.28 g, respectively. HdPk values were statistically significant for hard vs soft only, with an average observed difference of 0.30 g. Results suggest that while LgPk and HdPk varied with surface compliance, these male runners did not significantly modify SA characteristics across changes in surface stiffness or running speed.

18 **COMPARISON OF FREE-LIVING MODERATE-VIGOROUS PHYSICAL ACTIVITY INFERRED FROM WALKING SPEED AND ACTIVITY COUNTS**

James J. McClain, Gregory J. Welk, Catrine Tudor-Locke

Exercise and Wellness Department, Arizona State University & Iowa State University

Evolving body-borne technologies are useful for inferring physical activity intensity. For example, activity count cut points are commonly used now to infer time in intensity categories as detected by MTI accelerometers. Similarly, walking speed (i.e, mph) could be easily classified into intensity by referring to the Compendium of Physical Activities minimal walking speed associated with 3 METs (i.e., the floor value for moderate intensity equivalent to a 2.5mph walking pace). The IDEEA (Intelligent Device for Energy Expenditure Assessment) monitor accurately detects free-living walking speed. The purpose of this study was to compare estimates of time in moderate to vigorous physical activity (MVPA) inferred from the MTI accelerometer and the IDEEA monitor. Thirty college aged males (n=13) and females (n=17) participated in this study. Participants wore both monitors over 6-8 hours of self selected free-living activity. Data processing produced time-synchronized minute-by-minute output files for MTI activity counts and IDEEA walking speed. Data were recoded into time spent in MVPA activity intensity using accepted activity count cutpoints and the walking speed cutpoint of 2.5mph. Descriptive statistics, correlations, and a dependent sample t-test were calculated to evaluate differences in MTI and IDEEA estimates of time spent in MVPA. There was a statistically significant difference ($t=5.25$, $p<.001$) of approximately 16 minutes of time spent in MVPA inferred from data detected by the MTI and IDEEA monitors (66.7+25.3 vs. 50.3+15.0 minutes, respectively). The correlation between estimates was moderate ($r = .75$, $p<.001$). Using the accepted cut points to infer time spent in MVPA from the data detected by the MTI resulted in approximately 33% more time compared to using the accepted floor value for walking speed to interpret IDEEA-detected walking speed. Since both instruments have been previously validated this suggests that their relative cut points are not congruent for inferring time in MVPA.

20 **THE EFFECTS OF ELECTRICAL STIMULATION AND SUBMAXIMAL SWIMMING ON BLOOD LACTATE FOLLOWING A MAXIMAL EFFORT 200 YARD FRONTCRAWL**

Neric, F. B., W. Beam, L. Brown, FACSM, and L. Wiersma

Department of Kinesiology; California State University, Fullerton

Researchers have demonstrated that submaximal swimming (SMS) can reduce peak blood lactate concentrations ([BLA-]) to near baseline levels. H-wave® is a transcutaneous electrical stimulator used to reduce peripheral edema by inducing low intensity muscle contractions; this may be used as an alternative recovery mode. The purpose of this study was to evaluate the effect of recovery mode on lactate removal. Thirty competitive swimmers (males, n=19; females, n=11) with a mean age of 17.7±2.9 y, height of 1.8±0.1 m, and weight of 67.4±10.7 kg volunteered for the study; mean sprint times were 109.95±4.02 s and 121.60±3.94 s for males and females, respectively. Participants swam a 1,200 – 1,500 yd warm-up, sprinted a 200 yd frontcrawl, and completed a 20 min randomized-counterbalanced recovery. Recovery modes were defined as follows: SMS (8×100 yd repeats at 65% of 200 yd maximum speed); H-wave® (30 mA, 2 Hz; latissimus dorsi and rectus femoris); and, rest (seated). Lactate samples were defined as follows: peak (3 min post-sprint), mid-recovery (10 min into recovery), and post-recovery (following the final 10 min). Resultant blood lactates (mmol/L) were as follows (peak, mid-recovery, and post-recovery, respectively): SMS, 5.96±2.35, 3.50±1.57, and 1.60±0.57; H-wave®, 6.25±1.99, 4.46±1.79, and 3.12±1.41; rest, 6.32±2.17, 5.19±1.93, and 4.11±1.35. A repeated measures 3 x 3 (recovery mode x time) ANOVA revealed a significant interaction which was followed up by a Scheffe post hoc test to identify the source of the interaction. Submaximal swim recovery resulted in [BLA-] significantly lower ($p<0.05$) than rest at mid-recovery, and [BLA-] significantly lower ($p<0.05$) than both H-wave® and rest at post-recovery. H-wave® lead to a significantly lower ($p<0.05$) [BLA-] than rest at post-recovery. It appears that both recovery treatments, SMS and H-wave®, remove BLA- faster than rest recovery, with SMS proving to be the most effective method.

POSTER PRESENTATIONS

21

HR AND VO_2 ON-KINETIC RESPONSES TO SHORT-TERM ENDURANCE TRAINING

Eric M. Sickinger, Chris A.Garcia, Dustin R. Weim, Gabriel G. Guerrero, Susan L. Levy Michael J. Buono, FACSM, Fred W. Kolkhorst, FACS

Department of Exercise and Nutritional Sciences: San Diego State University

Previous studies have observed faster oxygen consumption (VO_2) on-kinetics after short-term endurance training. However, no studies have studied heart rate (HR) kinetics as a marker of training adaptations. The purpose of this study was to investigate the effects of a short term training program on HR and VO_2 on-kinetics. Seven inactive and untrained subjects participated in a cycling training program (age = 23.4 ± 1.5 yr; weight = 73.9 ± 7.8 kg; VO_{2max} = 3.303 ± 0.618 L · min^{-1}). Subjects exercised at 70% of their maximal HR for 30 min on alternating days for 14 d. On-kinetics were measured before and after the training period from a single 6-min bout at 50% of the power between the ventilatory threshold and maximal VO_2. Data were averaged into 10-s bins and the data modeled using non-linear regression. To maintain consistency with the length of the phases, phase II was modeled using data from 20 to 120 s. The slow components were estimated from the differences of values at minutes 6 and 3 (Δ_{6-3}). Data are reported as mean ± SE.

	pre-training	post-training
phase II HR tau (s)	24.6 ± 9.5	16.6 ± 6.9*
ΔHR_{6-3} (bpm)	10.8 ± 4.0	10.4 ± 4.1
phase II VO_2 tau (s)	24.8 ± 2.1	21.5 ± 1.1
$\Delta VO_{2\ 6-3}$ ($L \cdot min^{-1}$)	0.344 ± 0.034	0.255 ± 0.029*

* $P < 0.05$

Phase II HR time constant (tau) was faster after training, and although the post-exercise HR was lower, the ΔHR_{6-3} was unaffected. Conversely, the VO_2 time constants for phase II did not differ, but the ΔVO_2

22

PRELIMINARY STEPS/MINUTE IN OLDER ADULTS: PUBLIC HEALTH RECOMMENDATIONS

Susan B. Sisson; Melissa J. Benton; Pamela D. Swan, FACSM; Catrine Tudor-Locke, FACSM

Department of Exercise and Wellness, Arizona State University

Purpose: Create pedometer steps/min intensity categories (i.e., light, moderate, hard, and very hard) appropriate for older adults (aged 45-65 years) under controlled conditions and use these cut points to ascertain the number of steps expected in 30 minutes of at least moderate intensity activity (3METs). Methods: Twenty-three subjects (9 men and 14 women), performed 6-minute walking bouts at three counter-balanced treadmill speeds (2.8, 3.3, and 3.8 mph). Total steps taken were recorded by a Yamax SW-200 pedometer. VO2 was recorded and an average value for the last 3 minutes was recorded; METs were computed by dividing VO2 by 3.5ml/kg/min. Repeated measures ANOVA examined differences between speeds for VO2 and steps/min variables. Linear regression was used to estimate sex-specific METs from steps/min. Equations were cross-validated by comparing predicted to actual METs using a dependent t-test.Results: VO2 (ml/kg/min) for slow, medium, and fast speeds, respectively, was 12.1±1.4 (3.4±0.4 METs), 14.6±2.4 (4.2±0.7 METs), and 19.1±2.4 (5.5±0.7 METs) ($p<0.000$) for males and 11.5±1.5 (3.2±0.4 METs), 13.8±1.5 (3.9±0.4 METs), and 18.0±1.7 (5.1±0.5 METs) ($p<0.000$) for females. Steps/min for at each of the ascending speeds was 99.4±16.8, 117.1±7.7, and 122.8±7.5 ($p=0.01$) for males and 110.7±17.8, 126.4±11.9, and 133.4±4.7 ($p<0.000$) for females. The regression equation for males was:METs= -1.21+0.05*steps/min, ($r2=.24, p=0.014$). For females it was METs= -3.62+0.06*steps/min, ($r2=.44$, $p<0.000$). Cross validation of the equations (n= 5 cases) indicated that the absolute mean difference between the actual and predicted was 0.77 and 0.69 ml/kg/min, for males and females, respectively.Conclusions: Predicting intensity from steps/min had low to marginal strength (r2=0.24-0.44) in this sample of older adults. In older adults a minimum of 2500 steps and 3300 steps for males and females, respectively, appears necessary to accumulate 30 minutes of at least moderate intensity activity as per current public health recommendations.

23

THE EFFECTS OF SPEED AND SURFACE STIFFNESS ON SHOCK ATTENUATION FOR FEMALE RUNNERS

Teramoto, K., Griffin, J.R., Dufek, J.S. FACSM, Mercer, J.A. FACSM

Biomechanics Laboratory, Department of Kinesiology, University of Nevada, Las Vegas, Las Vegas, NV

The purpose of this study was to examine the effects of different surfaces and speeds on shock attenuation (SA) characteristics for female runners. Subjects (n = 7 females; 24.1±3.2yr; 67±3.6kg; 169.6±5.2cm) ran at a preferred jogging pace and 10% below preferred pace on a treadmill across three surface stiffnesses (hard, medium, soft). Light-weight accelerometers were securely mounted to the forehead and distal aspect of the tibia. Data were collected (1004 or 1082 Hz) for 17 sec. for each subject-trial with ten stance phase head and leg acceleration profiles analyzed per subject per condition. The magnitude of the leg impact peak acceleration (LgPk) and the head impact peak acceleration (HdPk) values were identified for each left foot contact. SA was calculated using the formula: SA = [1- (HdPk / LgPk)] • 100. Dependent variables (SA, LgPk, HdPk) were compared across conditions using three 2 x 3 (speed x surface) repeated measures ANOVAs. Results identified no significant ($\alpha = 0.05$) interactions for any of the dependent variables. Significant ($p < 0.05$) surface effects were identified for SA and HdPk while a significant ($p < 0.05$) speed effect was identified for LgPk. Specifically, SA and HdPk values increased across surfaces (soft to hard) an average of 4.8% and 0.2g, respectively. The inability to detect surface effects for LgPk may have been due to high variability (average coefficient of variation = 30.7%). Differences for LgPk across speed averaged 0.35g greater for preferred vs slow. In summary, results indicated that SA increased and HdPk decreased as running surface became less compliant for female runners. Also, an increase in running speed resulted in an increase in LgPk, but not in SA or HdPk, suggesting that a 10% speed difference is not great enough to elicit changes in SA or HdPk for female runners.

24

SELF-SELECTED FEEDBACK SCHEDULES DEMONSTRATE NO EFFECT VERSUS YOKED SCHEDULES ON LEARNING A DISCRETE MOTOR TASK

TW Walker, Zinder SM, Brown LE, FACSM, and Chen DD

Department of Kinesiology, California State University, Fullerton, Fullerton, CA

Self-selected feedback schedules, beneficial due to their easy application and flexibility to the demands of a task, are hypothesized to facilitate motivation and meta-cognitive processes. The purpose of this study was to determine the effects of self-selected feedback schedules on learning sub-maximal force production in the quadriceps. Healthy participants (N = 34) were asked to replicate 30% MVIC under self-selected or yoked feedback conditions. Constant error (CE), absolute constant error (ACE), variable error (VE) and absolute error (AE) were calculated for pre-test, acquisition, 10-min and 48-hr retention trials. A 2 (group) x 3 (test) ANOVA demonstrated no significant differences between self and yoked groups on any of the error scores. For CE, pre-test scores (12.32±30.7Nm) were significantly greater than 10-minute (-7.38±7.41 Nm) and 48-hour (-3.29±11.74Nm) retention test scores ($P<.05$). Likewise, AE, ACE and VE pre-test scores (AE = 27.09 ± 19.66 Nm, ACE = 25.60 ± 20.59 Nm, VE = 28.34 ± 19.48 Nm) were significantly greater ($P<.05$) than both10-min retention (AE = 9.16 ± 5.35 Nm, ACE = 8.78 ± 5.64 Nm, VE = 2.00 ± 0.57 Nm) and 48-hr retention scores (AE = 10.67 ± 6.91 Nm, ACE = 9.07 ± 7.26 Nm, VE = 5.95 ± 5.02 Nm). No significant differences were found between retention test scores in post hoc analysis. A second 2 (group) x 10 (trial block) ANOVA was also performed for each of the error scores. For ACE, VE, and AE, significantly greater error scores were evident over the first three trial blocks during acquisition ($P < .05$). No significant differences were noted in the subsequent 7 trial blocks in post hoc analysis. Both groups learned the force matching task well, indicating the utilization of self-selected feedback schedules did not facilitate greater retention than yoked feedback schedules for this discrete motor task. A variety of individual preferences in feedback schedules were evident.

POSTER PRESENTATIONS

25

EFFECT OF SPEED AND GENDER ON RATE OF VELOCITY DEVELOPMENT HAMSTRING/QUADRICEPS RATIOS

Wood, N.R., L.E. Brown FACSM, S.M. Zinder, L.M. Gardner, S.B. Kelly, S.G. Bera, D. Nguyen, N.M. Garrett and D.P. Murray

Movement Analysis Laboratory, Department of Kinesiology, California State University, Fullerton. Fullerton, CA

There is speculation that the ratio of hamstring and quadriceps rate of velocity development (RVD) differs between genders when testing across speeds. The purpose of this study was to determine if males and females demonstrated different lower body velocity ratios when testing across speeds. Sixty male (n=25) and female (n=35) university kinesiology students (age 23.30 + 2.11 years, height 170.94+10.68 cm, weight 71.19+15.32 kg) performed 6 maximal knee extension and flexion repetitions on an isokinetic dynamometer at 14 random speeds between 30 and 450 d/s. Hamstring/quadriceps ratios were determined by dividing peak flexion RVD by peak extension RVD. ANOVA was used to determine the differences between male and female hamstring/quadriceps ratios, as well as the differences of the hamstring/quadriceps ratios across all speeds. Males were found to have significantly ($p<0.05$) greater peak hamstring/quadriceps ratios than females at 30, 60, 90, and 120 d/s. The hamstring/quadriceps ratio for males was 66.18 + 10.69% at 30 d/s and 103.67+ 20.00% at 450 d/s, while the female hamstring/quadriceps ratios were 58.94 + 9.31% and 104.26+18.37%, respectively. There were no significant gender differences in hamstring/quadriceps ratios across speeds when testing at speeds of 360, 400, and 450 d/s. A main effect for speed was also found. As testing speeds increased, the hamstring/quadriceps ratios also increased. At speeds of 360, 400, and 450 d/s, approximately a one to one hamstring/quadriceps ratio was found (400 d/s was at 102.98 + 23.89%). These results demonstrate that although males had less RVD at all speeds, the difference in hamstring/quadriceps ratios was only seen at slower speeds. The data also indicates that peak RVD in the hamstrings and quadriceps is very similar when testing at high speeds. Therefore, training protocols may need to be moderated at very high velocities.

27 **DEFINING THE VENTILATORY THRESHOLD DURING INCREMENTAL EXERCISE**

M. Abrazado, B.S. [1], S. Weigt[1], MD, J. Ide-Don[1], J. Sowash, M.S.[2], J. Snodgrass[2], M. Taylor[2], T. W. Storer, PhD FASCM[1] and C. B. Cooper, MD FASCM [1]

[1]David Geffen School of Medicine at UCLA, Los Angeles, CA. [2] VIASYS Healthcare Inc, Yorba Linda, CA.

Rationale: Metabolic academia accelerates ventilation via carotid body stimulation after exceeding a threshold ($V_E\theta$ and $VCO_2\theta$) with rising minute ventilation (V_E) and carbon dioxide output (VCO_2) during incremental exercise. In addition, the ventilatory efficiency (*VE*) can be defined and portrayed as an independent predictor of survival in patients suffering with chronic heart failure. The purpose was to define $V_E\theta$, $VCO_2\theta$, and the slope and intercept of *VE* in a reference set of normal exercise tests (XT). **Methods**: 75 normal XTs (68 men) (normal aerobic and functional capacity, cardiovascular limitation with a normal chronotropic index, normal gas exchange, and absence of ventilatory limitation) were examined. Mean (SD) age was 48 (11) yr, height 1.76 (0.08) m, and weight 84.3 (13.4) kg. The slope and intercept of *VE* were calculated geometrically from V_E and VCO_2 at rest and at threshold**Results**: Threshold responses -- 55 (10) L/min for $V_E\theta$ and 2.15 (0.50) L/min for $VCO_2\theta$ -- occurred at 78% maximal oxygen uptake, 81% maximal heart rate, and at a respiratory exchange ratio of 1.09 (0.11), with the *VE* slope and intercept at 24.8 (3.9) and 2.2 (3.1), respectively. *VE* was well correlated with the ventilatory equivalent for carbon dioxide at the anaerobic threshold as determined from the VO_2-VCO_2 relationship ($y=0.87x + 3.14$; $r=0.69$; $P<0.001$). **Conclusion**: Ventilatory threshold has been defined in terms of both $V_E\theta$ and $VCO_2\theta$ as ventilatory compensation for metabolic acidosis during incremental exercise testing. This threshold can further direct interpretation interpretation of cardiopulmonary XTs.

26 **DOES BMI ACCURATELY DETERMINE OBESITY PREVALENCE?**

Antonia Barrett, Bryan Haddock, Hosung So and Linda Wilkin

Department of Kinesiology, CALIFORNIA STATE UNIVERSITY SAN BERNARDINO

Purpose: The purpose of this study was to compare body mass index (BMI) and body fat percentage classifications in a group of college students. **Methods:** Three hundred and one students enrolled in Kinesiology classes were asked to volunteer for this study. All students came to the lab and changed into shorts and a t-shirt. Students had their height measured on a stadiometer and weight measured on a standard physician scale. This was followed by a standard 7-site skin-fold test. BMI and percent body fat were correlated with a Pearson r correlation coefficient. Classification based on BMI was compared to classification based on body composition results. **Results:** BMI was significantly correlated to percent body fat, with an r of 0.50, ($p< 0.01$). The results varied somewhat depending on which body composition classification norms were used. If using ACSM (2000) classifications with overweight defined as below the 30th percentile and obese defined as below the 10th percentile, the following was found: 19 individuals were classified as healthy by BMI and either overweight or obese by body composition, while 57 were considered healthy by body composition and either overweight or obese by BMI. **Conclusion:** Although BMI and percent body fat were significantly correlated, there were a large number of discrepancies in classification. In addition there are no consistently agreed upon norms for % body fat. Therefore it would be imperative to develop a standard classification table for body composition.

28 **THE EFFECTS OF AN ANTIOXIDANT NUTRITION DRINK ON WORK PERFORMANCE AND HEALTH PARAMETERS IN AN INDUSTRIAL SETTING**

Mica L. Bell, BA, Eric P. Durak, MSc

Medical Health and Fitness, UCSB Department of Facilities Management - Injury Prevention Program, Santa Barbara, CA 93102

The effects of a six week nutrition drink program were measured in 33 university employees who work in an occupational work setting (eg: grounds keepers, custodians, and skilled trades). Staff work at various shifts during a 24 hour work period, and perform many jobs that require physical concentration, alertness, and manual labor. Specific areas of interest by using the antioxidant drink mix (FRS) included fatigue, mental alertness, and concentration, and were measured using a modified work performance Assessment Index (WPAI) Questionnaire (Reilly & Assoc., NY). Participants were chosen from worksite volunteers and randomly assigned to FRS drink containing quercetin (A) or non-quercetin (B), and switched drinks mid-way through the program in a cross-over design. Program consisted of consuming two 8 oz. cans per day for three weeks per mixture (six weeks total). Participants filled out WPAI survery pre-mid-and post with questions regarding eating and work habits, and physical and mental demands of work. Statistical analysis included t-test and ANOVA repeated measures using p=0.10 alpha as significance. Results indicate improvements in two areas of WPAI survey: In physical work demands, group A improved work performance by 11% (p=0.10), work frustration by 35% (p<0.09), fatigue by 45% (p=0.002), and concentration by 24% (p=0.02). Group B had improvements in phase II of the program using quercetin in areas of schedule demands (4.6%, p=0.08), and concentration (10%, p=0.02). Both groups improved work performance and quality of life indices including a 30% improvement in overall fatigue status (p=0.004), and concentration by 17% (p<0.001). Results indicate that in the industrial work setting, FRS with quercetin improves work performance and quality of life aspects necessary to improve performance complete jobs on time and reduce risks of injury or illness during work efforts over time.

POSTER PRESENTATIONS

29

A MODIFIED PUSH-UP PROTOCOL FOR ESTIMATING MUSCULAR ENDURANCE

T. Carmickle, A.R. Hull, and J.R. Coast, FACSM

Exercise Science Program, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ.

Push-up tests are a common way to measure upper body muscular endurance. One problem with these tests is that some people can only do 3 to 6 push-ups, making them tests of strength rather than endurance. This study evaluated alternative push-up tests, standard and modified (knee) push-ups for males and modified and wall push-ups for females. The purpose was to correlate the number of standard push-ups for each subject (standard push-ups for males and knee push-ups for females) to the number of modified push-ups (knee push-ups for males and wall push-ups for females) to arrive at standards for the modified push-up protocol for men and women. The modified push-up requires less strength to perform, allowing the test to be better evaluate muscular endurance. 106 male and 60 female subjects between the ages of 18 and 65 participated in this study. The subjects performed as many push-ups as possible in one minute using either the standard push-up or the modified push-up protocol. They then came back one week later to do the other type of push-up. The order of the push-up protocol used was randomized. For the male subjects, there was a significant correlation between standard and modified push-ups ($Y = 0.928X + 13.34$, $r2 = 0.863$). The mean difference between standard and modified push-ups was 10.9, with the modified push-ups yielding higher numbers. For the female subjects, neither the correlation nor the difference was as large, possibly indicating a great deal of infamiliarity with the testing. This study showed that for males, a modified push-up protocol may provide a very appropriate method of testing upper body muscular endurance, particularly for subjects weak in the upper body. More work needs to be done to secure such a relationship for females.

30

DIFFERENCES IN PEDOMETER-DETERMINED PHYSICAL ACTIVITY BY COMMUNITY AND SOCIO-DEMOGRAPHIC CHARACTERISTICS IN YOUNG CHILDREN LIVING IN SOUTHERN CALIFORNIA

Crespo, N. C., M. I. Goran and R. S. McConnell

Department of Preventive Medicine, University of Southern California, Los Angeles, CA; Occupational and Environmental Health, University of Southern California, Los Angeles, CA.

Current trends of increased obesity and related co-morbidities in the U.S. pediatric population are likely due to low physical activity (PA), however relatively little is known of the socio-demographic characteristics related to PA. The purpose of this study was to determine socio-demographic differences in pedometer-determined PA, in a sample of 1,907 children aged 5-8 years in 13 different communities from Southern California enrolled in the USC Children's Health Study. Anthropometric measures included height (cm), weight (kg), and calculated age- and gender-specific BMI percentiles. Weekend (Fri, Sat & Sun) PA was assessed by pedometer step counts (Yamax SW-701 Digi-Walker). Questionnaires were used to determine age, gender, race/ethnicity, socio-economic status (SES), and community of residence. Crude and mutually adjusted effects of each of these factors on PA were assessed. Boys had significantly higher adjusted total step counts compared to girls (24,618 ± 1,260 vs. 22,324 ± 1,185, respectively; $p<0.05$). Children living in the least active communities, Anaheim (17,680 ± 1,782) and San Dimas (18,802 ± 1,609) had 33% lower adjusted total step counts than those living in the most active communities, Santa Barbara (26,961 ± 1,609) and Upland (27,247 ± 1,556). PA was not significantly influenced by age, BMI percentile, SES, or race/ethnicity. These findings identify significant differences between communities in PA. Further study is warranted to understand the reasons for these differences, which may be important for developing interventions to promote increased PA in children.

31

THE EFFECT OF FUEL LOADING ON PREFERRED WALKING PACE

G. Castillo, C. Morris, J. Cooper, and J.R. Coast, FACSM

Exercise Science Program, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ

A previous study by Willis, et al determined that preferred walking speed (PWS) occurred at a level just below that at which carbohydrate (CHO) oxidation increased dramatically. This, presumably, helps save CHO stores during long bouts of low to moderate intensity exercise. Our earlier studies on external load and grade manipulation have shown an increase CHO usage at speeds above the subject's preferred walking speed, helping to verify this hypothesis. This study had as its goal, though, to determine whether increased availability of carbohydrates or fats had an effect on preferred walking speed. We hypothesized that having an easily accessible source of carbohydrate would lead to a higher PWS than the less available energy from the fat. Subjects came to the lab following a fast of minimally eight hours and were fed an isocaloric meal consisting of rolled oats with fat-free milk and a teaspoon of white sugar or a two egg omelet with cheese to maximize the availability of CHO and fat, respectively. Participants then chose a preferred walking speed at 0% grade and walked ten minutes. The VO2, VCO2, and RER were documented and net CHO and fat usage were established through indirect calorimetry during minutes 5.5 through 9.0. One-way repeated measures ANOVA showed that there was no effect of pre-fed meal on PWS, although that of the CHO meal appeared to be slightly elevated compared to the fasting or fat-fed condition. Therefore, we conclude that while fuel selection affects PWS, walking speed is not altered by the immediate availability of fat or carbohydrate.

32

THE EFFECTS OF QUERCETIN FLAVONOID ON QUALITY OF LIFE INDICES IN ADVANCED CANCER PATIENTS (PT.): A DOUBLE-BLIND RANDOMIZED PILOT STUDY.

Eric P. Durak, MSc, Julie Taguchi, MD

Medical Health and Fitness, Sansum Medical Clinic

We tested the hypothesis that ingesting a liquid anti-oxidant drink would improve quality of life (QOL) parameters advanced cancer pt. These 15 pt. (age range 49-69 yrs, years after diagnosis 1.6 + 1 yrs, cancer stage= advanced) drank a ready–to–drink blend of antioxidants, quercitin, & vitamins in a double–blind cross over study for 3 months. During this study pt. filled out 3 validated QOL surveys addressing behavioral & physical issues while consuming the drink. Outside of chemotherapy regimes, there were no other changes in pt. routines or supplementation during this time. Results indicate moderate improvements in the following areas: Perceived levels of fatigue and energy showed a cumulative improvement of > 23% in three survey questions ($p=0.042$). Two questions relating to fatigue (feeling fatigued/feeling tired), improved 29% and 33% respectively (P=NS, P=0.04*). Physical measures such as enhanced appetite and sleep both improved over the course of the study (4.5% increase, P=NS). Two separate questions on energy levels revealed improvements of 89.8% and 15% in both areas. Lastly, concentration ability improved by over 14% during the study ($p=0.038$*), independent of time on chemotherapy regimes. In conclusion – the use of FRS supplementation in pt. with advanced cancers receiving chemotherapy or radiation showed improvements in almost all quality of life areas of survey over a three-month period. Statistically significant changes were seen in areas related to improved fatigue. Supplementation may be of assistance to this difficult population of pt. who suffer from treatment-related fatigue and may be nutrient deficient. Any non-invasive, tolerable, and reasonably priced intervention that may improve any aspect of quality of life this population is worth reporting. Due to the small number and difficulty of retention (due to death) of these pt., research on different types of cancer pt. is warrented to confirm any quercetin vs. non-quercetin antioxidant drink effects.

POSTER PRESENTATIONS

33 CALF MUSCLE DESATURATION DURING LIGHT-TO-MODERATE EXERCISE IN HEALTHY ADULTS

Figoni, S. F., FACSM, A. Miranda, V. Castellano, D. Hyams, N. Kerendian, T. Nguyen, M. A. Tyson, A. M. E. Scremin, O. U. Scremin

Physical Medicine and Rehabilitation Service, VA Greater Los Angeles Healthcare System, West Los Angeles Healthcare Center, Los Angeles, CA.

The purpose of this study was to determine changes in calf muscle oxygenation during three progressively intense acute bouts of exercise in healthy adults. Subjects included 39 men and 34 women (N=73) with mean ± SD age = 38 ± 13 years. In semi-recumbent posture, subjects underwent a testing protocol consisting of 7 consecutive 5-minute test stages: rest, 0-W active plantar/dorsiflexion, rest, 4-W resistive plantar flexion, rest, 8-W resistive plantar flexion, and rest. The Stu-ert Stresst'er® pedal ergometer was used for resistive calf muscle exercise. Tissue oxyhemoglobin saturation (StO_2, %) was digitally acquired at the medial calf site in 3.5-s intervals by near-infrared spectroscopy (Hutchinson InSpectra™ Tissue Spectrometer Model 325). This technique measures StO_2 in skin, subcutaneous tissue, and muscle to a depth of 25 mm. Values determined were StO_{2max} during 0-W exercise, StO_{2min} during 4- and 8-W exercises, and StO_{2mean} during the minute of rest prior to each bout. Three Wilcoxon signed ranks tests were used to determine changes from the resting baselines to the respective minimum and maximum values. Compared with previous resting baseline, StO_{2max} during 0-W exercise increased significantly (from 77 to 81%, or ↑6%, $p<.001$), suggesting a small improvement in muscle oxygenation. StO_{2min} during 4- and 8-W exercises decreased significantly (from 76 to 69% and 77 to 67%, ↓9 and 12%, respectively, $p<.001$), indicating partial desaturation of calf muscle during exercise. This test was able to detect significant tissue desaturation during non-fatiguing, mild-to-moderate-intensity, resistive plantar flexion exercise in healthy adults. The degree and duration of the desaturation may provide an objective measure of physiological/ functional impairment and outcome in patients with peripheral arterial disease.

35 DISPARITIES IN CHILDHOOD OVERWEIGHT: A CASE STUDY OF AN ETHNICALLY DIVERSE REGION IN CENTRAL CALIFORNIA

Felicia Greer; Virginia Rondero-Hernandez; Kathleen Curtis

Department of Kinesiology; Department of Social Work, California State University, Fresno

Childhood overweight and obesity is associated with a number of health risks and economic costs that can extend into adulthood. This study includes a review of factors that contribute to the current understanding of disparities associated with the prevalence of overweight among children and adolescents. Data from the 2001 California Health Interview Survey (CHIS) specific to the San Joaquin Valley (SJV) are highlighted and compared to state and national data. The findings indicate that within the SJV ethnic disparities in childhood overweight exist. Among adolescents, 24% of African Americans, 12.6% of Latinos and 10% of Whites are overweight. Furthermore, African American and Latino adolescents are less physically active and spend more time watching television compared to Whites. There are also ethnic disparities related to food intake. CHIS (2001) reported over 81% of African American adolescents eat less than 5 servings of fruits and vegetables pr day compared to 70% of White adolescents and over 50% of Latino adolescents. While these trends within the SJV are similar to state and national data, this region in central California is one of the most ethnically and culturally diverse areas in the nation. This may pose an additional challenge to achieving community health goals and reductions in childhood overweight. Recommendations highlighted in this study include child-centered and family-centered education, school and community interventions as well as a neighborhood focus. All suggested interventions are targeted to be ethnically and culturally specific. The results presented in this research may serve as a "case study" for regions with similar demographics. In addition, the findings may prove useful in not only identifying factors that contribute to this problem, but also in identifying solutions to combat the progression of childhood overweight.

34 ISOKINETIC INTERNAL AND EXTERNAL ROTATIONAL STRENGTH OF THE SHOULDER IN COLLEGE BASEBALL PITCHERS

Bryan L. Haddock and Linda Wilkin

Department of Kinesiology, California State University, San Bernardino

PURPOSE: The purpose of this study was to determine if the isokinetic internal and external rotational strength of the shoulder changed over the course of a of Division II University baseball season. METHODS: Nine pitchers were evaluated utilizing a Biodex Isokinetic Dynamometer. The subjects were 23±0.67 years of age and weighed 91.2±3.14 kilograms. Isokinetic internal and external concentric strength was assessed with the shoulder abducted at 90 degrees and the elbow flexed at 90 degrees. Each athlete was evaluated at both 300 and 450 degrees/second at three times during the season: pre-season, mid-season and post-season. The testing protocol was standardized for all subjects at each time point. All data are reported as means ±SEM. A repeated measures ANOVA was performed using SPSS software to determine if changes in strength occurred over the length of the season. Statistical significance was set *a priori* at $p \leq 0.05$. RESULTS: Peak isokinetic internal and external rotational concentric strength was not significantly different at the season midpoint or end of the season compared to the pre-season measures ($p<0.05$). This lack of significance occurred at both 300 and 450 degress/second. CONCLUSION: In a group of nine Division II, university baseball pitchers, isokinetic internal and external rotation shoulder strength did not significantly change through the course of a four month baseball season.

36 VO_2 PLATEAU DETECTION USING WHOLE BODY VO_2 DURING CYCLE ERGOMETRY

Derek W. Marks[1] & Todd A. Astorino[2]

[1]California State University—Stanislaus, [2]California State University—San Marcos

Maximal oxygen uptake (VO_2max) is a fundamental measure of Exercise Physiology. A plateau in VO_2 at VO_2max is accepted as the most sensitive indicator of VO_2max attainment. Yet, no standardized techniques exist to detect the plateau in VO_2 at VO_2max. Thus, the primary aim of this study was to test the sensitivity of a new plateau detection technique incorporating the slope of VO_2 versus time during incremental cycle ergometry. Healthy, young men (n = 13) and women (n = 9) familiar with maximal cycle ergometry participated in the study. They completed a single bout of maximal cycle ergometry using a 20 – 30 Watt increment per minute ramp protocol. Gas exchange data were obtained breath-by-breath (bXb) during exercise. A third order polynomial function was applied to the last 5 min of raw bXb data to clearly identify the changes in VO_2 during this time. The slope of the last 30 s of data was analyzed to indicate the change in VO_2 (ΔVO_2) at VO_2max, using a plateau criterion of $\Delta VO_2 \leq 50$ mL/min. Mean VO_2max was equal to 56.1 ± 1.5 mL/kg/min. Mean ΔVO_2 of the last 30 s of data was equal to 303.8 ± 194.3 mL/min. Only 1 of 22 subjects met the plateau criterion. However, when using a more traditional technique where the last 30 seconds and last 60 seconds of data were smoothed using a 7-breath moving average, 6 and 3 of the 22 subjects revealed a plateau in VO_2 at VO_2max, respectively. To conclude, these data indicate that the specific technique used to detect the VO_2 plateau has a dramatic effect upon frequency of its presence in healthy subjects. This warrants creation of a standardized technique to be used when trying to confirm that VO_2max has been attained at the termination of incremental exercise.

POSTER PRESENTATIONS

37

SELF-SELECTED EXERCISE INTENSITY OF SEDENTARY MALES

Dumas Martin, Linda Wilkin, and Bryan Haddock

Department of Kinesiology, California State University, San Bernardino

As obesity is increasing in America, it is important to more completely understand ideal intensity and duration for an exercise prescription to help sedentary clients increase the amount of fat burned during an exercise session. The popular literature often refers to the "fat burning zone" while research suggests a Fatmax intensity range for healthy, moderately trained males at 62.5±9.8% of VO2max to assure maximal fat burning. This pilot work is being conducted to determine self-selected treadmill exercise intensity of apparently healthy, sedentary males. The purpose of the main study is to determine if training two groups of apparently healthy, sedentary males for ten weeks, three times a week at two different intensity levels will result in different amounts of fat loss. The two groups would be 1.assigned intensity within the "fat burning zone" and 2.self-selected intensity. The primary aim of this pilot work was to determine the self-selected treadmill intensity of apparently healthy, sedentary males. If all sedentary males self-select to a low intensity level, intensity levels will be assigned for the main study. Six males (28.2±2.3 years of age, 177.4±5.0 centimeters, 86.4±6.3 kilograms, BMI 27.3±1.2 kg/m2) performed 1.two maximal graded exercise tests (one for familiarization) and 2.three 30 minute sessions of aerobic activity on a treadmill at a self-selected intensity on non-consecutive days. Descriptive data are reported as mean±SEM.

VO2max (ml/kg/min) 37.4±2.7 Aerobic session speed (m/min) 80.4±5.36

Aerobic session grade (%) 1.7±1.1 Aerobic session RER 0.84±0.04

Mean speed and grade of self selected aerobic exercise intensity represented 38% of the mean VO2max. This pilot work demonstrates the need to set pre-determined intensity levels for the main study to potentially elicit differences in fat burning over ten weeks of aerobic training three times per week.

39

EFFECT OF INCREASED REACTIVE OXYGEN SPECIES ON DIAPHRAGM CONTRACTILITY

N.C. Menasco and J.R. Coast, FACSM

Exercise Science Program, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ

Increased blood reactive oxygen species (ROS) have been shown to have variable effects on diaphragm contractility, with one study showing that low levels of hydrogen peroxide (H_2O_2) actually improve contractile function. Further, exercise is known to increase arterial levels of ROS, posing a possible cause for exercise-related diaphragm dysfunction. The purpose of this study was to further investigate the effect of exogenous H_2O_2 on the contractility of the isolated rat diaphragm. We also wanted to investigate whether H_2O_2 had lasting effects following return to control conditions. Rat diaphragm muscle strips were tested under five separate conditions: 1) control (CTRL) 2) 10-1M H_2O_2 3) 10-2M H_2O_2 4) 10-3M H_2O_2 and 5) 10-4M H_2O_2. A baseline force frequency relationship (FF1) was measured from each strip in Krebs solution (pH 7.4 25oC). The treatment solution was introduced and a second force frequency relationship (FF2) was obtained. Finally, a control Ringer's solution was reintroduced and a third FF curve was determined (FF3). Differences between the FF relationships were compared within each group by 2-way repeated measures ANOVA (Freq X FF#). In all groups there was a significant difference between FF1 and FF2 forces, although that in the control was less than 5% while that in the other groups ranged from 10-60%, with increasing H_2O_2 concentrations leading to greater decrements. In all of the H_2O_2 groups, there was a further decrease between FF2 and FF3 of 20-30%, yielding FF3 forces that were 30-90% lower than those of FF1. There were no changes between FF2 and FF3 in the CTRL group. This suggests that hydrogen peroxide caused decreased force in the isolated rat diaphragm greater than that expected by time alone. Further, these results indicate that the effects of hydrogen peroxide on diaphragm contractility do not appear to be reversible.

38

THE EFFECT OF ULTRA-ENDURANCE CYCLING RELAY RACING ON LOWER LIMB ELECTROMYOGRAPHIC ACTIVITY

Jeffrey K. Moffit

Department of Physical Education and Kinesiology, California State University, Bakersfield

Muscular fatigue presents as reduced power output and muscle activation when compared to maximal contraction in laboratory models. Muscular fatigue from ultra-endurance cycling events such as the Race Across America (RAAM), a 3,000-mile race that traverses the United States, is profound, according to participants, yet uninvestigated. The purpose of this study was to identify leg muscle fatigue by measuring changes in electromyographic activity in one male cyclist following participation in the 2004 RAAM relay category. METHODS Pre testing was performed 24 hours prior to the event and identical post testing was performed 12 hours after the event. A 10 minute warm up was followed by 50 second bouts of cycling on an electronically braked cycle ergometer at randomized combinations of 100 and 200 watts and cadences of 70, 90, and 110 rpm. EMG signals were measured from the right vastus lateralis (Delsys, Inc., Boston, MA). During RAAM the subject (26 yr., 72 kg, 1.69 m) cycled over 750 miles in 5-20 mile increments at or near maximal intensity for 5 days, 5 hours. RESULTS Muscle activation, by determination of root mean square (RMS), for the right vastus lateralis and at each power/cadence combination was compared (Student's T-test) pre and post event. RMS increased for 100 watts at 70, 90, and 110 rpm ($p<.05$) by 26%, 136%, and 14%, respectively. An increase of 110% was found for 200 watts at 110 rpm ($p<.05$) but not for 70 or 90 rpm. CONCLUSIONS This investigation found inconsistent increases in muscle activation to a constant work load under conditions tested. The increases, however, could be attributed to a recruitment of motor units in greater numbers - a neuromuscular strategy to maintain the constant work load while fatigued. This suggests a reduction in efficiency and a greater energy demand as the ultra-endurance event progresses.

40

FUEL OXIDATION DURING WALKING ON GRADES

C. Morris, S. Trancik, N. Menasco, J.R. Coast, FACSM

Exercise Science Program, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ

According to the "minimal energy hypothesis," the human central nervous system chooses a preferred walking speed (PWS) based on minimizing carbohydrate usage during walking. Previous research by Willis, et al has shown that PWS is below a threshold speed where carbohydrate (CHO) oxidation abruptly begins to increase. Our previous study on external loads demonstrated that this hypothesis helps explain walking speed when subjects walk while carrying loads. The purpose of this study was to determine whether CHO oxidation rapidly increases at speeds greater than the PWS when subjects walk at varying grades. Six healthy subjects volunteered to complete walking tests on a treadmill. The subjects were allowed to choose their PWS at -6.25%, 0%, and +6.25% grades. Each subject then walked for 10 minutes each at 1.0 and 0.5 mph below their PWS, at their PWS, and at 0.5 and 1.0 mph above their PWS at each of the three grades. VO2, VCO2, and RER were measured every 30s from minutes 5.5 to 9.0 at each speed. Subjects' resting VO2 measurements were subtracted from their exercise VO2 measurements and their net CHO usage was determined from their RER values. A two-way repeated measures analysis of variance (speed x grade) yielded significant speed and speed by grade effects, indicating that CHO usage significantly increased at speeds greater than an individual's PWS and was even more elevated at higher grades. Fat usage, on the other hand, showed only minimal increases with increased speed, indicating that most or all of the increased energy expenditure at speeds above PWS came from CHO usage. Our results agree with those of Willis, et al, in that CHO usage increases at speeds greater than an individual's PWS, and further, that this relationship holds true when walking at both negative and positive grades.

POSTER PRESENTATIONS

41

PHYSICAL ACTIVITY PARAMETERS FOR WALKING GOLF PARTICIPATION: A DESCRIPTIVE ANALYSIS OF VOLUME AND INTENSITY.

Mark Peterson, Brent Alvar, Ph.D., James McClain, Matthew Rhea, Ph.D., & Curt Hudek

Department of Exercise and Wellness, Arizona State University, Mesa, AZ

Previous studies have examined the metabolic responses and benefits of walking golf, indicating an overall positive cardiovascular training effect. However, in order to ultimately prescribe such an activity for health maintenance and/or improvement, it is necessary to first analyze the actual PA dosage parameters through golf participation. Hence the purpose of this study was to assess total volume and intensity of physical activity during a typical round of golf. Elite male golfers (n = 15, ages = 18-40, golf handicap ≤ 5) were recruited to participate in a round of walking golf. MTI accelerometers, pedometers, and Polar heart rate monitors were worn by all participants in this study. Accelerometers provided necessary data regarding intensity of golfing activity over the monitoring period. The sum of activity counts (accelerations per 5 seconds) over the entire round of golf was classified into light, moderate, hard, and very hard activity, which was determined to account for approximately 32%, 13%, 24%, 28%, and 3% of total time, respectively. Heart rates were also collected at fifteen-second intervals throughout the round, to monitor relative intensities for each participant. Relative intensities were calculated for each golfer, and stratified based on the percentages of respective age predicted maximum heart rate (i.e. 220-age). In general, the group spent 8.5%, 25%, 43%, 20%, and 3% of total time at the following heart rate zones, respectively: (1) 60-80 bpm, (2) 81-100 bmp, (3) 101-120 bmp, (4) 121-140 bpm, and (5) 141-160 bpm. Pedometers were used in this investigation, and demonstrated that a total of 12044 ± 834 steps were taken over the course of an average 4-hrs and 15 minute round of golf. The findings of this study clearly demonstrate that walking golf may offer a unique, strategic opportunity to improve fitness and health, especially for individuals who typically do not find enough time to exercise, or bore easily from traditional ambulatory physical activities.

43

LONGITUDINAL CHANGES IN CORONARY HEART DISEASE RISK FACTORS IN OLDER RUNNERS

Rodriguez, L.M., Schroeder, E.T., Hawkins, S.A., Hyslop, D., Jaque, V., Wiswell, R.A

School of Kinesiology and Nutritional Science, California State University Los Angeles; Department of Biokinesiology, University of Southern California

Introduction/Purpose: It is currently unclear how primary-age related processes influence variables known to increase coronary heart disease (CHD) risk. Methods: Ninety-one older runners were assessed at baseline and ten-years later. Testing included body composition, aerobic fitness, blood chemistries, blood pressure (BP), resting and exercise EKG, nutrition, and exercise history. Cardiovascular risk was predicted using the Framingham equation. Results: Training volume (61.1±28.2 vs. 44.7±24.6 km/wk, $p < 0.05$), and frequency (5.8±1.0 vs. 4.9±1.5 days/wk, $p < 0.05$) decreased significantly over time while nutritional variables did not change. All of the CHD risk factors changed significantly from pre and post testing (total cholesterol 195±36 vs. 215±36 mg/dl; triglycerides 74±36 vs. 88±53 mg/dl; systolic BP 123±13 vs. 131±18 mmHg) independently of gender. Notably, none of the changes in CHD risk factors were predicted by training or nutritional variables. While predicted CHD risk increased over time, both CHD risk and the factors responsible for that risk were lower than published age- and gender-matched norms. Among women, risk factors were not influenced by the occurrence of menopause or the use of HRT. Conclusion: Although there was an increase of CHD risk over the course of the study the risks are lower than age-matched population norms. Change in CHD risk factors with age in older runners may be attributable to primary aging.

Research supported by Pickford Foundation and R.M Wadt Memorial Fund

42 **VENTILATORY FACTORS SEVERELY LIMIT FUNCTIONAL CAPACITY DURING EXERTION WITH MILITARY CHEMICAL GEAR**

Tardie GB, Dorsey DA, Greenberg BA, Roop SA, Wink JS, Zacher LL, Sobieraj JA, Contreras LR, Pennathur A.

William Beaumont Army Medical Center Pulmonary Medicine and Industrial Hygiene Services, El Paso, TX; and the University of Texas El Paso, Department of Industrial Engineering, El Paso, TX.

The purpose of the study was to determine the extent of impairment on functional capacity and ventilation encountered during exertion with US Army chemical protective attire. Thirteen volunteers performed three maximal, symptom limited, modified Balke protocol exercise tests in battle dress uniforms (BDU), M-40 mask (Mask), and full military oriented protective posture (MOPP). Data reveal reductions in mean expiratory flow rate (MEFR), minute ventilation (VE), VO2 Max, O2 pulse, and time to exhaustion (TTE sec.). Product Moment Correlation suggests the reduction in MEFR and VE are only moderately related (σ =.48). The coefficient of determination ($\sigma 2$ =.237) implies only 24% of the MEFR variability is explained by the reduction in VE. Results reflect changes baseline (BDU) values (mean + SD; p value).

	BDU	MASK	MOPP
VO2 (L/min)	3.51+0.75	2.78 + 0.48 (p = 0.00077)	2.76+0.51 (p = .00012)
TTE (sec)	894 + 190	825 + 147 (p = 0.175)	663+117(p = 0.003)
O2 Pulse (mL/beat)	20.75 + 2.84	15.47 + 1.84 (p = 0.0013)	15.93 + 2.83 (p = 0.0012)
Tidal Volume (L)	2.81+0.81	2.12+0.46 (p = 0.0006)	.24 + 0.5 (p = 0.00074)
VE (L/min)	132.86 + 26.93	98.76 + 11.39 (p = 0.0024)	101.06 + 8.76 (p = 0.004)
MEFR (L/sec)	4.22 + 1	2.6 + 0.42 (p = 0.00006)	2.62 + 0.52 (p = 0.0001)
HR	179.8 + 13.5	176.8 + 14.8 (p = 0.52)	175.1+ 9.62 (p = 0.18)
HRR (beats)	7.77 + 12.4	9.33 + 14.1 (p = 0.52)	11.33+ 7.5 (p = 0.18)

The data confirm that ventilatory factors, but not cardiovascular factors, negatively influence functional capacity and ventilation during exertion with military issue chemical gear. Other factors exacerbate the impairment in time to exhaustion, but do not further exacerbate ventilatory function, between Mask and MOPP levels of protective attire.

44

FUEL OXIDATION DURING WALKING WITH EXTERNAL LOADS.

S. Trancik, C. Morris, N. Menasco, J.R. Coast, FACSM.

Exercise Science Program, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ

Research by Willis et al. has shown that carbohydrate oxidation increases significantly at speeds above a subject's preferred walking speed (PWS), while fat oxidation stays the same. The purpose of this study was to determine if this relationship is consistent when external loads are applied. Six healthy volunteer subjects performed walking tests on a treadmill wearing a designated external load. The tests consisted of each subject walking on a treadmill wearing 0%, 10%, and 20% of their body weight in a pre-weighed backpack. The PWS was established with the subject wearing the designated external load. Each subject then walked for 10 minutes at 1.0 and 0.5 mph below their PWS, at their PWS, and at 0.5 and 1.0 mph above their PWS. Measurements of VO2, VCO2, and RER were recorded from minute 5.5 to minute 9.0 of each stage using indirect calorimetry. Carbohydrate and fat usage was then calculated from these values. A two-way ANOVA test revealed that carbohydrate usage significantly increased at speeds greater than a subject's PWS, while fat usage remained the same or decreased. Our results verify that carbohydrate usage increases above PWS not only in conditions of normal walking, but when subjects walk with external loads applied.

45

MUSCLE CONTRACTION DURING VASCULAR OCCLUSION: EFFECT ON MUSCLE ACTIVITY

Masaru Teramoto, John A. Mercer, FACSM, Lawrence A. Golding, FACSM

Department of Kinesiology, University of Nevada Las Vegas, Las Vegas, NV

A relatively new area of research is the effect of vascular occlusion on muscle activity measured by electromyography (EMG) (Takarada, et al., 2000). However, there has not been a thorough study to determine the validity of EMG during vascular occlusion. The purposes of this study were to investigate 1) whether EMG readings were affected when occlusion pressure was applied to EMG electrodes and 2) whether muscle activity was affected by blood flow of the contracted muscles. Healthy male and female volunteers (n=10) completed two experiments. The first experiment required them to perform a 90-degree isometric elbow flexion with 100%, 80%, and then 50% of their maximal effort. External force was monitored with a strength dynamometer, and muscle activity of the Biceps Brachii (BB) was recorded with EMG. These three contractions were repeated while a blood pressure cuff covered EMG electrodes and occluded blood flow of the BB at 100 mmHg. The second experiment required isometric wrist extension with the same three contractions using the Extensor Digitorum Communis (EDC) while the EDC was not occluded and then occluded. The blood pressure cuff for occlusion was placed around the upper arm and did not cover the EMG electrodes on the EDC. Mean EMG data were normalized to percent maximal voluntary contraction (%MVC) per Newton (N) of external force (%MVC/N). Mean %MVC/N data were analyzed using a 2 (Occlusion) x 3 (Effort) analysis of variance (ANOVA) with repeated measures on both factors. No significant difference of %MVC/N was found between occlusion and non-occlusion conditions at any contraction effort in either the BB or EDC ($p>0.05$). It appears that: 1) EMG was a valid tool regardless of pressure applied on EMG electrodes and 2) isometric muscle activity normalized to external force was not affected by blood flow of the muscles.

47

THE EFFECT OF CARBOHYDRATE SUPPLEMENTATION ON MULTIPLE ENDURANCE PERFORMANCES.

Romina Villamonte; Pat Vehrs, FACSM; Allen C Parcell.

Department of Exercise Science, Brigham Young University

The purpose of this study was to evaluate the efficacy of carbohydrate supplementation in a highly fit population during multiple daily endurance performances. Seven club cyclists (mean + SE, age = 25 + 1.6 years, weight = 76.27 + 3.4 kg, height = 1.80 + 0.025 m, VO2peak = 4.503 + 0.300 L/min, Wmax = 350 + 17 watts) were recruited to participate in this study. Two exercise sessions consisting of two endurance time-trials with a 4 hour recovery period between time-trials were performed. Time-trials occurred at the same time of day one week apart. Each time-trial required the completion of a predetermined amount of work as quickly as possible. The cumulative work was approximately equal to the total work performed over 90 min if cycling at 70% VO2 peak. Testing was carried out in a randomized, counterbalanced, double blind design. To determine an optimal level of energy consumption during endurance competition we investigated the participant's performance under the following two conditions: 1) carbohydrate supplementation (CHO) during the time-trials and during the four hour recovery period and 2) CHO during the time-trials and placebo during the four hour recovery period. The time-trial time at the beginning of each session was similar (Day 1 vs. Day 2: 107.33 + 2.46 vs. 106.65 + 2.56 min, $p > 0.85$) and after recovery was similar between trials (CHO vs. Placebo: 123.07 + 7.7 vs. 123.39 + 5.04 min, $p = 0.9722$). The first time-trial in both sessions was significantly faster than the second time-trial ($p < 0.01$). Also, there was no significant difference between time-trials (CHO vs. Placebo) in HR, RPE, RER, and VO2 ($p > 0.05$). These results suggest that CHO vs. placebo consumption during the 4 hour recovery did not make a difference in the overall time-trial performance.

46 **WHO SUMMITS MT. WHITNEY?**

Wagner, D.R., D. Parker, K. Tatsugawa, & T.A. Young

Dept. of HPER, Utah State Univ., Logan, UT; Dept. of Kinesiology & Health Sci., California State Univ.-Sacramento, Sacramento, CA; Dept. of Recreation, Northern Arizona Univ., Flagstaff, AZ

This descriptive study is part of a larger work in progress that examines which variables are determinants of acute mountain sickness (AMS). Over a period of 5 consecutive days, we interviewed 359 trekkers and mountaineers as they reached the summit of Mt. Whitney (4419 m) from the east side (Whitney Portal, 2550 m). Participants varied widely in age (10-76; 39.2 ± 14.5 y) and BMI (14.2-36.8; 23.7 ± 3.2 kg/m2) as well as time spent training (0-35; median = 6 h/wk). The majority were male (74%) and only 6% were smokers. Most were unacclimatized; nearly all were sea-level residents (only 8% lived above 1500 m), and the median for days spent above 3000 m in the month leading up to the ascent was only 1 d. Lifetime experience above 3000 m varied widely, but this ascent was a personal altitude record for 69.6% of the sample. The majority completed the ascent in one day (61% < 16 h) with a median liquid consumption of 3 L. Median values for resting pulse rate and arterial oxygen saturation on the summit were 103 and 83%, respectively as measured by finger pulse oximetry. Thirty-three percent of the sample met the Lake Louise Self-Assessment criteria for AMS, and 40% indicated that they had a history of altitude illness. Surprisingly, 65% of the summiteers were self-medicated. The medication, dosages, and knowledge of what they were taking varied greatly indicating the need for education about the side effects or increased risks of self-medicating in a high-altitude wilderness environment.

Acknowledgements: American Alpine Club (grant), Mazamas (grant), Nonin Medical, Inc. (pulse oximeters), Inyo National Forest Service (special use permit)

AUTHOR INDEX