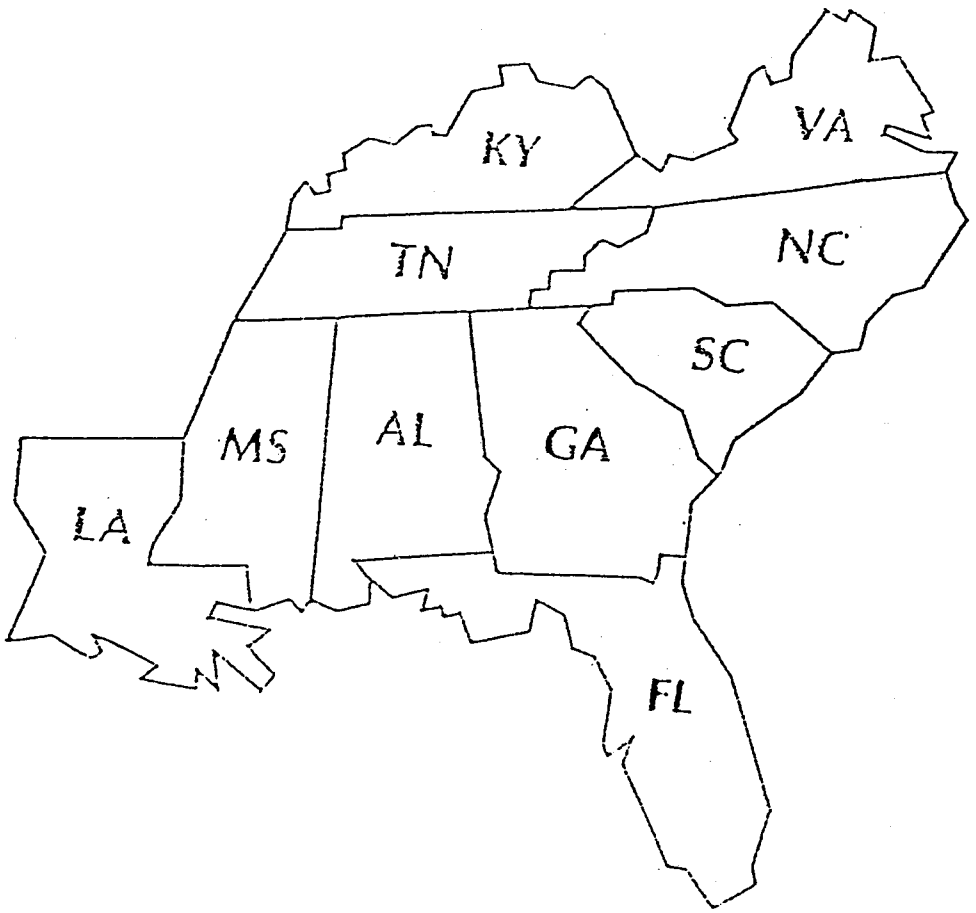
AMERICAN COLLEGE of SPORTS MEDICINE

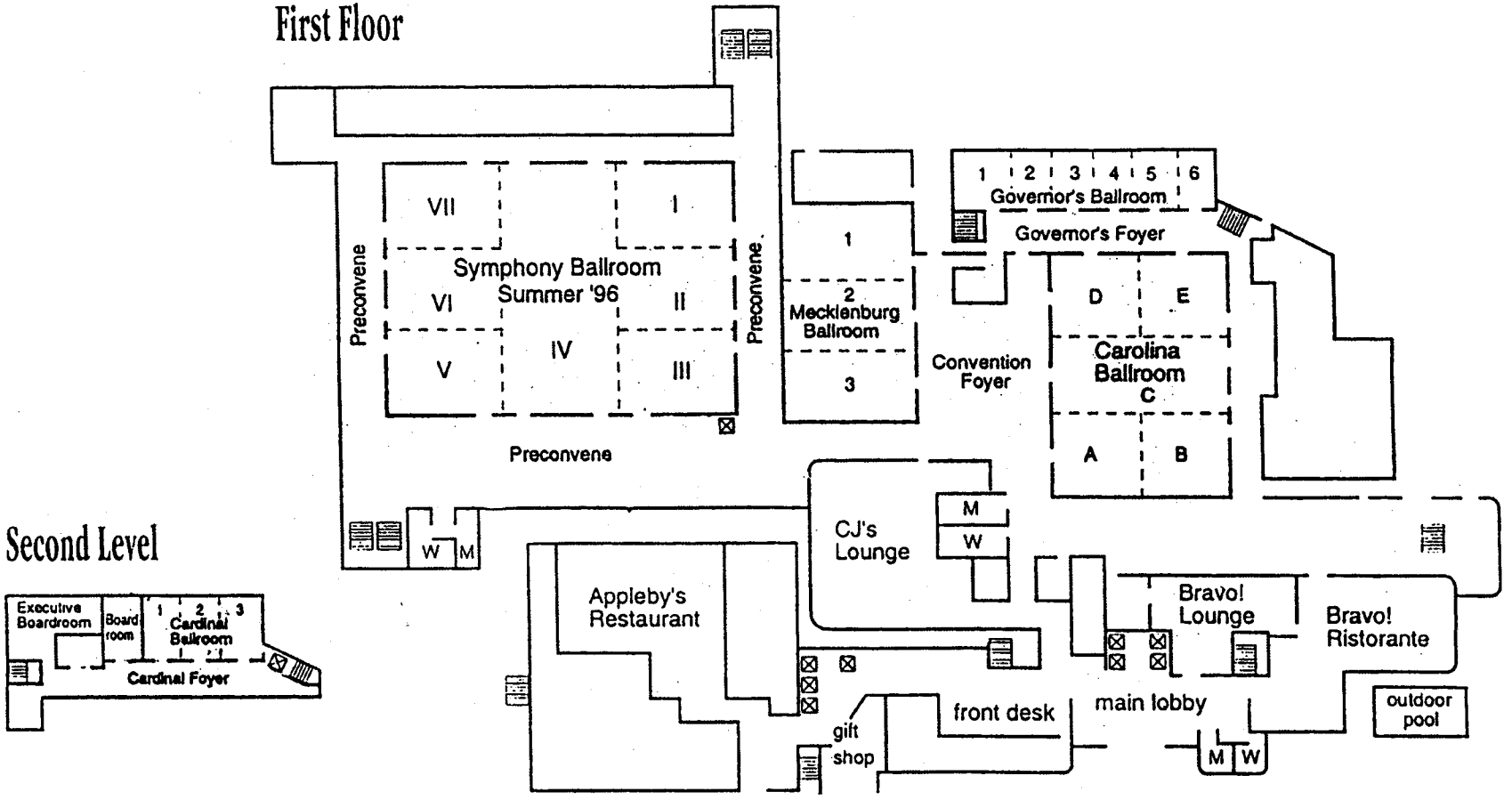
SOUTHEAST REGIONAL CHAPTER

January 27-29, 2000
28th Annual Meeting
Adam's Mark Charlotte Hotel
Charlotte, North Carolina

ABSTRACTS



Adam's Mark Charlotte Hotel Floor Plans



Twenty-Eighth Annual Meeting

SOUTHEAST REGIONAL CHAPTER AMERICAN COLLEGE OF SPORTS MEDICINE

Adam's Mark Charlotte Hotel
Charlotte, North Carolina

January 27-29, 2000

Officers

President:
Jeff Rupp, Georgia State University

Past President:
Dianne Ward, University of North Carolina-Chapel Hill

President-Elect:
Mindy Millard-Stafford, Georgia Institute of Technology

Executive Board:
Ted Angelopoulos, University of Central Florida
Linda Chitwood, University of Mississippi
Mark Davis, University of South Carolina (National Rep.)
Steve Dodd, University of Florida
Dixie Thompson, University of Tennessee
Keith DeRuisseau, Florida State University (Student Rep.)
George Wortley, Lynchburg Family Practice Residency (Clinical Rep.)

Executive Secretary:
Vaughn Christian, Appalachian State University

Meeting Host:
University of North Carolina-Charlotte
Tim Lightfoot

Publisher and Editor:
Don Torok, Florida Atlantic University

Meeting Objective

The objectives of this annual meeting are to provide students, scientists, educators and sports medicine practitioners with new research findings, a synthesis of current theories and applications, and contemporary approaches in clinical practice. These objectives will be accomplished with featured addresses, poster presentations, tutorials, symposia and free communications.

Planning Committee

Mindy Millard-Stafford, Program Chair
Jeff Rupp
Linda Chitwood
Mark Davis
Tim Lightfoot, Host
Mike Turner
Dixie Thompson
George Wortley
Dianne Ward
Ted Angelopoulos
Vaughn Christian
Steve Dodd
Larry Durstine
Craig Broeder
Keith DeRuisseau
Don Torok

SEACSM List of Reviewers

Barbara Ainsworth
Janet Walberg Rankin
Phil Sparling
Mark Davis
Steve Messier
Kirk Cureton
Emily Haymes
Bruce Gladden
Scott Powers

SEACSM Meetings & Officers

	Date/Place	Pres./PastPres./PresElect	Executive Board
1st	Fall 1973 Gatlinburg, TN	Andrew Kozar	
2nd	Fall 1974 Atlanta, GA	Clyde Partin	
3rd	Fall 1975 Charlottesville, VA	Dan Copeland	
4th	Fall 1976 Murfreesboro, TN	Rankin Cooter	
5th	Fall 1977 Lexington, KY	Ed Howley	Steve Blair Ron Byrd Joe Smith
6th	Fall 1978 Columbia, SC	Russ Pate	
7th	Feb. 16-17, 1979 Atlanta, GA	Dennis Wilson Ed Howley Ron Byrd	Earl Allen Thad Crews Art Weltman
8th	Feb. 8-9, 1980 Charlotte, NC	Ron Byrd Dennis Wilson Paul Ribisl	Bruce Gladden Jay Kearney Russ Pate
9th	Feb. 6-7, 1981 Charleston, SC	Paul Ribisl Ron Byrd Bill Herbert	Joe Chandler Tom Cronan Kirk Cureton

	Date/Place	Pres./PastPres./PresElect	Executive Board
10th	Feb. 5-6, 1982 Blacksburg, VA	Bill Herbert Paul Ribisl Russ Pate	Harvey Murphy (ES) Jon MacBeth (ES) Joe Chandler Tom Cronan Kirk Cureton Robert McMurray
11th	Feb. 4-5, 1983 Gainesville, FL	Russ Pate Bill Herbert Kirk Cureton	Jon MacBeth (ES) Earl Allen David Cundiff Scott Powers
12th	Feb. 3-4, 1984 Auburn, AL	Kirk Cureton Russ Pate Chris Zauner	Ron Bos (ES) Emily Haymes Phil Sparling Mike Stone
13th	Jan. 31-Feb. 2, 1985 Boone, NC	Chris Zauner Kirk Cureton Robert McMurray	Ron Bos (ES) John Billings Harry DuVal Diane Spitler J. W. Yates
14th	Jan. 23-25, 1986 Athens, GA	Robert McMurray Chris Zauner Scott Powers	Ron Bos (ES) Terry Bazarre John Billings J. Larry Durstine Russ Pate (N) Diane Spitler
15th	Jan. 29-31, 1987 Charleston, SC	Scott Powers Robert McMurray Diane Spitler	Ron Bos (ES) Terry Bazarre J. Larry Durstine Steve Messier Allen Moore (S) Russ Pate (N) Janet Walberg
16th	Jan. 28-30, 1988 Winston-Salem, NC	Diane Spitler Scott Powers Phil Sparling	Ron Bos (ES) Dalynn Badenhop Gay Israel Steve Messier Russ Pate (N) Janet Walberg Rankin Mark Senn (S)
17th	Jan. 19-20, 1989 Atlanta, GA	Phil Sparling Diane Spitler Emily Haymes	Ron Bos (ES) Dalynn Badenhop Kirk Cureton (N) Mark Davis Gay Israel Ben Kibler (MD) David Peltzer (S) Art Weltman

	Date/Place	Pres./PastPres./PresElect	Executive Board
18th	Feb. 1-3, 1990 Columbia, SC	Emily Haymes Phil Sparling Harry DuVal	Ron Bos (ES) Jerry Brandon Maria Burgess (S) Kirk Cureton (N) Mark Davis Ben Kibler (MD) Dianne Ward Art Weltman
19th	Jan. 31-Feb. 2, 1991 Louisville, KY	Harry DuVal Emily Haymes Steve Messier	Ron Bos (ES) Jerry Brandon Maria Burgess (S) Kirk Cureton (N) Kevin Davy (S) Alan Rogol (MD) Jeff Rupp Amanda Timberlake Dianne Ward
20th	Jan. 30-Feb. 1, 1992 Auburn, AL	Steve Messier Harry DuVal Gay Israel	Ron Bos (ES) Kevin Davy (S) Bill Duey (S) Ben Kibler (MD) Mindy Millard-Stafford Bob Moffatt Alan Rogol (MD) Jeff Rupp Phil Sparling (N) Amanda Timberlake
21st	Jan. 28-30, 1993 Norfolk, VA	Gay Israel Steve Messier J. Mark Davis	Vaughn Christian (ES) Barbara Ainsworth Michael Berry Jeff Chandler (CC) Shala Davis (S) Mindy Millard-Stafford Bob Moffatt Alan Rogol (MD) Phil Sparling (N) Kevin Tipton (S)
22nd	Jan. 20-22, 1994 Greensboro, NC	J. Mark Davis Gay Israel Janet Walberg Rankin	Vaughn Christian (ES) Barbara Ainsworth Michael Berry Jeff Chandler (CC) Shala Davis (S) Allan Goldfarb Victoria Schnyder (S) Phil Sparling (N) Beverly Warren
23rd	Feb. 2-4, 1995 Lexington, KY	Janet Walberg Rankin J. Mark Davis J. Larry Durstine	Vaughn Christian (ES) Carolyn Berry Jeff Chandler (CC) Allan Goldfarb Ed Howley (N) David Nieman Victoria Schnyder (S) Beverly Warren

	Date/Place	Pres./PastPres./PresElect	Executive Board
24th	Feb. 1-3, 1996 Chattanooga, TN	J. Larry Durstine Janet Walberg Rankin Bruce Gladden	Vaughn Christian (ES) Carolyn Berry Ed Howley (N) Tim Lightfoot Patricia Mosher David Nieman Stewart Trost (S) George Wortley (MD)
25th	Jan. 23-25, 1997 Atlanta, GA	Bruce Gladden J. Larry Durstine Bob Moffatt	Vaughn Christian (ES) Dave Bassett Ed Howley (N) Tim Lightfoot Patricia Mosher Ann Swank Stewart Trost (S) George Wortley (MD)
26th	Jan. 29-31, 1998 Destin, FL	Bob Moffatt Bruce Gladden Dianne Ward	Vaughn Christian (ES) Dave Bassett Mark Davis (N) Bonita Marks Mike Overton Ann Swank Melicia Whitt (S) George Wortley (MD)
27th	Feb. 4-6, 1999 Norfolk, VA	Dianne Ward Bob Moffatt Jeff Rupp	Vaughn Christian (ES) Mark Davis (N) Steve Dodd Bonita Marks Mike Overton Dixie Thompson Melicia Whitt (S) George Wortley (MD)
28th	Jan. 27-29, 2000 Charlotte, NC	Jeff Rupp Dianne Ward Mindy Millard-Stafford	Vaughn Christian (ES) Ted Angelopoulos Linda Chitwood Mark Davis (N) Keith DeRuisseau (S) Steve Dodd Dixie Thompson George Wortley (MD)

ES = Executive Secretary S = Student Representative CC = Clinical Consultant
N = National Representative MD = Physician Representative

SEACSM Award Winners

	Scholar Award	Service Award	Student Award
1989	Hugh Welch	Ron Bos	
1990	Russ Pate	Harvey Murphy	
1991	Wendell Stainsby	Paul Ribisl	Paul Davis
1992	Robert Armstrong	Phil Sparling	Brian Hinson
1993	Michael Pollock	Dennis Wilson	Steve Bailey
1994	Kirk Cureton	Ed Howley	David Criswell
1995	Scott Powers	Gay Israel	Marian Kohut
1996	Mel Williams	Russ Pate	Marvin Rainwater
1997	Henry Montoye	Emily Haymes	Kathryn Gracey
1998	Ed Howley	Kent Johnson	Heather Vincent
1999	Steve Messier	Vaughn Christian	Christopher Hewitt
2000	Bruce Gladden		Katherine Brittingham

SOUTHEAST CHAPTER OF THE AMERICAN COLLEGE OF SPORTS MEDICINE
2000 MEETING SCHEDULE SUMMARY

THURSDAY, JANUARY 27, 2000

12:00 - 2:00 PM	BOARD MEETING **(Executive Boardroom)**
12:00 - 6:00 PM	REGISTRATION **(Preconvene)**
12:00 - 9:00 PM	SPEAKER READY ROOM **(Governor's 2)**
2:00 - 7:30 PM	EXHIBITS **(Preconvene)**
4:00 - 6:00 PM **Preconvene**	**POSTER PRESENTATIONS I** (Authors present 4:00-5:00) Growth, Development, and Aging Body Composition Environmental Physiology
4:00 - 5:30 PM **Symphony I** **Symphony II**	**SYMPOSIA** Carbohydrate, Fat, and Protein Utilization During Prolonged Exercise: Integration of Current Concepts. Movement Strategies and Gait Related Biomechanics of Older Adults Transitioning to Frailty.
4:00 - 5:00 PM **Symphony III**	**TUTORIAL** Role of Ankle Invertor Muscles in Relation to Dynamic Control of Subtalar Motion and Susceptibility to Lower Extremity Injury.
4:00 - 5:30 PM **Symphony V** **Symphony VII**	**FREE COMMUNICATIONS** Skeletal Muscle Cardiovascular Physiology and Epidemiology (4:00-5:00)
4:00 - 5:15 PM **Symphony VI**	**CLINICAL CASE STUDIES AND FREE COMMUNICATION**
5:15 - 6:00 PM **Symphony IV**	**FREE COMMUNICATIONS- <u>STUDENT AWARD WINNERS</u>**
7:30 - 9:00 PM **Symphony** **I, II, III, IV**	**<u>BUSINESS MEETING AND KEYNOTE ADDRESS</u>** Barbara Sternfeld, Ph.D., Kaiser Permanente, Oakland, CA **"What We Really Know About Reducing the Risk of Breast Cancer With Physical Activity"**
9:00 - 11:00 PM	**SEACSM SOCIAL (Carolina Ballroom)**

<u>FRIDAY, JANUARY 28, 2000</u>

6:30 - 8:00 AM **Mecklenberg 1**	**WOMEN'S BREAKFAST**- (REGISTRATION REQUIRED) Speaker: Barbara Sternfeld, Ph.D. **"Everything You Always Wanted to Know About Mentoring But Were Afraid to Ask"**
7:30 - 6:00 PM 8:00 - 7:30 PM	REGISTRATION **(Preconvene)** EXHIBITS **(Preconvene)**
8:00 – 9:30 AM **Preconvene**	**POSTER PRESENTATIONS II** (Authors present 8:30-9:30) Carbohydrate Metabolism Respiratory Physiology Cardiovascular Physiology and Disease Epidemiology and Preventive Medicine Research Design Physical Fitness
8:00 - 9:00 AM **Carolina A** **Symphony II** **Carolina C**	**TUTORIALS** Aqua Running for Athletic Rehabilitation: State of the Art 2000. Utilizing Information Technology for Teaching Exercise Science Courses. Exercise and Fat Oxidation: Implications for Weight Control.

8:00 - 9:15 AM	**TUTORIALS**
Symphony V	Critical Evaluation of the BOD POD Body Composition System: Validity, Practical Considerations, and Implications for Multicomponent Models.
Symphony VI	Fall-Proofing Older Adults: Risk-Reduction Guidelines.
Symphony VII	Brachial Artery Flow-Mediated Dilation as an End-Point for Interventional Trials: Concepts, Methods and Current Data.
9:30 - 10:30 AM	**SEACSM BASIC SCIENCE LECTURE**
Symphony	Ronald Terjung, Ph.D., University of Missouri
I, II, III, IV	**"Skeletal Muscle Design: Matching Energy Supply to Energy Demand."**
10:30 - Noon	**POSTER PRESENTATIONS III** (Authors present 11-12)
Preconvene	Exercise Evaluation
	Biomechanics
	Athletic Care
10:45 - 11:45 AM	**INVITED LECTURE**
Symphony	Patrick O'Connor, Ph.D., University of Georgia
I, II, III, IV	**"The Neurobiology of Muscle Pain: Does it Limit Endurance Performance?"**
10:45 - 11:45 AM	**TUTORIALS**
Symphony V	The Monitoring of Nutritive Blood Flow and Metabolism Using Microdialysis.
Symphony VI	Effects of Resistive Training on Strength and Function in Older Well and Diabetic Adults.
10:45 - 11:45 AM	**SYMPOSIUM**
Symphony VII	Nutrition Supplement Use in Scholastic Athletics: Recommendations for Exercise Professionals.
12:00 – 1:00 PM	**PAST PRESIDENT'S LUNCH (Bravo!- Private Dining Room)**
1:00 - 2:00 PM	**TUTORIAL/SYMPOSIUM**
Symphony IV	Physical Fitness and Vegetarian Diets: Is There a Relation?
Symphony I	Evaluation of the Injured Runner.
1:00- 2:00 PM	**FREE COMMUNICATIONS**
Symphony II	Exercise Evaluation
Symphony III	Growth, Development and Aging
1:00 - 2:30 PM	Biomechanics
Symphony V	
1:00 - 2:15 PM	**SYMPOSIA**
Symphony VI	Countermeasures for Disuse Atrophy in Skeletal Muscle.
1:00 - 2:30 PM	
Symphony VII	What to Look for in an Exercise Physiology Education Program.
2:30 - 3:30 PM	**SPECIAL TOPICS LECTURE**
Symphony	Edward Coyle, Ph.D., University of Texas, Austin
I, II, III, IV	**"Physiological Determinants of Endurance Performance"**
3:45 - 4:45 PM	**HENRY J. MONTOYE SCHOLAR LECTURE**
Symphony I, II, III, IV	L. Bruce Gladden, Ph.D. Auburn University
	"Confessions of a Lactic Acidologist"
5:15 - 6:15 PM	**CLINICAL TUTORIAL**
Symphony III	"ACL Injuries- Current Concepts on Injury Mechanisms, Prevention, Treatment, & Rehabilitation."
5:15 - 6:15 PM	**STUDENT SYMPOSIUM**
Symphony IV	Edward Coyle, Ph.D. and Ronald Terjung, Ph.D.
	"Top Ten Things to Do When Choosing a Graduate Program"
	"Elements of a Good Grant"
6:15 - 7:30 PM	**SEACSM GRADUATE STUDENT FAIR**
Symphony V, VI, VII	

SATURDAY, JANUARY 29, 2000

7:30 - 9:00 AM	**REGISTRATION (Preconvene)**
8:00 - 9:00 AM **Symphony** **I, II, III, IV**	**ACSM PRESIDENTIAL ADDRESS** Paul Thompson, M.D., Hartford Hospital, Hartford, CT **"The Genetics of Lipid Disorders: What Can We Learn from Zebras?"**
9:00 - 11:00 AM **Preconvene**	**POSTER PRESENTATIONS IV** (Authors present 9-10) Nutrition and Sports Competitive Athletes Lipid, Protein Metabolism Fluids and Electrolytes Psychology
9:15 – 10:30 AM **(Governor's 3,4)**	**BIOMECHANICS STUDENT SYMPOSIUM**
9:15 - 10:00 AM **Symphony V**	**CLINICAL TRACT – INVITED TUTORIAL** Kevin Speer, M.D., Duke University Medical Center, Durham, NC **"Labral Tears in Contact Athletes"**
9:15 - 10:30 AM **Symphony VI** **Symphony VII**	**TUTORIALS** What Exactly is Exercise-Induced Muscle Injury and How Do We Measure It? Scientific Contributions of A.V. Hill.
9:30 - 10:30 AM **Symphony I** **Symphony III**	 A Review of the Scientific Evidence For and Against Phytomedicines. Menopause: Can Exercise Replace Hormone Replacement Therapy?
9:30 - 10:30 AM **Symphony II**	**FREE COMMUNICATIONS** Immunology and Oxidative Stress
10:00 - 10:45 AM **Symphony V**	**CLINICAL TRACT – INVITED TUTORIAL** Paul Thompson, M.D., Hartford Hospital, Hartford, CT **"Cardiac Complications of Vigorous Physical Activity"**
10:45 - Noon **Symphony II**	**FREE COMMUNICATIONS** Nutrition and Sports
10:45-11:45 **Symphony VII**	**FREE COMMUNICATIONS** Cellular Regulatory Mechanisms
10:45 – Noon **Symphony III** **Symphony IV**	**SYMPOSIA** Aging Muscle: Factors Relating to Functional Status. Androstenedione – Did It Help Big Mac Hit 70 Home Runs?
10:45 - 11:45 AM **Governor's 3, 4** **Symphony VI** **Symphony I**	**TUTORIALS** Transcranial Magnetic Stimulation: An Evolving Technique in Exercise Neuroscience. Membrane Transport of Lactic Acid in Striated Muscle. Variability in Cardiovascular Signals: Physiologic Correlates and Clinical Relevance.
11:00 - 11:45 AM **Symphony V**	**CLINICAL TRACT- INVITED TUTORIAL** Jerry Baron, M.D., Miller Orthopedic Clinic, Charlotte, NC **"Articular Cartilage Repair and Replacement: New Techniques."**
12:00 - 2:00 PM **Carolina Ballroom**	**SEACSM LUNCHEON & LECTURE** David Costill, Ph.D., Ball State University **"If a Nobel Prize Were Given in Exercise Physiology...."**
2:30 PM	**SEACSM EXECUTIVE BOARD MEETING**

SOUTHEAST AMERICAN COLLEGE OF SPORTS MEDICINE
28TH ANNUAL MEETING

THURSDAY, JANUARY 27, 2000

12:00 – 2:00 PM **BOARD MEETING**
(Executive Board Room)

12:00 - 6:00 PM **REGISTRATION**
(Preconvene)

12:00 – 9:00 PM **SPEAKER READY ROOM**
(Governor's 2)

2:00 – 7:30 PM **EXHIBITS**
(Preconvene)

4:00 - 6:00 PM **POSTER PRESENTATIONS I**
(Preconvene)
Authors present from 4:00 – 5:00 PM
Chair: Phillip Bishop, University of Alabama

Growth, Development, and Aging

[P1] Perceived Value of Exercise After Exercising One Year. L.W. Boyette, A. Lloyd, D. Gaasch, K. Echt, J. Brandon. Atlanta VA Medical Center, Rehab R & D Center

[P2] Is the ACSM Prediction Equation for the Estimation of VO_2 During Treadmill Walking Appropriate for Apparently Healthy Older Adults? M. Burton, R. Reyes, M. Welsch, R. Wood. Louisiana State University

[P3] Effects of Long-Term Resistive Training on Strength and Stair Climbing in Older Diabetic Adults. A. Lloyd, D.A. Gaasch, L.W. Boyette, L.J. Brandon. Atlanta V.A. Medical Center, Rehab R & D Center

[P4] Does The AAHPERD Physical/Functional Ability Test For Older Adults Really Measure Strength? M. Sabatier, R. Reyes, E. Hirschey, M. Welsch, R. Wood. Louisiana State University

[P5] Relationship Between Body Mass Index and Forearm Vascular Resistance in Adolescents. M. Frisard, S. Gordon, M. Lee, M. Sothern, M. Welsch, R. Wood. Louisiana State University

[P6] Effects of Resistive Training on Strength and Stair Climbing in Well Older Adults. D.A. Gaasch, A. Lloyd, L.W. Boyette, L.J. Brandon. Atlanta V.A. Medical Center and Georgia State University

[P7] The Effects of Resistance Training With or Without Androstenedione Supplementation on Bone Turnover and Density. J.L. York, A.C. Aiken, J. Quindry, K. Brittingham, L.B. Panton, C.E. Broeder. East Tennessee State University - James H. Quillen College of Medicine

Body Composition

[P8] A Comparison of Leg-to-Leg Bioelectrical Impedance and Skinfolds in Assessing Body Fat in Collegiate Wrestlers. A.C. Utter, J.R. Scott, R.A. Oppliger, P.S. Visich, F.L. Goss, B.L. Marks, D.C. Nieman. Appalachian State University

[P9] Evaluation of a Foot-to-Foot Bioelectrical Impedance System for Determining Body Fat in Males. M.J. Evans, G.A. King. AM Swartz, D.L. Thompson. University of Tennessee

[P10] Hydrostatic Weighing: An Alternative Method. T. Mendez, AM Arneson, J.B. Fleming, K.M. Fulmer, S.L. Rozzi, W.R. Barfield. College of Charleston

[P11] Body Composition Changes in Obese Older Adults Using Dual-Energy X-Ray Absorptiometry Measurements After a Weight Loss Intervention. T. Bonoffski, G. Miller. Wake Forest University

Environmental Physiology

[P12] Micro-Environment Changes Inside Impermeable Protective Clothing During a Continuous Work Exposure. J.M. Kozusko, I.H. Muir, P.A. Bishop. University of Alabama and Queens College, City University of New York

[P13] Influence of a Cooled Vest on the Thermoregulatory Responses While Wearing a Protective Barrier Suit. M.J. Ryan, D.D. Pascoe. Auburn University

[P14] Effects of Age on Sweat Lactate in Males. J.M. Green, P.A. Bishop, J.F. Smith, J.R. McLester Jr., R.G. Lomax. Western Kentucky University and University of Alabama

[P] Validation Of Air Displacement Plethysmography (Bod Pod®) For Body Composition Measurement: Effect Of A Mixed Meal. B.L. Fray, D.B. Hampson, G.D. Miller. Dept. of Health and Exercise Science, Wake Forest University

4:00 – 5:30 PM **SYMPOSIA**

[S1] Carbohydrate, Fat, and Protein Utilization During Prolonged Exercise: Integration of Current Concepts. Jeff Zachwieja, David Pascoe, and Peter Grandjean, Pennington Biomedical Research Center, Louisiana State University, and Auburn University

Chair: Jeff Zachwieja, Pennington Biomedical Research Center
(Symphony I)

[S2] Movement Strategies and Gait Related Biomechanics on Older Adults Transitioning to Frailty. Robert Gregor, Steven Wolf, Kathy Browder, Susan Hage, and Alanna Oliver, Georgia Institute of Technology, Emory University Medical School, and East Tennessee State University
Chair: Robert Gregor, Georgia Institute of Technology
(Symphony II)

4:00 – 5:00 PM **TUTORIAL**

[T1] Role of Ankle Invertor Muscles in Relation to Dynamic Control of Subtalar Motion and Susceptibility to Lower Extremity Injury.
Gary B. Wilkerson, University of Tennessee at Chattanooga
Chair: Elizabeth Higbie, Georgia State University
(Symphony III)

4:00 – 5:30 PM **FREE COMMUNICATIONS**
Skeletal Muscle
(Symphony V)
Chair: Kevin McCully, University of Georgia

[O1] 4:00 – 4:15 Relation Between Muscle Activation and the Slow Component Rise in Oxygen Uptake During Cycling. M.J. Saunders, E.M. Evans, S.A. Arngrimsson, J.D. Allison, G.L. Warren, K.J. Cureton. University of Georgia and Medical College of Georgia

[O2] 4:15 – 4:30 Mechanisms of Fatigue Following Short-Term Maximal Exercise. J.C. Martin, S.M. Lamb. University of South Carolina

[O3] 4:30 – 4:45 Bar Placement in the Squat Exercise and Its Effect on Electromyographic Activity in Four Leg Muscle Groups. V.C. Lewis, R.F. Moss, A. Caterisano, K. Woodruff, T.K. Pellinger, T. Khadra, W. Booth. Furman University

[O4] 4:45 – 5:00 The Effect of Weighted Squat Depth on EMG Activity of Four Superficial Muscle Groups During Concentric Contraction. T.K. Pellinger, A. Caterisano, R.F. Moss, K. Woodruff, V.C. Lewis, W. Booth, T. Khadra. Furman University

[O5] 5:00 – 5:15 Unloading Elicits Different Adaptations in Aged and Young Muscle Fibers. W.C. Chandler, A.A. Britt, M.R. Deschenes. College of William and Mary

[O6] 5:15 – 5:30 Effects of Fitness on Induction and Resolution Kinetics of a Muscle Metabolite Observed by 1H-MR Spectroscopy. L.J. White, R.A. Robergs, W.L. Sibbitt, Jr., W. Brooks. University of New Mexico and University of Florida

4:00 – 5:00 PM **FREE COMMUNICATIONS**
Cardiovascular Physiology and Epidemiology
(Symphony VII)
Chair: Michael Welsch, Louisiana State University

[O8] 4:00 – 4:15 Relationship Between the Framingham Coronary Heart Disease Prediction Algorithm and Brachial Artery Flow-Mediated Dilation. J.D. Allen, M. Welsch, K. Landry, S.R. Smith, M. Lefevre, M. Windhauser. Louisiana State University

[O9] 4:15 – 4:30 Evaluation of Heart Rate Variability and Its Association to Physical Function In Patients With Heart Failure. C.M. Lee, M. Alomari, T. Parrish, D. Kalb, R. Wood, L. Li, M. Welsch. Louisiana State University

[O10] 4:30 – 4:45 The Effects of a Moderate-Intensity Exercise Program on Improving Coronary Artery Disease Risk Factors in Previously Sedentary African Americans. M.R. McCammon, M.R. Moreland, R.C. Hickner, D.K. Shaw, G.S.M.R. Poehlman, N.W. Pollock. East Carolina University

[O11] 4:45 – 5:00 Effects of Exercise and Weight Status on Blood Pressure in Middle-School Aged Youth: The CHIC Study. R.G. McMurray, J.S. Harrell, S.I. Bangdiwala, S. Deng, C.B. Bradley. University of North Carolina-Chapel Hill

4:00 – 5:15 PM **CLINICAL CASE STUDIES AND FREE COMMUNICATIONS (Symphony VI)**
Chair: George Wortley, M.D., Lynchburg Family Practice Residence

[C1] 4:00 – 4:30 Severe Headache in Male Weightlifter. Kenneth M. Bielak, M.D. University of Tennessee Sports Medicine

[C2] 4:30 – 5:00 Low Back Pain in Soccer Player. Robin Merket, M.D. University of Tennessee Sports Medicine

[O7] 5:00 – 5:15 Evaluation of Stress Fracture Risk Factors Between Two Distinct College Female Populations. William R. Barfield, J.F. Otteni, AM McBryde, J.S. Carter, P.J. Nietert. College of Charleston and Medical University of South Carolina

5:15 – 6:00 PM **STUDENT AWARD WINNERS – ORAL PRESENTATIONS (Symphony IV)**
Chair: Jeffrey Rupp, Georgia State University

[O12] 5:15 – 5:30 **Third Place (Eric Arnold, Georgia State University)**
The Effect of Strength Training on Glycosylated Hemoglobin A_{1c} in Adults With Type 2 Diabetes. E.A. Arnold, J.A. Doyle, C.D. Lancaster, A.R. Oxford, E.J. O'Malley, K.H. Hall. Georgia State University
Advisor: J. Andrew Doyle

[O13] 5:30 – 5:45 **Second Place (Zuowei Zhao, University of South Carolina)**
CNS Effect of Caffeine and Adenosine on Fatigue During Treadmill Exercise in Rats. Z.W. Zhao, J.M. Davis, J. Buggy, H. Stock, P. Burghardt, G.A. Hand. University of South Carolina
Advisor: J. Mark Davis

[O14] 5:45 – 6:00 **First Place (Katherine Brittingham, East Tennessee State University)**
Leptin's Modulation of Monocyte Inflammatory Function.
K.C. Brittingham, J. Suttle, C.E. Broeder. East Tennessee State University
Advisor: Craig Broeder

7:30 - 9:00 PM **BUSINESS MEETING AND KEYNOTE ADDRESS (Symphony I, II, III, IV)**
Presiding: Jeffrey Rupp, Georgia State University
Introduction of Speaker: Russ Pate, University of South Carolina

"What We Really Know About Reducing the Risk of Breast Cancer With Physical Activity."
Barbara Sternfeld, Ph.D., Kaiser Permanente, Oakland, CA

9:00 - 11:00 PM **SEACSM SOCIAL (Carolina Ballroom)**

FRIDAY, JANUARY 28, 2000

6:30 – 8:00 PM **WOMEN'S BREAKFAST (Mecklenberg I)**
"Everything You Always Wanted To Know About Mentoring But Were Afraid To Ask..."
Speaker: Barbara Sternfeld, Ph.D., Kaiser Permanente, Oakland, CA
Chair: Emily Haymes, Florida State University

8:00 - 6:00 PM **REGISTRATION**
(Preconvene)

7:00 - 8:00 PM **SPEAKER READY ROOM**
(Governor's 2)

8:00 - 7:30 PM **EXHIBITS**
(Preconvene)

8:00 - 9:30 AM **POSTER PRESENTATIONS II**
(Preconvene)
Authors present from 8:30 – 9:30 AM
Chair: Carolynn Berry, Winston-Salem State University

Carbohydrate Metabolism

[P15] Muscle Glycogenolysis Evoked by Isokinetic Leg Exercise. G.G. Haff, A.J. Koch, J.A. Potteiger, K.E. Kuphal, L.M. Magee, S.B. Green, J.J. Jakicic. Appalachian State University and University of Kansas

[P16] Single-Cell Measurements of Lactate Transport Into Isolated Rat Ventricular Cardiac Myocytes. R.K. Evans, D.D. Schwarta, L.B. Gladden. Lander University and Auburn University

[P17] Relationship Between Plasma and Whole Blood Lactate Concentrations in Various Exercise Protocols. J.L. Dobson, E.W. Smith, L.B. Gladden. Auburn University

[P18] Effect of Solid and Gel Carbohydrate Ingestion on Moderate Intensity, Moderate Duration Exercise. J.M. Norris, V.M. Gray, D.E. Kremer. Lander University

Respiratory Physiology

[P19] Exploring of Coupling Between Step Frequency, Breathing Frequency, and Heart Rate In College Varsity Female Cross-Country Runners. A. Jung, M. Craib, H. O'Bryant, M . Johnson. Appalachian State University

[P20] Influence of Flow Resistance and Airflow Limitation on Ventilatory Output During Exercise. J.S. Williams, D.S. DeLorey, G.W. Brumbaugh, T.G. Babb. University of Mississippi and Institute for Exercise and Environmental Medicine, Dallas, TX

Cardiovascular Physiology and Disease

[P21] Validation of Pulse Oximetry Measures of Hemoglobin Saturation. B. Pierce, J.A. Young, N.W. Pollock. Duke University Medical Center

[P22] Evaluation of Physical Function and Perceived Quality of Life in Patients With Heart Failure in a Family Pratice Setting. T. Parish, M. Alomari, R. Wood, D. Kalb, M. Welsch. Louisiana State University

[P23] Two-Week Stability of Tonometric Blood Pressure During Incremental Resistance Leg-Exercise. J. Sabatier, H. Kluess, M. Welsch, R. Wood. Louisiana State University

Epidemiology and Preventive Medicine

[P24] Relationships Between Physical Activity, Aerobic Capacity, and Body Composition in Children. J.M. DiNallo, D.P. Hales, G. Williams, M.T. Mahar. East Carolina University

Research Design

[P25] An Example of the Integration of Research Methods in an Undergraduate Nutrition Course. J.L. Fisher. Clark Atlanta University

Fitness

[P26] Development of Lower Body Strength Norms for the Body Masters TM Super Leg Press in Females. J.G. Alvarez, J.J. Mayo, R. Roberts, S.P. Brown. Delta State University, University of Louisiana - Monroe, and Southwest Baptist University

[P27] Technological Tools for the Management of Fitness Testing Data and Report Generation. J.G. Langley. University of Tennessee

8:00 - 9:00 AM **TUTORIALS**

[T2] Aqua Running for Athletic Rehabilitation: State of the Art 2000.
Robert P. Wilder, M.D., University of Virginia
Chair: Linda Chitwood, University of Mississippi
(Carolina A)

[T3] Utilizing Information Technology for Teaching Exercise Science Courses.
Silas N. Pearman and Brian A. Reinhardt, Furman University
Chair: Don Torok, Florida Atlantic University
(Symphony II)

[T4] Exercise and Fat Oxidation: Implications for Weight Control.
Edward T. Howley and Brian B. Parr, University of Tennessee
Chair: Craig Broeder, East Tennessee State University
(Carolina C)

8:00 - 9:15 AM **TUTORIALS**

[T5] Critical Evaluation of the BOD POD Body Composition System: Validity, Practical Considerations, and Implications for Multicomponent Models.
Mitchell A. Collins and Christopher M. Modlesky,
Kennesaw State University and University of Georgia
Chair: Mitchell Collins, Kennesaw State University
(Symphony V)

[T6] Fall-Proofing Older Adults: Risk-Reduction Guidelines.
Bonita L. Marks, University of North Carolina-Chapel Hill
Chair: M. Elaine Cress, University of Georgia
(Symphony VI)

[T7] Brachial Artery Flow-Mediated Dilation as an End-Point for Interventional Trials: Concepts, Methods and Current Data.
Michael A. Welsch, Louisiana State University
Chair: Greg Hand, University of South Carolina
(Symphony VII)

Visit the **SEACSM WEB SITE**:
www.fau.edu/divdept/exsci/seacsm/sehomepage.htm

9:30 – 10:30 AM **BASIC SCIENCES LECTURE**
(Symphony I, II, III, IV)

"Skeletal Muscle Design: Matching Energy Supply to Energy Demand."
Ronald L. Terjung, Ph.D., University of Missouri
Chair: Steve Dodd, University of Florida
Sponsor: POWERāDE, The Coca Cola Company

10:30 – 12:00 AM **POSTER PRESENTATIONS III**
(Preconvene)
Authors present from 11:00 AM to Noon
Chair: Liz Dowling, Old Dominion University

Exercise Evaluation

[P28] Criterion-Referenced and Norm-Referenced Reliability of the Mile Run/Walk and Pacer in College Age Men and Women. M.P. Donovan, M.T. Mahar. East Carolina University

[P29] Accuracy of Several VO_{2max} Prediction Equations Based on Bruce Maximal Treadmill Performance. J.P. Roy, M.T. Richardson, J.F. Smith. Judson College and University of Alabama

[P30] Effects of Active and Passive Warm-up on RPE and Hip Range of Motion. D.L. Wenos, R.E. Koslow. James Madison University

[P31] The Use of the Transtheoretical Model and Exercise Behavior. D. Williams, J.S. Hallam. University of Mississippi

[P32] A Comparison of Responses to Two Backpack Style Hydration Systems During Simulated Hiking. L. McManus, P. Reneau. Tennessee Wesleyan College

[P33] Validation Trials of a Sensormedics VMAX 229 Metabolic Measurement System. E.L. Buckalew, C.J. Tanner. East Carolina University

[P34] Effects of Stretching on Reaction Time in Collegiate Females. D.W. Mesaros, W.K. Guion. Georgia Southern University

Biomechanics

[P35] Mechanical Response Tissue Analysis (MRTA): A Pilot Study to Reliably Assess Bending Stiffness (EI) of the Human Tibia. R.A. Thorne, T.W. Chittenden, A.S. Kaleth, D.F. Wooten, W.K. Ramp, W.G. Herbert. Virginia Tech

[P36] Proprioceptive Neuromuscular Facilitation Causes Diminished Muscle Activity During Response to Rapid Lengthening in the Hamstrings. AM Carter, S.J. Kinzey, L.F. Chitwood, J.L. Cole. University of Mississippi

[P37] Myoelectrical Comparison of Quadricep and Hamstring Activity While Performing Elliptical Exercise, Walking and Bicycling. B.F. LeVeau, W.D. LeVeau, H.S. O'Bryant. Georgia State University and Appalachian State University

[P38] EMG Analysis of Trunk and Lower Extremity Musculature in Tennis Groundstrokes. S.K. Schiff, T.L. Uhl, B. Zeller, T.J. Chandler, W.B. Kibler. Lexington Sports Medicine Center

Athletic Care

[P39] Influence of Magnetic Insoles on Subjective Ratings of Muscle Soreness. H.H. Holmes, J.M. Green, P.A. Bishop, J.R. McLester, Jr. University of Alabama and Western Kentucky University

10:45 – 11:45 AM **INVITED LECTURE**
(Symphony I, II, III, IV)
"The Neurobiology of Muscle Pain: Does it Limit Endurance Performance?"
Patrick J. O'Connor, Ph.D., University of Georgia
Chair: Phillip Sparling, Georgia Institute of Technology
Sponsor: Knoll Pharmaceutical Company

10:45 – 11: 45 AM **TUTORIALS**

[T8] The Monitoring of Nutritive Blood Flow and Metabolism Using Microdialysis. Robert C. Hickner, East Carolina University
Chair: Ron Cortright, East Carolina University
(Symphony V)

[T9] Effects of Resistive Training on Strength and Function in Older Well and Diabetic Adults. L. Jerome Brandon, Georgia State University
Chair: Ted Angelopoulos, University of Central Florida
(Symphony VI)

10:45 – 11:45 AM **SYMPOSIUM**

[S3] Nutrition Supplement Use in Scholastic Athletics: Recommendations for Exercise Professionals. M. Christopher Washam and Jerry Mayo, University of Louisiana - Monroe
Chair: Amanda Timberlake, Life University
(Symphony VII)

Noon – 1:00 PM **PAST PRESIDENT'S LUNCH**
(Bravo !-Private Dining Room)

1:00 – 2:00 PM **SYMPOSIUM**

[S4] Evaluation of the Injured Runner. Robert P. Wilder, M.D. and Francis O'Conner, M.D., University of Virginia and Dewitt Army Community Hospital.
Chair: Laurie Tis, Georgia State University
(Symphony I)

1:00 – 2:00 PM **TUTORIAL**

[T10] Physical Fitness and Vegetarian Diets: Is There a Relation? David C. Nieman, Appalachian State University
Chair: Richard Lewis, University of Georgia
(Symphony IV)

1:00 – 2: 00 PM **FREE COMMUNICATIONS**
Exercise Evaluation
(Symphony II)
Chair: James W. Yates, University of Kentucky

[O15] 1:00 – 1:15 Consistency in Regulating Cycling Exercise Intensity Using Ratings of Perceived Exertion. C.S. Katsanos, K.C. DeRuisseau, R.J. Moffatt, E.M. Haymes. Florida State University

[O16] 1:15 – 1:30 The Onset of the VO_2 Slow Component is Associated With Increased Motor Unit Activity. S.E. Bearden, R.J. Moffatt. Florida State University

[O17] 1:30 – 1:45 Standing vs. Seated Spin Cycling at 65% and 85 % VO_{2max}. D. Carroll, D. Johns, P. Schuler. University of West Florida

[O18] 1:45 – 2:00 Physiological Responses to Cycling Depend Upon Pedaling Cadence Despite Constant Exercise Intensity. J.C. Weinlein, R.W. McCoy, B.M. Turner, P.T. Buffington, M.R. Deschenes. College of William & Mary

1:00 – 2:00 PM **FREE COMMUNICATIONS**
Growth, Development and Aging
(Symphony III)
Chair: Robert Wood, Louisiana State University

[O19] 1:00 – 1:15 Effects of Brief Neonatal Injury on Pain Sensitivity in Adult Rats. I.J. Smith, A. Hawkins, C. Cleland. James Madison University

[O20] 1:15 – 1:30 Steadiness of Submaximal Isometric Quadriceps Muscle Force is Similar in Young and Old Adults. S. Beam, D. Tunnel, J. Moody, J. Davis, P. DeVita, T. Hortobagyi. East Carolina University

[O21] 1:30 – 1:45 The Relationship of Leg Power to Functional Tasks in Older Adults. T.A. Miszko, M.E. Cress. University of Georgia

[O22] 1:45 – 2:00 Similar Strength Gains After High and Low Intensity Resistive Training in Elderly Adults. J. Moody, D. Tunnel, P. DeVita, T. Hortobagyi. East Carolina University

1:00 – 2:30 PM **FREE COMMUNICATIONS**
Biomechanics
(Symphony V)
Chair: Jean McCrory, University of Kentucky

[O23] 1:00 – 1:15 The Effect of Foot Structure on Postural Sway. S.C. Cobb, L.L. Tis, B.F. Johnson, E.J. Higbie. Georgia State University

[O24] 1:15 – 1:30 Effects of Speed and Grade on Plantar Pressure Measurements During Treadmill Walking. T.S. Nofal, E. J. Higbie, L.L. Tis, G.L. Warren. Georgia State University

[O25] 1:30 – 1:45 Determination of Parameters Indicating Effectiveness of the Fencing Lunge. M.D. Geil. Georgia Institute of Technology

[O26] 1:45 – 2:00 Effects of Duty Cycle on Maximal Power in Human Cycling. S.M. Lamb, J.C. Martin. University of South Carolina

[O27] 2:00 – 2:15 Variability of Running and Walking at Gait Transition Speeds. L. Li. Louisiana State University

[O28] 2:15 – 2:30 The Effect of Pedaling Rate on Quadricep Muscle Activation and RPE While Cycling at Constant Exercise Intensity. R.W. McCoy, B.M. Turner, M.R. Deschenes. College of William and Mary

1:00-2:15 PM **SYMPOSIA**

[S5] Countermeasures for Disuse Atrophy in Skeletal Muscle.
Stephen Dodd, Thomas Koesterer, and Scott Powers, University of Florida
Chair: Stephen Dodd
(Symphony VI)

1:00-2:30 PM

[S6] What to Look for in an Exercise Physiology Education Program.
Constance Mier, Barry University; Tim Lightfoot, University of North Carolina-Charlotte; Don Torok, Florida Atlantic University; Monique Butcher, Barry University; and William Herbert, Virginia Tech.
Chair: Constance Mier, Barry University
(Symphony VII)

2:30 – 3:30 PM **SPECIAL TOPICS LECTURE**
(Symphony I, II, III, IV)

"Physiological Determinants of Endurance Performance"
Speaker: Edward F. Coyle, Ph.D., University of Texas, Austin
Chair: Robert Moffatt, Florida State University
Sponsor: Gatorade Sports Science Institute

3:45 – 4:45 PM **HENRY J. MONTOYE SCHOLAR LECTURE**
(Symphony I, II, III, IV)
"Confessions of a Lactic Acidologist"
Speaker: L. Bruce Gladden, Ph.D., Auburn University
Chair: Dianne Ward, University of North Carolina-Chapel Hill

5:15 – 6:15 PM **CLINICAL TUTORIAL**
(Symphony III)
[T11] **"ACL Injury - Current Concepts on Injury Mechanisms, Prevention, Treatment and Rehabilitation"**
Speakers: W. Ben Kibler, M.D. and T.L. Uhl,
Lexington Sports Medicine Center and University of Kentucky
Chair: Ken Bielak, M.D., University of Tennessee

5:15 – 6:15 PM **STUDENT SYMPOSIUM**
(Symphony IV)

"Top Ten Things to Do When Choosing a Graduate Program"
Edward F. Coyle, Ph.D., University of Texas, Austin

"Elements of a Good Grant"
Ronald L. Terjung, Ph.D., University of Missouri
Chairs: Scott Powers, Ph.D., University of Florida
Keith DeRuisseau, Florida State University

6:15 – 7:30 PM **SEACSM GRADUATE STUDENT FAIR**
(Symphony V, VI, VII)
Chair: Dixie Thompson, University of Tennessee

SATURDAY, JANUARY 29, 2000

7:30 - 9:00 AM **REGISTRATION**
(Preconvene)

7:00 – Noon **SPEAKER READY ROOM**
(Governor's 2)

8:00 - 9:00 AM **ACSM PRESIDENTIAL ADDRESS**
(Symphony I, II, III, IV)
"The Genetics of Lipid Disorders: What Can We Learn From Zebras?"
Paul D. Thompson, M.D., Hartford Hospital, Hartford, CT
Chair: Larry Durstine, University of South Carolina

9:00 - 11:00 AM **POSTER PRESENTATIONS IV**
(Preconvene)
Authors Present from 9:00 – 10:00 AM
Chair: David Pascoe, Auburn University

Nutrition and Sports

[P40] Effectiveness of Assessing Nutritional Knowledge Using the World Wide Web. A.R. Wood, F.D. McConnell, S.H. Colclough, P.D. McClellan. Middle Tennessee State University

[P41] Comparison of Calorie, Fat, Carbohydrate, and Protein Intake in Male Versus Female College Students. T.V. Seibles, C.M. DeWitt. University of South Carolina

[P42] Androstenediol and Androstenedione Use on Body Composition in Men Participating in a High Intensity Resistance Training Program. G. Dominick, J. Quindry, K. Brittingham, L. Panton, J. Breuel, C. Earnest, M. Olson, C. Broeder. East Tennessee State University and James H. Quillen College of Medicine

[P43] Endurox Supplementation on Submax and Maximal Cycling. J. Golden, L. Gilson, G. Dominick, J. Inglis, C.E. Broeder. East Tennessee State University and James H. Quillen College of Medicine

[P44] Effects of Androstenedione on Sex-Hormone Profiles in Men (35-65 Yrs. Old) Participating in a High Intensity Resistance Training Program. J. Inglis, J. Quindry, K. Brittingham, L. Panton, J. Breuel, C. Earnest, M. Olson, and C. Broeder. East Tennessee State University and James H. Quillen College of Medicine

[P45] The Effects of a Creatine-Supplemented Diet on Muscle Injury in Mice. J.M. Fennessy, G.L. Warren, M.L. Millard-Stafford. Georgia Institute of Technology and Georgia State University

Competitive Athletes

[P46] Knowledge of High School Cross-Country Runners About the Female Athlete Triad. J.J. Mayo, J.G. Alvarez, A. Lee. University of Louisiana – Monroe and Delta State University

[P47] The Association Between Lifetime Running Distance and Running Economy. M. Craib, R. Whaley, R. Coglianese, A. Utter. Appalachian State University

Lipid, Protein Metabolism

[P48] Effect of a Single Eccentric Resistance Exercise Session on Lipoprotein. R.W. Thompson, P.G. Davis, J.L. Nesbitt, E.M. Smarr, J.R. Burke, K.L. Drowatzky, G.A. Hand, J.L. Durstine. University of South Carolina

Fluids and Electrolytes

[P49] Role of Sodium Content on Taste Preference and Volume of Fluid Ingested While Working in the Heat. B. Sirikul, P. Bishop, J. Lasuzzo, I. Muir. University of Alabama

Psychology

[P50] Effects of Repeated Exhaustive Swim Stress on Pain Tolerance. P.R. Burghardt, J.M. Davis, H. Stock, Z. Zhao, J.L. Durstine, G.A. Hand. University of South Carolina

9:15 - 10:00 AM **INVITED TUTORIAL – CLINICAL TRACT (Symphony V)**

"Labral Tears in Contact Athletes"
Kevin P. Speer, M.D., Duke University Medical Center, Durham, NC
Chair: W. Ben Kibler, M.D., Lexington Sports Medicine Center

9:15 - 10:30 AM **BIOMECHANICS STUDENT SYMPOSIUM (Governor's 3, 4)**
Chair: Tony Marsh, Wake Forest University

9:15 – 10:30 AM **TUTORIALS**

[T12] What Exactly is Exercise-Induced Muscle Injury and How Do We Measure It?
Gordon Warren and Christopher Ingalls, Georgia State University
Chair: Tibor Hortobagyi, East Carolina University
(Symphony VI)

[T13] Scientific Contributions of A.V. Hill.
David R. Bassett, Jr., University of Tennessee
Chair: L. Bruce Gladden, Auburn University
(Symphony VII)

9:30 – 10:30 **TUTORIALS**

[T14] A Review of the Scientific Evidence For and Against Phytomedicines.
Amanda Timberlake, Life University
Chair: DuAnn Kremer, Lander University
(Symphony I)

[T15] Menopause: Can Exercise Replace Hormone Replacement Therapy?
Judi Flohr and Tracy Hatfield, James Madison University
Chair: Beverly Warren, Lander Universtiy
(Symphony III)

9:30 – 10:30 AM **FREE COMMUNICATIONS**
Immunology and Oxidative Stress
(Symphony II)
Chair: J. Mark Davis, University of South Carolina

[O29] 9:30 – 9:45 Immune Function in Elite Adolescent Tennis Athletes. M.D. Austin, D.C. Nieman, M.W. Kernodle, D.A. Henson, G. Sonnenfeld, D.S. Morton. Appalachian State University

[O30] 9:45 – 10:00 Exercise Intensity Effects on Plasma Protein Carbonyls. A.H. Goldfarb, T. You, S. Bryer, S. Landes, C. Murphy. University of North Carolina-Greensboro

[O31] 10:00 – 10:15 The Acute Response of the Immune System to Tennis Drills in Adolescent Athletes. D.C. Nieman, M.W. Kernodle, D.A. Henson, G. Sonnenfeld, D.S. Morton. Appalachian State University

[O32] 10:15 – 10:30 Influence of Carbohydrate on the Cytokine Response to Marathon Competition. M. Shute, D.C. Nieman, L. Smith, D.A. Henson, A.C. Utter, M. Craib. Appalachian State University

10:00 – 10:45 AM **CLINICAL TRACT INVITED LECTURE**
(Symphony V)
"Cardiac Complications of Vigorous Physical Activity"
Paul D. Thompson, M.D., Hartford Hospital, Hartford, CT
Chair: Paul Ribisl, Wake Forest University

10:45 – 11:45 AM **TUTORIALS**

[T16] Variability in Cardiovascular Signals: Physiologic Correlates and Clinical Relevance.
Robert W. Wood, Louisiana State University
Chair: Michael Berry, Wake Forest University
(Symphony I)

[T17] Transcranial Magnetic Stimulation: An Evolving Technique in Exercise Neuroscience.
Tibor Hortobagyi, East Carolina University
Chair: Gordon Warren, Georgia State University
(Governor's 3,4)

[T18] Membrane Transport of Lactic Acid in Striated Muscle.
William G. Aschenbach and L. Bruce Gladden, Auburn University
Chair: Joseph Houmard, East Carolina University
(Symphony VI)

10:45 – Noon **FREE COMMUNICATIONS**
Nutrition and Sports
(Symphony II)
Chair: David Nieman, Appalachian State University

[O33] 10:45 – 11:00 The Effect of Muscle Glycogen Status on Muscle Damage and Inflammation Following Intermittent, Intense Exercise. J.W. Rankin, H.L. Stevens, L.L. Smith. Virginia Tech

[O34] 11:00 – 11:15 Effect of Carbohydrate Substrate Availability Ratings of Perceived Exertion During the 1999 Charlotte Marathon. C. Piccinni, A.C. Utter, J. Kang, R. Suminski, E. Chaloupka, M. Craib, R.J. Robertson, D.C. Nieman. Appalachian State University

[O35] 11:15 – 11:30 An Energy Deficient Diet Reduces Lean Body Mass But Not Performance in Physically Active Men and Women. J. J. Zachwieja, D.M. Ezell, A.D. Cline, J.C. Ricketts, P.C. Vicknair, S.M. Schorle. Pennington Biomedical Research Center

[O36] 11:30 – 11:45 The Effect of Creatine Supplementation on Single Sprint Cycle Performance. R.S. O'Connor, J.A. Doyle, J.C. Rupp, W.R. Thompson. Georgia State University

[O37] 11:45 - 12:00 Effects of Androstenediol and Androstenedione Use on Strength in Men Participating in a High Intensity Resistance Training Program. J. Thomson, J. Quindry, K. Brittingham, L. Panton, J. Breuel, C. Earnest, M. Olson, C. Broeder. East Tennessee State University and James H. Quillen College of Medicine

10:45 – 11:45 AM **FREE COMMUNICATIONS**
Cellular Regulatory Mechanisms
(Symphony VII)
Chair: Allan Goldfarb, University of North Carolina - Greensboro

[O38] 10:45 – 11:00 Recovery of Neuromuscular Junction Morphology Following 17 Days of Spaceflight. A.A. Britt, S.E. Gordon, F.W. Booth, M.R. Deschenes. College of William and Mary

[O39] 11:00 – 11:15 Resistance Training Alters Neuromuscular Junction Morphology. D.A. Judelson, W.J. Kraemer, M.R. Deschenes. College of William and Mary

[O40] 11:15 – 11:30 Osteocalcin Responses to High-Intensity Anaerobic Cycling Exercise. D.F. Wootten, W.K. Ramp, F.C. Gwazdauskas, W.G. Herbert. Virginia Tech

[O41] 11:30 – 11:45 Human Skeletal Muscle Uncoupling Protein-3 mRNA Levels are Elevated in Response to Acute Exercise. R.C. Noland, R.C. Hickner, D. Zheng, R.N. Cortright. East Carolina University

SEACSM 2001 Meeting:
Columbia, South Carolina

10:45 - Noon	**SYMPOSIA**
[S7]	Aging Muscle: Factors Relating to Functional Status. M. Elaine Cress, Miriam Morey, Kevin McCully, and Scott Stevenson, University of Georgia **(Symphony III)**
[S8]	Androstenedione – Did it Help Big Mac Hit 70 Home Runs? Craig Broeder, John Quindry, and Conrad Earnest, East Tennessee State University **(Symphony IV)**
11:00 – 11: 45 AM	**CLINICAL TRACT – INVITED LECTURE** **(Symphony V)** **"Articular Cartilage Repair and Replacement: New Techniques."** Jerry Baron, M.D., Miller Orthopedic Clinic, Charlotte, NC Chair: Anne Allen, M.D.
12:00 – 2:00 PM	**SEACSM LUNCHEON LECTURE** **(Carolina Ballroom)** **"If a Nobel Prize Were Given in Exercise Physiology...."** David L. Costill, Ph.D., Ball State University Introduction of Speaker: Ed Coyle, Ph.D., University of Texas-Austin
2:30 PM	**SEACSM EXECUTIVE COMMITTEE BUSINESS MEETING** **(Executive Boardroom)**

AMERICAN COLLEGE OF SPORTS MEDICINE • FOUNDED 1954 • SM

AMERICAN COLLEGE of SPORTS MEDICINESM

T1

ROLE OF THE ANKLE INVERTOR MUSCLES IN RELATION TO DYNAMIC CONTROL OF SUBTALAR MOTION AND SUSCEPTIBILITY TO LOWER EXTREMITY INJURY

Gary B. Wilkerson, EdD, ATC
The University of Tennessee at Chattanooga, TN

Dynamic control of subtalar motion is clearly an important factor related to the prevention and management of numerous lower extremity injury syndromes among athletes. Despite widespread acceptance of the idea that ankle strengthening should be focused on the ankle evertor muscles, the results of several recent studies have strongly suggested that a relationship exists between lateral ankle ligament injury and impairment of the normal performance capabilities of the ankle invertor muscles. The purpose of this tutorial is to provide the theoretical basis for recommended evaluative and therapeutic procedures. Content will include a review of basic biomechanical concepts related to ankle function, and a review of the findings of research that is relevant to ankle invertor muscle function. The target audience includes physicians, athletic trainers, physical therapists, strength coaches, biomechanists, and graduate students in exercise science.

T2

AQUA RUNNING FOR ATHLETIC REHABILITATION: STATE OF THE ART 2000

R.P. Wilder, Dept. of Physical Medicine & Rehabilitation, Division Of Spine & Sports Care, The University of Virginia, Charlottesville, VA 22903

Deep water running is a popular form of cross-training for injured athletes and other patients who can benefit from non-impact exercise. Research has demonstrated that deep water running can produce sufficient exercise responses to result in a training effect as well as a cross over effect to land based running. This tutorial will review available literature detailing physiologic responses to deep water running technique, and suggested methods of exercise prescription. At the completion of this session the participant will be able to design a viable deep water running program for athletic rehabilitation.

Target audience: Physicians (orthopedists, physiatrists, primary care physicians), physical therapists, athletic trainers, exercise physiologists, coaches.

T3

UTILIZING INFORMATION TECHNOLOGY FOR TEACHING EXERCISE SCIENCE COURSES

S.N. Pearman, III, and B.A. Reinhardt. Dept. of Health and Exercise Science, Furman University, Greenville, SC 29613

The purpose of this tutorial is to provide college faculty and graduate teaching assistants with ideas for using information technology as a pedagogical technique for undergraduate and graduate courses. Areas to be addressed include: the use of the World Wide Web (WWW) for teaching and research, using information technology to enhance student research, and using information technology to enhance student assignments. Specific topics include: developing WWW laboratory activities, accessing on-line professional journals and scientific databases, organizing web pages for student research assignments, developing course materials for WWW usage, creating on-line grade checking systems, using on-line anatomy and physiology tutorials, and developing WVW career information for students. Samples of three years of student feedback who have been involved with this technology program as compared to students who did not utilize these pedagogical strategies will also be briefly reviewed ($p<.01$). Some of the materials for this tutorial can be reviewed at http://www.furman.edu/~Pearman/.

Supported by three grants from The Andrew Mellon Foundation.

T4

EXERCISE AND FAT OXIDATION: IMPLICATIONS FOR WEIGHT CONTROL

E.T. Howley and B.B. Parr. Exercise Science and Sport Management, The University of Tennessee, Knoxville, TN 37996

This tutorial will discuss the role of exercise in modifying 24-hour fat oxidation, the implications for weight control, and directions for future research. Obesity results from a chronic imbalance between caloric intake and expenditure. When the macronutrients are considered separately, excess carbohydrate and protein intake drive their own oxidation while excess fat intake is stored, resulting in obesity. Endurance exercise promotes both fat oxidation and total caloric expenditure, although this effect extends only briefly into the post-exercise period. Other forms of exercise, including resistance training, may result in a chronic increase in 24-hour fat oxidation. We will summarize the literature on the role of exercise in achieving weight maintenance and provide calculations that quantify the impact that shifts in the RQ have on fat balance. The target audience for this tutorial includes students and professionals in exercise science.

T5

CRITICAL EVALUATION OF THE BOD POD BODY COMPOSITION SYSTEM: VALIDITY, PRACTICAL CONSIDERATIONS, AND IMPLICATIONS FOR MULTICOMPONENT MODELS

M.A. Collins. Dept. of HPS. Kennesaw State Univ., Kennesaw, GA.
C.M. Modlesky. Dept. of Foods and Nutrition. Univ. of Georgia, Athens, GA.

For Exercise Scientists, it is important to critically evaluate new instrumentation based on an objective review of current research. The BOD POD Body Composition System is a new, commercially available device for measuring body density using air displacement plethysmography. The purpose of this symposium is to closely examine the BOD POD as a method for assessing body density and body composition. There will be three major areas of discussion. First, the validity of using the BOD POD to determine %fat will be reviewed. Second, practical considerations that affect %fat values, such as the minimal clothing requirement and the measurement of thoracic gas volume will be discussed. Lastly, the impact of using the BOD POD as part of a multicomponent model will be examined. The target audience for this symposium will be the exercise professionals who have an interest in the assessment of body composition.

T6

FALL-PROOFING OLDER ADULTS: RISK-REDUCTION GUIDLINES

Bonita L. Marks, Department of Exercise and Sport Science, University of North Carolina at Chapel Hill, 27599-8700.

Identifying older adults at risk for falling is a crucial medical and economic concern. Every year, one-third of the elderly living in the community and almost half living in skilled nursing facilities fall, with many resulting in severe injuries requiring hospitalization. It is relatively simple to reduce fall risk due to one's external environment. However, the health-related risk factors for failing are more difficult to prevent because they are due to one's medical or functional status. Most elderly have multiple chronic health conditions which taken together further increase their fall risk. It is important that everyone involved with the health and well being of older adults be able to determine if their elderly client/patient/family member is at increased risk for falling and know how to prevent or reduce this risk. This clinical tutorial will provide information about assessment and intervention strategies for fall risk reduction, highlighting interventions showing the most promise for fall risk reduction.

T7

BRACHIAL ARTERY FLOW-MEDIATED DILATION AS AN END-POINT FOR INTERVENTIONAL TRIALS: CONCEPTS, METHODS AND CURRENT DATA

Michael A. Welsch. Dept. of Kinesiology, Louisiana State University, Baton Rouge, LA

Non-invasive assessment of brachial artery flow-mediated dilation has been suggested as a surrogate marker for coronary artery dysfunction based on evidence indicating vasoreactivity of the coronary arteries parallels vasoreactivity of the brachial artery. Dilatation of the brachial artery occurs after flow is increased, and attenuation in this response is seen in individuals with cardiovascular risk factors and those with cardiovascular disease. Subsequently, evaluation of brachial artery vasoreactivity may have potential as a screening tool for those at risk of vascular disease, and as an end-point in intervention studies. The objective of this tutorial is to review the physiological concepts underlying vasoreactivity, to describe available methodology for its assessment, and to discuss effects of diet and exercise training in individuals with and without cardiovascular disease. The information presented aims to provide clinicians with practical information about risk factor modification and basic scientists with further insight into the nature of vascular dysfunction.

T8

THE MONITORING OF SKELETAL MUSCLE NUTRITIVE BLOOD FLOW AND METABOLISM USING MICRODIALYSIS

R.C. Hickner. Human Performance Laboratory, Department of Exercise and Sports Science, and the Department of Physiology, East Carolina University, Greenville, NC 27858

The intent of this tutorial is to familiarize the audience with the microdialysis methodology and to provide a critical review of some of the recent applications of this technique in skeletal muscle and adipose tissue. Many experiments have been limited by the inability of the researcher to investigate a local site in tissue, as well as the inability to exclude possible systemic effects of pharmacological agents. Microdialysis allows for the in vivo sampling of metabolites from the interstitial space in a given muscle and specific adipose depots. Microdialysis also provides a means of administering pharmacological agents to a local site, thereby avoiding confounding factors associated with systemic affects. This tutorial is intended for experienced and beginning researchers interested in potential applications of the microdialysis methodology.

T9

EFFECTS OF RESISTIVE TRAINING ON STRENGTH AND FUNCTION IN OLDER WELL AND DIABETIC ADULTS

L. J. Brandon, Dept. of Kinesiology & Health, Georgia State Univ. & VA Medical Center Rehab R&D Center, Atlanta, GA

A major concern of older adults is losing independence due to an inability to perform routine activities related to tasks of daily living. This concern is magnified in older diseased individuals, such as diabetics, as they are often overweight and have difficulty with mobility. Diabetics appear to experience age related functional reductions at an earlier age. Since strength training studies in the literature typically are for 12 months or less and often do not include the effects of increased strength on function, the nature and duration of the benefits of resistive training for older non-diabetics and diabetics needs further elucidation. Therefore, the purpose of this tutorial is to present data on the effects of 18 months of strength training on functional ability in older non-diabetic and diabetic adults. Fifty-nine, older non-diabetics (30 exercisers - ES and 29 comparison CS; 71.6 years of age) and 50 older diabetics (28 exercisers DES and 22 comparison DCS; 66.6 years of age) served as subjects in this study. The ES and DES resistive trained an hour a day, three days a week for the first 6 months and 2 days a week for the remaining 12 months. They trained 11 muscle groups on a multi-station Nautilus system and all subjects were evaluated for strength and performance functional tasks at baseline and at 6-month intervals. Strength and function both increase, but at different rates and non-diabetics and diabetics responded similarly to resistive training. These findings and specific strength and functional tasks responses will be discussed during the presentation.
Target Audience: General and those interested in geriatric health
Supported by Department of Veterans Affairs, Project OE721-RA

T10

PHYSICAL FITNESS AND VEGETARIAN DIETS: IS THERE A RELATION?

David C. Nieman, Dept. HLES, Appalachian State University, Boone, NC 28608

The purpose of this tutorial is to summarize current scientific understanding regarding the relationship between physical fitness and vegetarian diets. The target audience includes all exercise scientists and graduate students who have an interest in this important area of sports nutrition. The available evidence does not support either a beneficial or detrimental effect of a vegetarian diet upon physical performance capacity, especially when carbohydrate intake is controlled. Concerns have been raised that an emphasis on plant foods to enhance carbohydrate intake to optimize body glycogen stores may increase dietary fiber and phytic acid intake to levels that reduce the bioavailability of several nutrients, including zinc, iron, and some trace minerals. There are no convincing data, however, that vegetarian athletes suffer impaired nutrient status from the interactive effect of their heavy exertion and plant-food based dietary practices, at least enough to impair performance and/or health. Although there has been some concern about protein intake for vegetarian athletes, data indicate that all essential and nonessential amino acids can be supplied by plant food sources alone as long as a variety of foods is consumed and the caloric intake is adequate to meet energy needs. Creatine, found in uncooked meat, has been urged as an ergogenic aid to athletes who perform repeated bouts of short-term high intensity exercise. However, further laboratory and field research is needed to help resolve the conflicting findings regarding the ergogenic efficacy of creatine. There has been some concern that vegetarian female athletes are at increased risk for oligo-amenorrhea, but evidence suggests that low energy intake, not dietary quality, is a major cause. In conclusion, the vegetarian diet per se is not associated with improved aerobic endurance performance. Although some concerns have been raised about the nutrient status of vegetarian athletes, a varied and well-planned vegetarian diet is compatible with successful athletic endeavor.

T11

ACL INJURIES – CURRENT CONCEPTS ON INJURY MECHANISMS, PREVENTION, TREATMENT, AND REHABILITATION

W.B. Kibler, T.L. Uhl, Lexington Sports Medicine Center and University of Kentucky, Lexington, KY 40504

ACL injuries continue to be a source of major concern for athletes, researchers, and clinicians due to their high incidence and long time for recovery. This tutorial will present the results of an AOSSM/NIH consensus conference on ACL injuries. It will review anatomical, hormonal, and neuromuscular causative factors in pathogenesis, highlight preventative strategies that have literature backing, and present closed chain rehabilitation protocols, that are directed towards restoration of kinematic and kinetic function to the entire affected extremity.

T12

WHAT EXACTLY IS EXERCISE-INDUCED MUSCLE INJURY AND HOW DO WE MEASURE IT?

G.L. Warren and C.P. Ingalls. Departments of Physical Therapy and Kinesiology & Health, Georgia State University, Atlanta, GA 30303

Muscle injury resulting from overuse on the athletic field, in the workplace, or in the lab is a popular topic for study. However, we, the researchers, have not done a good job in defining the injury as evidenced by the multitude of instruments in use, many not measuring the same thing. The purpose of this tutorial is to argue for a definition of exercise-induced muscle injury that is function based. We will then review the instruments used to study the injury and assess their validity in light of this definition. We will conclude with recommendations for future studies, in terms of both instruments and experimental design, that enable us to best study the injury as we have defined it. This tutorial is targeted towards the beginning graduate student as well as established basic science and clinical researchers in the field of muscle injury.

T13

SCIENTIFIC CONTRIBUTIONS OF A.V. HILL

D.R. Bassett, Jr., Department of Exercise Science & Sport Management, University of Tennessee, Knoxville, TN 37996

In the early 1920's, A.V. Hill conducted careful experiments of heat production in isolated frog muscle and nerve. His research closely paralleled the contributions of German biochemist Otto Meyerhoff in elucidating the pathway for anaerobic glycolysis. For their work in discovering the distinction between aerobic and anaerobic metabolism, Hill and Meyerhoff were jointly awarded the 1922 Nobel Prize for Physiology or Medicine. Due to his interest in athletics, Hill sought to extend his observations in isolated frog muscle to the exercising human. Hill, Long, and Lupton made gas exchange measurements on themselves and other subjects running around an 85 meter grass track. In the process, they developed the concepts of maximum oxygen intake, oxygen debt, steady state and running economy. These were landmark studies in the field of exercise physiology. Other contributions of Hill include the discovery of heat production in nerve, the pulse wave velocity in arteries, and research on the physical chemistry of blood. Perhaps Hill's greatest legacy was that he mentored other investigators, and "pointed the way" towards many of the physiological adaptations that occur with physical training.

T14

A REVIEW OF THE SCIENTIFIC EVIDENCE FOR AND AGAINST PHYTOMEDICINES

Amanda Timberlake, Dept of Nutrition, Life University, Marietta Georgia, 30060

The purpose of this tutorial is to expose participants to a review of the scientific evidence for and against phytomedicines (herbal treatments). In this country most individuals self select herbs without regard to the scientific legitimacy of the herb. Consequently, a basic understanding of the popular phytomedicinals and their respective classifications will be useful to all those working in the health care field. Included in this presentation will be a discussion of the commonly marked adaptogens (Echinacea, Goldenseal and Ginseng), anxiolytics (St. John's Wort, Kava and Valerian), antiatherosclerotics (Garlic, Hawthorn, Ginkgo, Horse Chestnut Seed), gastrointestinal aids (Ginger, Peppermint and Chamomile) and finally, some of the more toxic herbs (Chaparral, Comfrey, Ephedra and Pennyroyal). In addition, this tutorial will address the current regulatory status of herbal supplements in the United States. When applicable, relevance to sport health science will be covered for the phytomedicinals.

T15

MENOPAUSE: CAN EXERCISE REPLACE HORMONE REPLACEMENT THERAPY?

J.A. Flohr and T.L. Hatfield. School of Kinesiology and Recreation Studies, James Madison University, Harrisonburg, VA. 22807

Menopause can alter a woman's health status and place her at an increased risk for cardiovascular disease, osteoporosis, and weight gain (obesity). Cardiovascular disease is the leading cause of mortality of women in the United States. Coupled with the increased risk for disease are a variety of physical symptoms including hot flashes, and significant mood fluctuations. The purpose of this tutorial will be to review the current literature contrasting the benefits and risks associated with regular physical activity and hormone replacement therapy. Studies examining the relationship between health status, physical activity and hormone replacement therapy will be reviewed. Potential questions for future research will be addressed in the tutorial. This tutorial should appeal to all individuals interested in women's health and fitness.

T16

VARIABILITY IN CARDIOVASCULAR SIGNALS: PHYSIOLOGIC CORRELATES AND CLINICAL RELEVANCE.

Robert H. Wood. Department of Kinesiology, Louisiana State University, Baton Rouge.

Variability of heart rate (HRV) and blood pressure (BPV) appear to be valuable non-invasive measures of autonomic modulation of cardiovascular (CV) function, and are becoming increasingly popular for quantifying acute autonomic responses and chronic adaptations to a variety of antecedents. However, the assumptions and limitations of time series analyses of these physiologic signals are poorly understood and largely ignored. The primary objectives of this tutorial are to summarize the European Task Force recommendations for measurement of cardiovascular variability and to critically review the evidence that describes physiologic origins of HRV and BPV and the relevance of these measures with respect to cardiovascular and all-cause mortality. Moreover, the extant literature in support of the relationships between cardiovascular variability and physical fitness and physical activity will be discussed. This tutorial targets physiologists who desire a greater understanding of the importance and limitations of dynamical systems approach to cardiovascular variability.

T17

TRANSCRANIAL MAGNETIC STIMULATION: AN EVOLVING TECHNIQUE IN EXERCISE NEUROSCIENCE

T. Hortobágyi. Biomechanics Laboratory, Department of Exercise and Sport Science, East Carolina University, Greenville, NC 27858

The purpose of this tutorial is to provide an overview on transcranial magnetic stimulation of the human brain. This new non-invasive technique allows researchers to gain insight into the workings of the human brain in vivo. The technique permits the determination of the excitability level of the central nervous system including the cortical areas that control movement. The tutorial will describe the mechanism of action during transcranial magnetic brain stimulation. The tutorial will review research areas where transcranial magnetic stimulation has been already used, focusing on the subdiscipline of exercise neuroscience. The results obtained with transcranial brain stimulation will be compared to results obtained with electrical brain stimulation. Important safety considerations will be also explained. The presentation will be instructional for all audiences representing the basic and applied exercise science.

Supported in part by NIA

T18

MEMBRANE TRANSPORT OF LACTIC ACID IN STRIATED MUSCLE.

W.G. Aschenbach and L.B. Gladden. Dept. of Health & Human Performance, Auburn University, Auburn, AL 36849.

The purpose of this tutorial is to illustrate the central role of striated muscle in whole body lactate (La^-) dynamics, and specifically, to provide a current perspective on the mechanisms of La^- transport across the sarcolemma. A brief (~10 minute) introduction will be provided by Dr. L. Bruce Gladden to review pertinent historical findings that have led to our current understanding of striated muscle as the central component of the "lactate shuttle" hypothesis. Mr. Aschenbach will then discuss 1) characterization of La^- transport across the sarcolemma of skeletal and cardiac muscle, 2) the use of different model systems to study transport, 3) the role and function of monocarboxylate transporters (MCT) in this process, and 4) regulation of transport by contractile activity and disease. The target audience of this tutorial will be primarily graduate students and faculty in exercise physiology with an interest in La^- transport and metabolism.

S1

CARBOHYDRATE, FAT AND PROTEIN UTILIZATION DURING PROLONGED EXERCISE: INTEGRATION OF CURRENT CONCEPTS.

J.J. Zachwieja, D.D. Pascoe, P.W. Gratidjean. Pennington Biomedical Research Center, Baton Rouge, LA and Dept. of Health and Human Performance, Auburn University, Auburn, AL

Carbohydrates, fats and to a lesser extent proteins, are all important energy substrates during prolonged exercise. Often, presentations provide separate in-depth and exhaustive discussions of the individual importance of each of these substrates. It is the purpose of this symposium to develop and integrative understanding of substrate utilization during prolonged exercise as influenced by high carbohydrate, fat, or protein diets. Each of these dietary regimens has been proposed as a means of achieving improved athletic performance. Presentations will focus on the efficacy of these regimens and on the regulation and integration of the biochemical pathways of carbohydrates, fats, and proteins as influenced by substrate availability, exercise duration and intensity. Current understanding of the metabolic integration of these substrates during exercise should be of interest to exercise scientists, exercise science graduate students, nutritionists, and sports medicine professionals.

S2

MOVEMENT STRATEGIES AND GAIT RELATED BIOMECHANICS IN OLDER ADULTS TRANSITIONING TO FRAILTY

R.J. Gregor, S.L. Wolf, K. Browder, S. Hage, R. Kressig, and A. Oliver Department of Health & Performance Sciences, Center for Human Movement Studies, Georgia Institute of Technology, Atlanta, GA 30332-0110, Department of Rehabilitation Medicine, Emory University Medical School, Atlanta, GA 30322

The consequences of falls among older adults represent a major public health problem, especially if medical attention and/or surgical interventions are required. However, while the causes for falls among older adults are multifactoral, their consequences extend well beyond physical trauma and its associated costs. Understanding movement strategies in older adults transitioning to frailty is requisite to the interpretation of any interventions designed to prevent falls in this population of older adults. Data presented here represent measurements taken on a group of 50 older adults transitioning to frailty. The population is a subset of a larger population half of which received an intense Tai Chi program in an effort to prevent falls in older adults. Data presented include: an evaluation of movement strategies, strength measurements, gait-related timing measures, and gait-related joint moments in the lower extremity. These data serve as a baseline for subsequent information obtained in each population, i.e., the Tai Chi intervention population and a control population. Knowledge of baseline data related to these parameters is requisite to understanding movement strategies in older adults and represent data not currently available in the literature. Because investigators are blinded to the intervention population, data presented here will be baseline data serving as the first step in interpretation of the interventions previously mentioned.

This work is supported by NIH Grant AG14767-03

S3

NUTRITIONAL SUPPLEMENT USE IN SCHOLASTIC ATHLETICS: RECOMMENDATIONS FOR EXERCISE PROFESSIONALS

M. C. Washam and J. J. Mayo, Human Performance Laboratory, The University of Louisiana at Monroe, Monroe, LA 71209.

Increasingly, health and fitness professionals are becoming primary sources for information on nutrition for optimal sports performance and training success. Recently, two extremely popular nutritional supplements have burst on the sports and fitness scene: creatine monohydrate and androstenedione. Use of these supplements has filtered down from professional and collegiate athletics to high school, and even junior high school sports. While adult athletes are capable of making their own decisions regarding supplement use, minor children should only ingest supplements with the permission of their parents. Since the possibility exists that some coaches may subjugate the welfare of an individual player to the success of the team, parents of children who are considering the use of these supplements may come to the exercise specialist or fitness professional in order to get objective information on the potential risks and benefits. This symposium will outline the general health concerns for the more popular supplements, and provide the practicing exercise professional with some common sense advice to use when a parent asks them for an opinion that might influence the health and welfare of a child.

S4

EVALUATION OF THE INJURED RUNNER

R.P. Wilder, Dept. of Physical Medicine & Rehabilitation, Division of Spine & Sports Care,The University of Virginia, Charlottesville, VA F. O'Connor, Primary Care Sports Medicine, Dewitt Army Community Hospital, Fort Belvoir, VA

The evaluation of the injured runner emphasizes the identification of intrinsic and extrinsic risk factors in addition to establishing injury specific diagnosis. The history emphasizes identification of contributory changes in training regimen or technique. The physical examination includes a biomechanical screening to identify related imbalances in posture, alignment, strength, and flexibility. This comprehensive, running specific approach to diagnosis will assist the clinician in developing optimum, rehabilitation program.

Target audience: physicians (orthopedists, physiatrists, primary care physicians), physical therapists, athletic trainers.

S5

COUNTERMEASURES FOR DISUSE ATROPHY OF SKELETAL MUSCLE

Stephen Dodd, Thomas Koesterer, and Scott Powers. Center for Exercise Science, University of Florida, Gainesville, FL 32611

Skeletal muscle atrophy and dysfunction is a major complication of space flight and prolonged immobilization. Under these conditions, there is a loss of muscle mass, decreased force generation, and an increase in speed of contraction. Muscle morphology and biochemistry are also altered. While there are a number of models of muscle disuse, the effects of animal hindlimb unweighting (HLU) will be the focus of this symposium. The purpose of this symposium will be to: 1) describe the effects of disuse on skeletal muscle, 2) discuss possible mechanisms causing these changes, and 3) propose countermeasures that may be beneficial in attenuating these effects. Recent studies have suggested that mechanisms heretofore unrecognized may play a role in muscle disuse atrophy and dysfunction. The symposium is intended for those individuals with an interest in mechanisms linked to muscle atrophy/hypertrophy.

S6

WHAT TO LOOK FOR IN AN EXERCISE PHYSIOLOGY EDUCATION PROGRAM

Constance Mier, Barry Univ; Tim Lightfoot, Univ N. Carolina-Charlotte; Don Torok, Florida Atlantic Univ; Monique Butcher, Barry Univ, William Herbert, Virginia Tech.

The purpose of this symposium is to present suggestions on areas believed to be critical to the success of an exercise physiology program and its graduates. Educators must continue to evaluate their programs regarding new laboratory and classroom technology, utilization and application of computer technology, recruitment of minorities and women, the connection between clinical or applied exercise physiology with the current research, wellness programming within the community, and the broadening of the profession to include all populations. These points and others will be presented in this symposium. Dr. Constance Mier will present an overview of undergraduate exercise physiology education and its role in developing a university-wide wellness program. Dr. Tim Lightfoot will present the topic of preparing students for doctorate-level research. Dr. Don Torok will present the topic of preparing students for internship opportunities and ACSM certification examinations. Dr. Monique Butcher will present the topic of preparing students to work with diverse populations. Dr. William Herbert will review the competency foundations of the new ACSM Clinical Exercise Physiology Registry and suggest ways for exercise physiology graduate students to prepare for the Registry exam. The target audience will be both undergraduate and graduate students, as well as exercise physiology educators.

AGING MUSCLE: FACTORS RELATING TO FUNCTIONAL STATUS

M.E. Cress, Dept. of Exercise Science, The University of Georgia, Athens, GA 30602

S7

Increased prevalence of functional dependency in advanced age is linked to sarcopenia. The purpose of this symposium is to further the understanding of the links between the cellular and epidemiological evidence for this linkage as gathered in performance-based measure of function. The second presentation will describe the changes in central and peripheral metabolic factors with age including peripheral circulation. This will be followed by evidence for supporting the relationship of decreased muscle mass and strength and the impact on functional status. The final presentation will evaluate the efficacy of interventions in changing functional status in older adults.

ANDROSTENEDIONE - DID IT HELP BIG MAC HIT 70 HOME RUNS?

Craig E. Broeder, Ph.D., John Quindry, M.S., Conrad Earnest, Ph.D. East Tennessee State University, Johnson City, TN, 37614-0654

S8

This symposium's purpose is to provide an up-to-date research based presentation on what is currently known about the efficacy and risks factors associated with the use of androstenedione and other testosterone pro-hormone substances. In 1994, Congress passed The Dietary Supplement Health and Education Act (DSHEA). The passing of this act has led to a flood of new "dietary" supplements suggesting anti-aging and performance related benefits. In many cases, few well-controlled clinical trials are available on a particular supplement. For example, androstenedione over the last year has been such a product hyped to improve sexual performance, reduce body fat levels, increase muscle mass, and in the lay-press to have contributed to Mark McGwire's 1998 home run record. This symposium will provide a comprehensive background on androstenedione and other potential testosterone related pro-hormone enhancing substances. In addition, data will be presented from several new well controlled studies performed at Iowa State University, East Tennessee State University, and Texas Women's University over the last year. The results of these study's will be summarized to provide information on what acute and chronic effects these substances have on sex-hormone interactions, body composition, bone density, strength, muscular power, muscle mass development, cardiac function, mood, sexual performance, and cardiovascular disease related risk factors, i.e., cholesterol profiles. The target audience for this symposium are individuals whom have a special interest in ergogenic aids for strength and conditioning. In addition, because several of the studies to be discussed include middle-age to elderly subjects, those interested in understanding what role, if any, substances like androstenedione might play in reversing the consequences of aging, would also benefit from attending this symposium.

SEVERE HEADACHE IN MALE WEIGHT'LIFTER

Kenneth M. Bielak, MD University of Tennessee Sports Medicine

C1

HISTORY: JE is a 22 year old male presenting to office with severe headache). Last night while at work he had a sudden onset of nausea, spotted vision, tingling and Weakness to right side, vision changes/seeing stars and feeling lightheaded without syncope. Minutes later, severe frontal headache with difficulty using right arm (picking up phone) and slurred speech and emesis. He described severity of headache as 11/10 scale and lasted for several hours until falling asleep at 3 AM. He had been working out with weights in gym 1 hour prior to episode and drove himself home when he became so nauseated. This day, he continues to have a moderate headache, feeling "out of it" and face tingling with mild nausea. He has had mild headaches in the past; mother has history of migraines. He denies drug use but had been taking some creatine supplements for a while but stopped two weeks ago. PHYSICAL EXAMINATION: Vital Signs: Blood pressure 115/54, Heart rate 76, respiration 16. In general, a well developed male with mild headache with ? slight facial droop on right side. HEENT: normocephalic, atraumatic; extraocular movements intact, pupils equal and reactive, fundi with normal discs and venous pulsation, no hemorrhage or exudates noted; oropharynx unremarkable. Neck: supple, full range of motion. Carotids +2 with no bruits, no lymphadenopathy, no thyromegaly. Cardiac: regular rate and rhythm without murmur. Lungs: clear to auscultation. Neuro: Alert, Oriented x3, Cranial Nerves II-XII grossly intact. Motor: symmetric upper and lower strength 5/5. Deep Tendon Reflexes to upper extremity +2 and symmetric; downgoing Babinski. Mental Status: no cognitive impairment; remote/recent memory intact. Sensory and Cerebellar examination intact. DIFFERENTIAL DIAGNOSIS: 1. Severe tension headache, 2. Transient Ischemic attack, 3. Complicated migraine, 4. Dissection Cerebral vessel, 5.Cerebral aneurysm, 6. Exertional Headache 7. Brain Tumor TESTS AND RESULTS: CBC/ESR within normal limits; CT Head showed no focal intracranial abnormalities, no evidence of hemorrhage, mass effect. Neurology consultation arranged. FINAL WORKING DIAGNOSIS: Complicated Migraine TREATMENT: Valproic Acid 250 mg b.i.d., Midrin ® prn, trial Sumatriptan

LOW BACK PAIN IN SOCCER PLAYER

Robin Merket, MD University of Tennessee Sports Medicine

C2

HISTORY: 17 old soccer player with a complaint of lower right sided back pain. The pain began 6 months prior while he was leaning over to cut another player's hair. He continued to play soccer despite the pain, but noticed pain that radiated down the back of his right leg to the level of his right knee with his kicking motion in which the right hip was flexed and the knee extended. He did not have any incontinence with his bowel or bladder any motor weakness of the right lower extremity or any sensory alterations. He also denied any worsening of symptoms with the Valsalva maneuver. His symptoms decreased in severity with cessation of activity after soccer season ended.
PHYSICAL EXAMINATION: He showed full range of motion in flexion with a mild lumbar scoliosis to the right. Full extension with lateral bending and rotation without pain. The right L-4 to L-5 area showed maximum tenderness to palpation. Sitting straight leg raise was positive. Deep tendon reflexes were 2+ and symmetric to lower extremities. Sensation was grossly intact to light touch. Strength testing showed 5/5 to lower extremities with exception to extensor hallucis longus on the right which showed 4+/5 strength. Straight leg test in supine position was positive. Decreased flexibility in both hamstrings with limitation occurring at 40 degrees.
Differential.Diagnosis- 1. Herniated Nucleus Pulposus L-4, L-5. 2.) Spondylolysis. 3.) Spondylolisthesis. 4.) Disc Space Infection. 5.) Ankylosing Spondylitis. 6.) Vertebral Osteomyelitis. 7.) Primary Spinal Tumor
Results: MRI of lumbar spine: midline herniation to the right of L-4/ L-5 and mild herniation at L-5/ S-1. Compression of L-5 nerve root as the disk protrusion went into the thecal sac.
Final Working Diagnosis: Herniated Nucleus Pulposus L-4/L-5
Treatment: Bed rest was avoided; pain control with ice, ice massage and NSAIDs; Rehabilitation with maintaining neutral spine position and improving flexibility of upper and lower extremities; stabilization training; abdominal and quadriceps strengthening; and progressive sport conditioning with advanced sport specific exercises. McKenzie extension exercises were emphasized throughout rehabilitation.

P1

PERCEIVED VALUE OF EXERCISE AFTER EXERCISING ONE YEAR

Boyette, L.W., Lloyd, A., & Gaasch, D., Echt, K., & Brandon, J., FACSM
Atlanta VA Medical Center, Rehab R&D Center, Atlanta, GA 30033

This study examined older adults' perceived value of exercise before and after participating in an exercise program for one year. The sample consisted of 74 older subjects (age range 60-85) who volunteered to participate in a strength and flexibility exercise program. The participants were divided into exercisers (n=42) and nonexercisers (n=32). The exercisers trained on a multi-station Nautilus system for one hour, three days a week for two years. The nonexercisers came to the lab twice during the course of the year to be evaluated for physiological changes. Neither group received formal instructions on perceived value of exercise. A four item subscale on the Physical Exercise Profile-Revised (PEP-R) developed by Boyette, et al. (1998) was used to measure perceived value of exercise. Scores could range from 1 to 5 with higher perceived scores indicating greater perceived value of exercise in one's life. This subscale was administered at baseline and at the one-year follow-up. At baseline, 18.4% of the exercisers and 24.4% of the nonexercisers received the highest possible score on this subscale. While these numbers increased substantially after one year, (45.2% the exercisers and 31.3% of the nonexercisers received the highest possible score for perceived value of exercise), the exercisers showed higher gains in levels of perceived value of exercise compared to the nonexercisers. These results indicate a trend suggesting that those older individuals who actively participate in an exercise program will more likely to value exercise and perceive it to play an important role in their daily lives.

Funded by Rehabilitation Research & Development Services
Department of Veterans Affairs Project # E721-4RA

P2

IS THE ACSM PREDICTION EQUATION FOR THE ESTIMATION OF VO2 DURING TREADMILL WALKING APPROPRIATE FOR APPARENTLY HEALTHY OLDER ADULTS?

Martha Burton, Rafael Reyes, Michael Welsch, & Robert Wood. Department of Kinesiology, The Louisiana State University, Baton Rouge.

The American College of Sports Medicine (ACSM) has published a prediction equation for estimating oxygen consumption (VO2) during treadmill walking for the general population that has not been adequately tested in healthy older adults. In fact, studies in older populations have generally been limited to people with chronic diseases. The purpose of this study was to determine if the ACSM prediction equation is accurate for apparently healthy older adults. It was hypothesized that direct measurement of VO2 would show low intraclass correlation with values obtained using the ACSM equation. Five men and 8 women (60-83 years of age) performed graded submax treadmill tests. The test involved 3-minute stages with increments of approximately 1.5 METs per stage and was terminated at 75% of age predicted max HR or RPE>15. VO2 was measured using the Sensormedics Vmax metabolic system. The average length of the test was 10.2 minutes, and the average VO2 achieved was 18.7 ml/kg/min. A repeated measures ANOVA indicated an intraclass correlation coefficient of R= 0.61 between measured and estimated VO2. Moreover, the ANOVA indicated that the prediction equation consistently overestimated VO2 by approximately 1 MET ($p< 0.0001$). Therefore, multiple regression was used to develop the following prediction equation for this group of participants: (0.11)(mph)(26.8) + (0.92) (%grade/100)(mph)(26.8) + 3.5 =ml/kg/min. The standard error of the estimate for the equation is 0.135 ml/kg/min. In conclusion, these results suggest that more attention be devoted towards developing population specific prediction equations for estimating VO2 during treadmill walking, particularly for apparently healthy older adults.

P3

EFFECTS OF LONG-TERM RESISTIVE TRAINING ON STRENGTH AND STAIR CLIMBING IN OLDER DIABETIC ADULTS

A. Lloyd, D.A. Gaasch, L.W. Boyette & L. J. Brandon
Atlanta V.A. Medical Center, Rehab R&D Center, Decatur, GA 30033

The purpose of this study was to evaluate the effects of an 18-month resistive training intervention on older diabetic adults. Fifty older diabetics (mean age = 66.1 years; 28 exercisers [ES] and 22 comparisons [CS]) volunteered to serve as subjects. Over 18 months, the ES resistive trained 3 times a week for the first 6 months and 2 days a week the last 12 months. Training intensities were prescribed at 50%, 60%, and 70% of one repetition maximum (1RM). ES trained plantar flexors, knee flexors, and knee extensors using a Nautilus multi-station system. CS were told to maintain their routine activities which did not include resistive training. All subjects were evaluated at baseline and every 6 months for strength by 1RM tests performed on the plantar flexors, knee flexors, and knee extensors. They were also evaluated on 2 stair climb tasks: 1) time required to walk up 10 steps, and 2) time to walk down 10 steps. The data were analyzed using descriptive, correlation, and repeated measures ANOVA statistics. In the ES, there was an increase ($p < 0.05$) in strength for all three muscle groups for each of the testing periods. Based on lower extremity strength (mean strength of plantar flexors, knee flexors, and knee extensors) the ES were 30.7% stronger after 18 months of training than at baseline with the largest strength gain occurring in the plantar flexors. The ES improved ($p< 0.05$) on both stair climb tasks during the 18-month intervention. Based on total stair climb time (time to go up the stairs plus the time to go down the stairs) the ES were 14.7% faster after 18-months of training. There was a significant negative relationship between strength and stair climb for the ES at baseline. While the ES improved both strength and stair climb, the rate of improvement was greater for strength. Although there was a trend toward improvement, no significant changes for strength or stair climb were observed for the CS. These results indicate the important task of climbing stairs can be improved in older diabetic adults up to 18 months with moderate intensity strength interventions.

Supported by Department of Veterans Affairs, Grant # E825-RA

P4

DOES THE AAHPERD PHYSICAL/FUNCTIONAL ABILITY TEST FOR OLDER ADULTS REALLY MEASURE STRENGTH?

Manning Sabatier, Rafael Reyes, Elke Hirschey, Michael Welsch, Robert Wood. The Louisiana State University, Baton Rouge.

The American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) has validated a battery of field tests for assessing physical function of adults over 60 years of age. The test includes assessments of body composition, agility/dynamic balance, cardiorespiratory endurance, flexibility, muscular strength and endurance, and coordination. However, this test has been criticized for poor content validity with respect to measuring lower and full-body strength. The purpose of this study was to examine relationships between AAHPERD test scores and the 5-repetition maximum (RM) strength of several muscle groups. Thirty-six participants (ages 60-83) were evaluated for AAHPERD test performance and 5 RM strength on Med-X leg extension(LX), Leg curl(LC), seated row(SR), chest press(CP), lateral raise(LR), seated dip(SD), and biceps curl(BC) machines. Pearson correlation was used to examine relationships between variables ($p<0.05$). Males and females were considered separately with respect to the AAHPERD strength and body composition indices. Significant correlations ($p<0.05$) were observed between agility and CP (r=-0.35); and endurance and LR (r= -0.40) and LX (r= -0.36). Among females, the AAHPERD strength scores correlated with CP (r= 0.58,), LR (r= 0.53), and SD (r=0.46). The AAHPERD strength assessment did not correlate with 5 RM tests in men. These results suggest that the AAHPERD strength component is satisfactory for describing upper-body strength in women, but appears to be of little value in assessing strength in older men. Interestingly, the endurance and agility items of the AAHPERD test contribute to the ability of the test battery to detect individual differences in strength.

P5

RELATIONSHIP BETWEEN BODY MASS INDEX AND FOREARM VASCULAR RESISTANCE IN ADOLESCENTS

M. Frisard, S. Gordon, M. Lee, M. Sothern, M. Welsch, R. Wood. Dept. of Kinesiology, Louisiana State University, Baton Rouge, Louisiana.

There is evidence to suggest that vascular dysfunction provides an early marker of cardiovascular disease. Thus, it is of value to determine populations for whom such testing may be indicated. The purpose of this investigation was to examine the relationship between vascular reactivity and BMI among adolescents. Venous occlusion plethysmography was used to assess forearm blood flow (FBF) in 16 adolescents at rest, and following 5 minutes of forearm arterial occlusion. Forearm vascular resistance (FVR) was calculated by dividing mean arterial press ure (MAP) by FBF. Pearson correlation was used to describe the relationship between BMI and FVR at rest and during reactive hyperemia. ANOVA was used to compare resting to hyperemic data. Alpha was set a-priori at 0.05. The ANOVA indicated a main effect of forearm occlusion manifested by an 8-fold increase in FBF and a 90% reduction in FVR. The results indicated significant correlations between BMI and resting MAP ($r = 0.46$) and diastolic pressure ($r = 0.50$). Finally, the relationship between BMI and the change in FVR following ischemia approached statistical significance ($r = 0.37$, $p < 0.10$). In conclusion, the results confirm a relationship between BMI and resting blood pressure in adolescents. Moreover, there is some indication that high BMI is associated with blunted vascular reactivity. Future investigations should provide normative data for vascular reactivity and examine the potential for such measures to quantify risk of disease. Lastly, experimental studies should investigate the effect of physical activity on vascular reactivity in adolescents.

P6

EFFECTS OF RESISTIVE TRAINING ON STRENGTH AND STAIR CLIMBING IN WELL OLDER ADULTS

D.A. Gaasch1, A. Lloyd1, L.W. Boyette1 & L. J. Brandon1,2 V.A. Medical Center1, Rehab R&D Center & Georgia State University2, Atlanta, GA

This study was designed to evaluate the effects of long-term (18 months) strength training on walking up and down a flight of stairs with a 3.4 kg weight (simulate carrying groceries). Fifty nine older volunteers (mean age 71.6 years; 30 exercisers-ES and 29 comparison-CS) served as subjects. The ES strength trained 3 days a week, an hour a day for the first 6 months and 2 days a week the last 12 months. The subjects trained at 50%, 60% and 70% of their one repetition maximum (1RM). They trained plantar flexors, knee flexors and knee extensors on a Nautilus multi-station system. All subjects were evaluated for strength (1RM) and stair climb (time required to walk up and down a flight of stairs) every 6 months. The data were analyzed using descriptive, correlation and repeated measures ANOVA statistics. The results show that the ES increased strength significantly and maintained the strength for the duration of the study. The largest strength increase was for plantar flexion and the smallest was for knee flexion. A significant improvement for both up and down stair climbs was observed for the duration of the training. However, the improvement above baseline was less at 18-months than at 6-months of training. There was not a significant relationship between lower extremity strength and stair climb performance. In contrast, the CS essentially experienced no change in strength or stair climb during this time. These results suggest that resistive training can extend the functional independence of well older adults.

P7

THE EFFECTS OF RESISTANCE TRAINING WITH OR WITHOUT ANDROSTENEDIONE SUPPLEMENTATION ON BONE TURNOVER AND DENSITY

J.L. York, A.C. Aiken, J. Quindry, K.Brittingham, L.B. Panton, and C. E. Broeder. East TN State University – James H. Quillen College of Medicine, Johnson City, TN 37614

Testosterone levels decrease with age in men possibly leading to a decreased bone turnover and density. Oral androstenedione supplementation elevates blood testosterone levels by 6-11% in young men (24±3 yrs; Earnest strength train, subsequent increases in bone density occur. Thus, this study,s purpose was to determine the effects of 12 wks of high intensity resistance training in untrained men with or without androstenedione supplementation on bone turnover and density. Ten untrained, healthy men, between the ages of 35-65 yrs (46 ± 7 yrs, values mean ± standard deviation) were randomly assigned (double blind procedure) into one of 2 groups, placebo (P) or androstenedione (ANDRO). Measurements before and after training included a comprehensive physical exam, height, weight, body strength, hormonal profiles, and bone density (evaluated by Dual-Energy X-ray Absorptiometry (DEXA)). Osteoblastic and osteoclastic activity were evaluated in blood and urine samples, respectively. The resistance training consisted of 12 exercises, 3 x/wk. at 80-85% of initial pre-training 1-RM strength values. Two-way repeated ANOVA was used to evaluate if there were differences between P and ANDRO. All significance was accepted at $p<=0.05$. Strength increased significantly for both upper and lower body in the P and ANDRO groups. Increases in upper body strength were significantly higher for the ANDRO (149 ± 40 lbs to 197 ± 53 lbs) vs the P group (158 ± 77 lbs to 196 ± 101 lbs). Testosterone levels were not significantly different between the two groups. However, total and regional bone density were not significantly different between the two groups. Interestingly, there was a trend for bone turnover to be higher in the ANDRO group indicating potential for improved bone density for longer stimulus periods (P: 0.886 ± 0.88 to 0.840 ± 0.403; ANDRO: 0.912 ± 0.212 to 1.034 ± 0.303). It is important to point out that due to the limited subject number, more testing is needed before firm conclusions can be drawn about androstenedione's effects on strength, bone turnover, and bone density.

P8

A COMPARISON OF LEG-TO-LEG BIOELECTRICAL IMPEDANCE AND SKINFOLDS IN ASSESSING BODY FAT IN COLLEGIATE WRESTLERS.

A.C. Utter, J.R. Scott, RA. Oppliger, P.S. Visich, F.L.Goss, B.L. Marks, and D.C. Nieman. Department of Health and Exercise Science, Appalachian State University, Boone, NC 28608.

A comparison of the leg-to-leg bioelectrical impedance (BIA) system and skinfold analysis in estimating % body fat in a large number of NCAA collegiate wrestlers was investigated. A series of 5 cross-sectional assessments, including the NCAA Division #I and # III Championships, were completed throughout the 1998-1999 wrestling season with samples ranging from (N = 90 - 274). Body density was determined from the three skinfold measures using the Lohman prediction equation. BIA measurements were determined using the Tanita Body Fat Analyzer, Model 305. Significant correlations between methods ranging from ($r = 0.67$ -.83, $P < 0.00$ 1) and low standard error of estimates (SEE) for % body fat ranging from (2.1% - 3.5%) were found throughout the assessment periods. This preliminary study demonstrated that the leg-to-leg bioelectrical impedance system accurately estimated % body fat when compared to skinfolds in a diverse collegiate wrestling population.

Supported by a Grant from The Tanita Corporation of America, Inc. and ASU Research Council.

P9

EVALUATION OF A FOOT-TO-FOOT BIOELECTRICAL IMPEDANCE SYSTEM FOR DETERMINING BODY FAT IN MALES

M.J. Evans, G.A. King, A.M. Swartz, and D.L. Thompson. Dept. of Exercise Science and Sport Management, The University of Tennessee, Knoxville, TN 37996

The Tanita corporation has a foot-to-foot bioelectrical impedance analyzer (BIA) which incorporates equations for predicting percent body fat (%BF) based on impedance, body mass, height, and gender as well as the individual's level of physical activity (PA). The "athlete" equation is used for those engaging in 10 or more hr of PA per wk. Others are classified as "adults." Our purpose was to determine if these equations were accurate for males of varying PA levels. Thirty men, 18-35 years old, were categorized into 3 groups: (1) athletes (A) engaging in 10 or more hr of PA per wk (n=10); (2) recreationally active men (RA) exercising at least 2.5 but less than 10 hr per wk (n=10); and (3) inactive men (I) who were active less than 2 hr per wk (n=10). Groups performed significantly different ($p < 0.05$) amounts (mean$\pm$SE) of aerobic activity per wk, 14.4$\pm$2.3, 5.3$\pm$2.2, and 1.0$\pm$0.7 hr per wk for A, RA, and I, respectively. Subjects were tested using the BIA "athlete" mode and again in the "adult" mode. Immediately following BIA testing, hydrostatic weighing (HW) was performed. These values were used to estimate %BF using the Siri equation and used as criterion %BF measures. Repeated measures ANOVA revealed that the "athlete" mode accurately predicted ($p>0.05$) %BF for A and RA but not for I. %BF values for HW and BIA in the "athlete" mode were 11.8$\pm$1.8 vs 10.0$\pm$1.1 % for A and 10.1$\pm$2.0 vs 9.7$\pm$0.8% for RA. There was no significant difference ($p > 0.05$) in %BF between HW and BIA in the "adult" mode for I (15.8$\pm$1.8% and 18.5$\pm$1.3%, respectively); however HW yielded significantly lower values than the BIA adult mode in A and RA (11.8$\pm$1.8 vs 16.9$\pm$1.4% for A and 10.1$\pm$2.0 vs 15.8$\pm$1.0% for RA). When using the Tanita BIA, %BF is best estimated in A and I by following the manufacturers recommendations about mode. In RA, one should use the "athlete" mode even though these men do not meet the Tanita criteria for athletes.

P10

HYDROSTATIC WEIGHING: AN ALTERNATIVE METHOD

T. Mendez, A. M. Arneson, J. B. Fleming, K. M. Fulmer, S. L. Rozzi and W.R. Barfield. Department of Physical Education and Health, 66 George Street, Charleston, SC 29424.

Hydrostatic weighing is considered the standard method of determining body density. Traditional underwater measurements have been known to vary in accuracy, as they are dependent upon subject experience and degree of comfort while submerged in water. Breathing devices, which permit the subject to breathe under water, may be considered as viable means of increasing subject comfort during hydrostatic weighing. The purpose of this study was to compare body density measurements obtained with a breathing device (WBD) to the traditional method of measuring body density without a breathing device (WOBD). Thirty-three college students, 15 males and 18 females (22.03 +- 3.9 yrs, 171.2 + 8.5 cm, and 70.6 +- 18.5 kg), volunteered to participate in the study. All subjects completed both procedures on the same day in a randomized fashion. Paired t-tests revealed no significant differences between the WBD and WOBD method for either body density (WBD 1.06 +- 0.02 g/cc, WOBD 1.06 +- 0.02 g/cc) or % body fat (WBD 17.9 +- 6.9 % body fat, WOBD 17.4 +- 7.4 % body fat). These results suggest both WBD and WOBD are equally effective methods of obtaining body density. Interestingly, 42% of the subjects reported feeling more comfortable during the WBD measurement compared to the traditional WOBD method. This study suggests that when subjects experience fear or anxiety during hydrostatic weighing assessments, the breathing device used in this study may provide a means of increasing subject comfort without compromising the accuracy of the assessment.

P11

BODY COMPOSITION CHANGES IN OBESE OLDER ADULTS USING DUAL-ENERGY X-RAY ABSORPTIOMETRY MEASUREMENTS AFTER A WEIGHT LOSS INTERVENTION

T. Bonoffski, G. Miller. Wake Forest University.

In that age associated decline in bone mineral density (BMD) contributes to an elevated risk of osteoporosis in older adults, and obesity appears to be protective for fracture risk in post-menopausal women, the purpose of this study was to examine the effect of weight loss on BMD in older adults. Obese (BMI >30.0 kg/m2) males and females (age >60 years) with osteoarthritis of the knee underwent a 6-month diet and exercise targeted behavioral weight loss program. Dual-Energy X-ray Absorptiometry (DEXA) was used to measure body composition at baseline and following 6 months of weight loss. Values are expressed as mean (SD). The twelve participants in this study had an average age of 65.5 (4.3) years , height of 164.6 (8.8) cm , weight of 88.6 (13.2) kg, and BMI of 32.6 (3.6) kg/m2 at baseline. Paired T-tests were used to analyze for the effect of the weight loss program on the different variables. After 6 months of weight loss, participants lost an average of 4.7 (5.2) kg ($p=.01$) with a change in BMI from 32.6 to 30.9 (1.8) kg/ m2 ($p=.009$). From the total weight lost, absolute fat mass was significantly less at 6 months ($p=.006$). Non-significant decreases in total BMD (0.0095 +/- 0.0390 g/cm2), total bone mineral content (BMC) (25.6 +/- 145.0 g), and lean body mass (912.6 +/- 2592.7 g) were observed after 6 months of weight loss. The amount of fat mass lost was significantly correlated to BMC loss ($r=.647$, $p=.023$). In conclusion, significant decreases in body weight and fat mass following a 6- month diet and exercise weight loss intervention did not result in significant decreases in BMC and BMD in obese older adults.

P12

MICRO-ENVIRONMENT CHANGES INSIDE IMPERMEABLE PROTECTIVE CLOTHING DURING A CONTINUOUS WORK EXPOSURE

J.M. Kozusko*, I.H. Muir, and P.A. Bishop*. *Department of Human Performance, University of Alabama, Tuscaloosa, Alabama 35487; Department of Family, Nutrition, and Exercise Sciences, Queens College, City University of New York, Flushing, New York 11367

Protective clothing (PC) results in a micro-environment between the suit and the body. Workers are then exposed to a heat stress which is a reflection of micro-environment rather than the macro-environment alone. Adjustments to the ambient environment to account for the micro-environment have been formulated as a means to predict heat strain for safety purposes. Measurement of the actual micro-environment was made using a remote sensor (Davis Instruments) at the shoulder, hip, and thigh levels on 15 subjects during a continuous work protocol of 63.1 + 7.9 min (300Kcal/hr) in impermeable (Saranex 23P) PC at an ambient temperature of 30oC WBGT (32oC dry, 29oC wet, 33oC globe). Micro-environment temperature increased rapidly and then reached a plateau within each work period. There was no statistically significant difference ($p<0.05$) between the measurements made at the three different body sites for temperature or humidity. The mean (SD) micro-environmental WBGT temperature for each site was 35.7+0.4oC (shoulder), 35.8+0.5oC (hip), and 35.6+0.4oC (thigh). Mean (SD) micro-environment relative humidity was 93.8+1.0% (shoulder), 91.1+3.8% (hip), and 91.2+1.7% (thigh). These results suggest that at this single high ambient temperature (30oC WBGT) an adjustment factor of 6oC WBGT may give a more accurate indication of thermal stress within PC.

P13

INFLUENCE OF A COOLED VEST ON THE THERMOREGULATORY RESPONSES WHILE WEARING A PROTECTIVE BARRIER SUIT

M.J. Ryan and D.D. Pascoe Ph.D. FACSM, Dept of Health and Human Performance, Auburn University, AL 36849

The purpose of this investigation was to determine the influence of water cooled vests (Aquatexô Hydroweave) on the thermal regulatory responses of subjects wearing a Tyvek coverall protective barrier suit (PBS) in the heat. Eight recreationally fit males, ages 19-48 years, participated in three randomized trials: No Vest (NV), Tap Water (24.5 degrees C) activated vest (TV), or Cold Water (12.0 degrees C) activated Vest(CV). The subjects walked on a motorized treadmill 3.5 mph, 6% grade) for 30 minutes in a heat chamber(31 degrees C, 50-55% relative humidity). No significant differences ($p>0.05$) were observed for heart rate or oxygen consumption between trial conditions. A 30 minute rating of perceived exertion demonstrated a significantly lower rating for CV when compared to NV and TV. Mean skin temperature (weighted formula: right shin, left upper chest)for the TV and CV trials were significantly lower as compared to NV during the first 10 minutes, while core (rectal) temperatures were significantly lower for CV and TV during the last 10 minutes. The ability of the cooled vests to promote conductive heat transfers abated the rise in core temperature. These lower core temperatures suggest that both CV and TV were able to reduce heat storage and, if worn in a PBS, may provide extended work time in the heat.

Supported by Aquatexô Industries.

P14

EFFECTS OF AGE ON SWEAT LACTATE IN MALES

J.M. Green, P.A. Bishop, J.F. Smith, J.R. McLester Jr., R.G. Lomax. Western Kentucky University, Bowling Green, KY 42101, The University of Alabama, Tuscaloosa, AL 35487

Potential age-associated decreases in sweat rate and skin blood flow may influence sweat lactate and alter eccrine gland metabolism, however, this has not been adequately studied. Older (51.5±3.8 yrs) (n=6) and younger (25.8±1.5 yrs) (n=6) males matched for $V0_2$ max with similar height, weight, body fat %, and surface area, completed 30 min constant load (CON) and 30 min interval (INT) cycling trials at 32°±1°C WBGT designed to elicit different blood and sweat lactate responses. Each was preceded by 15 min warm-up and followed by 15 min rest. Sweat and blood were analyzed for lactate at 15, 25, 35, 45, and 60 min. Sweat rates (ml/hr) for younger (CON=779.7±292.6, INT=798.0±268.3) and older (CON=795.9±258.5, INT=763.6±178.7) subjects were not significantly different ($p>0.05$) between trials or groups. Estimated total sweat lactate excretion was not significantly different ($p>0.05$) between trials or groups. Blood lactate was significantly greater in younger subjects at 25, 35, 45, and 60 min. Sweat lactate (mmol/l) was not significantly different ($p>0.05$) between groups at any time point (Table). Results suggest that age-associated differences between our two cohorts in skin blood flow, or eccrine gland metabolism in well-matched subjects may be minimal.

	Group	15 min	25 min	35 min	45 min	60 min
CON	Older	22.8 (16.1)	11.3 (2.5)	9.5 (1.4)	8.9 (0.9)	9.8 (3.1)
	Younger	22.8 (9.7)	11.6 (1.5)	9.8 (1.2)	8.5 (1.1)	10.5 (2.1)
INT	Older	18.3 (6.4)	11.4 (3.1)	9.6 (1.9)	9.2 (1.5)	8.6 (1.5)
	Younger	18.5 (5.2)	11.5 (2.7)	9.2 (1.3)	9.1 (1.1)	8.9 (1.6)

Research supported in part by Smith and Nephew, Inc.

P15

MUSCLE GLYCOGENOLYSIS EVOKED BY ISOKINETIC LEG EXERCISE

*G.G. Haff, A.J. Koch, J.A. Potteiger, K.E. Kuphal, L.M. Magee, S.B. Green, and J.J. Jakicic. *Exercise Physiology Laboratory, Appalachian State University, Boone, NC 28608. Exercise Physiology Laboratory, University of Kansas, Lawrence, KS 66044

The purpose of this investigation was to examine the effects of an isokinetic leg exercise bout on muscle glycogenolysis. Muscle biopsies were obtained from the *m vastus lateralis* of eight resistance-trained males (mean±SEM, age 24.3±1.1 y, height: 171.9±9.0 cm, body mass: 85.7±3.5 kg) before (PRE) and after (POST) an acute isokinetic leg extension/flexion exercise bout. The exercise bout consisted of 1 warm-up set of 10 repetitions performed at 3.14 $rad \cdot s^{-1}$ and 3 training sets of 10 repetitions performed 2.09 $rad \cdot s^{-1}$ on a Cybex II Isokinetic Dynamometer with 3-min recovery between each set. Plasma glucose, lactate, and free fatty acids were also measured at PRE and POST. The isokinetic bout elicited a significant decrease ($p<0.001$) in muscle glycogen content from 150.6±9.4 to 121.4±8.1 $mmol \cdot kg$ wet wt^{-1}. There were no significant changes in plasma glucose (PRE: 5.9±0.2 $mmol \cdot L^{-1}$, POST: 5.9_-0.3 $mmol \cdot L^{-1}$) and free fatty acids (PRE: 77.4±16.1 $mg \cdot L^{-1}$, POST: 72.5±13.9 $mg \cdot L^{-1}$) from the PRE to POST measurements. Lactate concentration was significantly. ($p<0.001$) elevated (PRE: 0.7±O.l $mmol \cdot L^{-1}$, POST: 2.9±0.4 $mmol \cdot L^{-1}$) after the isokinetic exercise bout. The results of this investigation demonstrate that an acute bout of Isokinetic Leg extension/exercise can significantly decrease the glycogen concentration of the *m vastus lateralis*.

P16

SINGLE-CELL MEASUREMENTS OF LACTATE TRANSPORT INTO ISOLATED RAT VENTRICULAR CARDIAC MYOCYTES

R.K. Evans1, D.D. Schwartz2, L.B. Gladden3. 1Division of Physical Education and Exercise Studies, Lander University, Greenwood, SC 29649; 2School of Veterinary Medicine, Auburn University, AL 36849; 3Department of Health and Human Performance, Auburn University, AL 36849

L-lactate (La-) has been shown to traverse the cardiac myocyte sarcolemma predominantly by a membrane-bound H+-monocarboxylate co-transport pathway (MCT). Utilizing the fluorescent intracellular pH (pHi) indicator 2í,7í Bis(carboxyethyl)-5(6)-carboxyfluorescein (BCECF), La- transport via the MCT pathway has been previously reported to have maximal transport (Vmax) and Michaelis constant (Km) values of 5.21 nmol∑uL-1∑min-1 and 2.74 mM, respectively, in Tyrode solution at 23 ∞C (Wang et al. Am. J. Physiol. 267 (Heart Circ. Physiol. 36): H1759-H1769, 1994). BCECF is employed to assess the pHi decrease that is the result of the co-transport of the H+ and the La- into the cell following the addition of La- to the extracellular solution. The purposes of this study were to 1) determine the kinetics of La- transport into single ventricular cardiac myocytes isolated from Sprague-Dawley rats (n = 5) and 2) compare the findings with previously reported Vmax and Km values. The addition of La- ([La-] = 2.0, 5.0, 10.0, and 20.0 mM) to an extracellular Tyrode perfusion solution caused a rapid decrease in the pHi of the BCECF-loaded cells, which was attenuated by 72-84% with the addition of 5.0 mM a-cyano-4-hydroxycinnamate (CHC) to the extracellular perfusion solution. The addition of CHC, a specific inhibitor of the MCT pathway, allowed differentiation between La- transport via the MCT pathway and total La- transport. La- transport via the MCT pathway was found to exhibit Michaelis-Menten kinetics with Vmax and Km values of 16.18 nmol∑uL-1∑min-1 (±0.84) and 8.69 mM (±1.02), respectively. The results of this study substantiate the use of pHi indicators for quantitative measurement of lactate transport into isolated cardiac myocytes; however, the most significant finding is the three-fold higher Vmax and Km values compared to those previously reported.

Supported by NIH Grant # 1R01AR-40342

P17

RELATIONSHIP BETWEEN PLASMA AND WHOLE BLOOD LACTATE CONCENTRATIONS IN VARIOUS EXERCISE PROTOCOLS

J.L. Dobson, E.W. Smith, and L.B. Gladden. Dept. of Health & Human Performance, Auburn University, Auburn, AL 36849

The lactate response to exercise is frequently evaluated by measuring lactate concentration ([La]) in either plasma or whole blood. Additionally, there are analytical instruments that measure plasma [La] and use an algorithm to estimate whole blood [La] whereas other instruments measure whole blood [La] following red blood cell lysis. In either case, the relationship between plasma and whole blood [La]s is important. Therefore, the purpose of this study was to compare the [La] in plasma with the [La] in whole blood during progressive, steady state and high intensity exercise. The following cycle ergometer exercise protocols were investigated: 1) progressive, incremental (1 and 4 min durations) exercise to exhaustion (n=8); 2) steady state exercise for 30 min at 40 and 70% of peak oxygen uptake (n=8); and 3) 1 min of maximal effort against a resistance of 0.75 kp per kg body weight followed by 60 min of either passive or active (35% of peak oxygen uptake) recovery (n=8). Blood samples were collected frequently throughout exercise (and recovery for the maximal effort exercise) through a catheter in a prominent forearm vein. The arm was heated throughout all protocols. There was a uniform linear relationship between plasma [La] and whole blood [La] in all of the exercise protocols. Correlation coefficients between plasma [La] and whole blood [La] for all exercise protocols ranged from 0.972 to 0.994. Further, the ratio of whole blood [La] to plasma [La] was consistent throughout the different exercise protocols (0.708 ± 0.003). However, a closer inspection of the data revealed that the ratio of whole blood to plasma [La] was significantly lower immediately following the maximal effort exercise (0.525 ± 0.017) and early in recovery (0.632 ± 0.013). These data suggest that whole blood [La] can be reasonably predicted from plasma [La] in many types of exercise, but not during early recovery from maximal effort exercise.

Supported in part by NIH Grant No. 1R01AR-40342.

P18

EFFECT OF SOLID AND GEL CARBOHYDRATE INGESTION ON MODERATE INTENSITY, MODERATE DURATION EXERCISE

J.M. Norris, V.M. Gray, and D.E. Kremer. Division of Physical Education and Exercise Studies, Lander University, Greenwood, SC 29649

The market for carbohydrate-based ergogenic performance enhancement has gradually escalated. However, the efficacy of the various carbohydrate forms has not been determined. The purpose of this study was to assess the effects of ingesting two different forms of carbohydrate (CHO) on physiological parameters during moderate intensity, moderate duration running. Subjects were three male and three female Division II cross-country runners (age: 20.0+1.0 yrs; male VO2max: 65.4+9.0 ml.kg-1.min-1; female VO2max: 45.6+4.4 ml.kg-1.min-1) engaged in off-season practice. All subjects performed a maximal effort treadmill test with continuous gas analysis to determine maximal oxygen consumption (VO2max). Subjects then completed three 40 min submaximal tests at an intensity of 70% VO2max. The three testing conditions were ingestion of a solid CHO with water (S), a gel CHO with water (G), and water only (W), consumed 15 minutes prior to exercise. CHO ingestion was 1 g CHO.kg-1 body weight. Water ingestion was calculated as the volume needed to attain an 8% carbohydrate concentration. Test order was randomized with at least 72 hours between tests. During each submaximal test, VO2 and RER (VCO2/VO2) were continuously monitored and recorded every 30 seconds. Heart rate (HR) and perceived exertion (RPE, Borg 6-20 scale) were recorded every 3 minutes. Results indicated no significant differences between treatments for RER (S:0.912+0.076; G:0.923+0.078; W:0.934+0.050), HR (S:164.0+10.3, G:160.5+6.6, W:163.0+6.3 bpm), or RPE (S:10.8+2.8; G:10.2+2.2; W:11.3+2.9 units). In order to maintain an exercise intensity of 70% VO2max, speed during G was significantly slower than was speed for W, while S was not significantly different from either condition (177.2+27.9, 187.3+29.1, and 184.8+27.3 m.min-1, respectively). These results indicate that carbohydrate ingestion may not have a positive impact on physiological parameters associated with moderate intensity, moderate duration running performance.

P19

EXPLORATION OF COUPLING BETWEEN STEP FREQUENCY, BREATHING FREQUENCY, AND HEART RATE IN COLLEGE VARSITY FEMALE CROSS-COUNTRY RUNNERS

A. Jung, Craib, M., O'Bryant, H, Johnson, M. Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC 28608

Coupling of step frequency and physiological parameters (breathing frequency, heart rate) has been observed in some animals and humans. For example, in the dik-dik antelope step rate and heart rate appear to be linked in a 1:1 ratio over a range of velocities. Rationale for synchronizing these gait and physiological factors have been developed, most having to do with optimizing the cost of locomotion. However, it remains to be determined if coordination of these variables occur in humans when they walk and run over a range of velocities, and if coordination is associated with better performance. To explore coupling between gait and metabolic variables (breathing frequency and heart rate) 10 female varsity cross-country runners (age=18.7 +/- 1.2 yr, height = 168.9 +/- 4.6 cm, weight = 54.9 +/- 2.4 kg, body fat = 14.0 +/- 3.9%) were assessed while walking (at 1.56 m.s-1) and running at a number of level submaximal and maximal treadmill running speeds (3.15-4.65 m.s-1). All athletes appeared to entrain respiration frequency with walking step rate (n=6 at 1:4, n=4 at 1:6). No coupling was seen between heart rate and breathing frequency while walking. Five of the 10 athletes appeared to entrain step rate with breathing frequency over the large majority of running speeds (n=4 at 1:4 and n=1 at 1:3). When the group was divided in half by fitness (using velocity at VO2 max and lactate threshold), four of these athletes fell in the higher fitness group. Six of the ten athletes showed coupling between breathing and heart rate (n=4 at 1:4, n=2 at 1:3), and five of these were in the higher fitness group. The results from this sample reveal that coupling of step frequency, breathing frequency and heart rate is associated with higher fitness and ability. However, no association was observed between coupling and economy of walking or running.

P20

INFLUENCE OF FLOW RESISTANCE AND AIRFLOW LIMITATION ON VENTILATORY OUTPUT DURING EXERCISE

J.S. Williams, D.S. DeLorey, G.W. Brumbaugh, and T.G. Babb, FACSM. Exercise Physiology Lab, The University of Mississippi, University, MS, 38677, and Institute for Exercise and Environmental Medicine, Dallas, TX, 75231.

This study was conducted to investigate the effects of airway resistance and airflow limitation on the regulation of minute ventilation during exercise. Eight older subjects (65-74 yr) performed incremental cycle ergometry while breathing room air (RA) or a less dense helium-oxygen mixture (Heliox). Major variables included minute ventilation (VE), expiratory airway resistance (RLe), mouth occlusion pressure (P0.1), and airflow limitation (AFL). Exercise flow-volume curves that exceeded the resting maximal expiratory flow-volume curve were considered airflow-limited. Variables were analyzed during both breathing conditions at rest, ventilatory threshold (VTh), and during heavy exercise by a paired t-test. Correlations among variables were also determined during heavy exercise. Breathing the Heliox mixture did not significantly increase VE at heavy exercise. However, RLe and P0.1 were significantly lower ($p < 0.05$ & $p = 0.05$, respectively) while breathing Heliox compared with RA during heavy exercise. AFL was lower though not significantly different during heavy exercise while breathing Heliox compared to RA. Significant correlations were detected between the change in RLe and the change in P0.1 ($r = 0.88$) and between the change in RLe and the change in AFL during heavy exercise ($r = 0.82$) (delta = Heliox value - RA value). These data suggest that changes in expiratory airway mechanics and respiratory drive can be produced by breathing Heliox during heavy exercise without significant increases in VE in older subjects. It also appears that increases in maximal expiratory flow and/or the degree of AFL present are important contributors to the magnitude of increase in VE during resistive unloading with Heliox.

Supported by NIA AG-11805

P21

VALIDATION OF PULSE OXIMETRY MEASURES OF HEMOGLOBIN SATURATION
B. Pierce, J.A. Young, N.W. Pollock Center for Hyperbaric Medicine and Environmental Physiology Duke University Medical Center, Durham, NC 27710

Objective: Pulse oximetry is commonly used as a non-invasive means of estimating hemoglobin saturation. Our purpose was to evaluate five commercially available pulse oximeters against an arterial standard. Method: A single healthy, fit participant (57 years; 22.3 kg(m-2 BMI) had an arterial line inserted in the distal portion of the left radial artery. Pulse oximetry measures were recorded as the blood sample was drawn. Arterial blood was analyzed with an Instrumentation Laboratory Model 482 CO-Oximeter. Conditions included: 1) activity - rest or 75 W of exercise on a cycle ergometer; 2) breathing gas - room air (121 m [398 ft] altitude) or hypoxic mixture (0.118 oxygen/balance nitrogen; simulating 4572 m [15,000 ft] altitude); supplemental oxygen content - 0, 1 or 2 L(min-1. Oximetry measures were taken upon reaching steady state in each of nine conditions. Devices: The Nellcor N-100C, Capnocheck Plus Model 5855083, Ohmeda Biox Model 3740, Nonin Onyx Model 9500, and Novametrix Model 520 were tested. The sample rate for each of the oximeters was set to the manufacturersí standard. Percent error (PE) and standard error (SE) relative to the arterial values were computed. Results: Trial arterial hemoglobin saturation ranged from 79.5 to 99.2%. PE and SE for the pulse oximetry units ranged from 0.1-7.8% and 0.01-60.84, respectively. Unit-specific values: Ohmeda, digit - PE=0.7-2.7%, SE=22.6, ear - PE=0.1-7.8%, SE=235.6; Capnocheck, digit - PE=1.1-5.4%, SE=74.2, ear - PE=0.1-2.8%, SE=13.2; Nellcor, digit - PE=0.1-2.7%, SE=9.2; Novametrix, digit - PE=0.4-1.7%, SE=13.1; Nonin, digit - PE=0.5-3.4%, SE=28.9. Conclusions: All five pulse oximetry units demonstrated fairly good agreement with arterial measures. The Nellcor oximeter (digit placement) displayed the smallest overall error. The Ohmeda oximeter (ear placement) displayed the greatest overall error.

P22

EVALUATION OF PHYSICAL FUNCTION AND PERCEIVED QUALITY OF LIFE IN PATIENTS WITH HEART FAILURE IN A FAMILY PRACTICE SETTING
T. Parish, M. Alomari, R. Wood, D. Kalb and M.Welsch. Dept. of Kinesiology, Louisiana State Univ., Baton Rouge, LA 70803

The purpose of this study was 3-fold: (1) to determine the construct validity of the 6-min walking test and a quality of life (QOL) survey between patients with heart failure (HF) and age-matched controls (CON); (2) to examine the relation of maximum walking distance (MWD) and QOL; and (3) to evaluate the effects of a care-managed program on functional status and perceived QOL in HF. Patients (n=19; age:61+12yr) were recruited from a local family practice clinic and matched with healthy CON(n=13; age:65+12yr). Functional status was defined as the MWD on a 6-min walking test and perceived QOL was assessed using the short form (SF)-36 health survey. MWD [CON:552.03+73.80m; HF:242.35+86.35m, $p<0.05$) and all-scores on the SF-36 were consistently higher in CON. Furthermore, a direct association of MWD and physical function scores on the SF-36 was noted ($r=0.85$, $p=0.001$) in the patients. Eleven patients subsequently completed a 4-month care-managed program with extensive follow-up through weekly telephone calls and monthly clinic visits aimed at medical compliance through patient education and exercise recommendations. Following the 4-month period MWD increased from 231.03+123.05m to 277.49+149.03m ($p=0.03$), and physical function, vitality and physical component scores improved 19%, 27%, and 9% respectively. In addition, changes in MWD were directly related to the changes in physical function scores ($r=0.59$, $p=0.09$). These preliminary findings indicate the 6-min walking test and SF-36 health survey clearly differentiate between HF and CON. Furthermore, these data support the idea that a carefully managed program for HF in the family practice setting is efficacious. Finally, the significant relationship between MWD and physical function scores suggests the meaningfulness of these measures when conducting clinical trials.

P23

TWO-WEEK STABILITY OF TONOMETRIC BLOOD PRESSURE DURING INCREMENTAL RESISTANCE LEG-EXERCISE. Jennifer Sabatier, Heidi Kluess, Michael Welsch, Robert Wood. The Department of Kinesiology, Louisiana State University, Baton Rouge.

Continuous non-invasive arterial tonometry devices have demonstrated good reproducibility for measuring blood pressure at rest and during dynamic continuous exercise. However, no studies have examined the reproducibility of tonometric blood pressure during incremental resistance exercise testing. Therefore, the purpose of this investigation was to examine the 2-week stability of systolic, diastolic and mean arterial pressures (SBP, DBP, MAP, respectively) obtained using the Colin 7000 continuous blood pressure device (CPB) at rest and during incremental knee extension. The knee extensions were performed at workloads of 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90% maximal voluntary contraction (MVC). One investigator examined nine college-aged participants (6 women & 3 men), each of whom performed two trials of incremental leg extension 2 weeks apart. The bouts were carried to 12 reps or fatigue. The CPB waves were examined for peak SBP and DBP, and MAP during each work bout. Repeated-measures ANOVAs were used to examine pressure changes within each trial and to test for the reproducibility between trials (intraclass R). Consistent with other studies, CPB increased with increasing workload. There was good reproducibility of resting values between the two trials ($R = 0.97$ for SBP, 0.77 for DBP, and 0.61 for MAP) and during 20-40% MVC (R values ranged from 0.95 to 0.70). However, the data became progressively less reproducible with increasing work, and the reproducibility at 50%MVC or above was quite poor. These data suggest that inter-individual sources of variation in tonometric blood pressure need further elucidation before these devices can be used to examine hemodynamic responses during moderate to high intensity resistance exercise.

P24

RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY, AEROBIC CAPACITY, AND BODY COMPOSITION IN CHILDREN
J.M. DiNallo, D.P. Hales, G. Williams, and M.T. Mahar. Department of Exercise and Sport Science, East Carolina University, Greenville, NC 27858

The purpose of this study was to examine the relationships between physical activity, aerobic capacity, and body composition in 7- to 12-yr-old children. Participants included 22 girls and 19 boys. Physical activity was assessed with Tritrac- R3D activity monitors and Digiwalker pedometers for four consecutive days. The Tritrac provides an integrated measure of physical activity assessed in three dimensions. The Digiwalker provides a measure of the total number of steps taken. Aerobic capacity was estimated from the highest speed and grade attained on a maximal treadmill test. Body composition was assessed via triceps and calf skinfolds. Physical activity measured by the Tritrac or pedometer had low correlations ($p > .05$) with aerobic capacity ($r = .20$ and .28, respectively) for the total sample. Low correlations ($p > .05$) between physical activity and aerobic capacity were also found for girls ($r = .11$ and .29) and boys ($r = .26$ and .25) separately. Physical activity measures from the Tritrac and pedometer were negatively correlated ($p < .05$) to sum of skinfolds for the total sample ($r = -.35$ and -.31). For girls, a moderate correlation ($r = -.47$) was found between number of steps taken and body fatness, although no such relationship was found when activity was assessed with the Tritrac ($r = -.14$). For boys, a moderate correlation ($r = -.48$) was found between the Tritrac and body fatness, but not between number of steps taken and body fatness ($r = -.19$). Regression analysis demonstrated that neither Tritrac nor Digiwalker assessed physical activity were significant predictors of aerobic capacity after accounting for body fatness. In this sample, physical activity was only weakly associated with aerobic fitness. Small to moderate associations were found between physical activity and body fatness.

P25

AN EXAMPLE OF THE INTEGRATION OF RESEARCH METHODS IN AN UNDERGRADUATE NUTRITION COURSE

J.L. Fisher, FACSM. Health and Physical Education Program, Clark Atlanta University, Atlanta, GA 30314

In order to integrate research methods into classroom experiences, reinforce intellectual curiosity, and educate students about scientific approaches to evaluating every-day questions, 6 male and 7 female students enrolled in a nutrition course at one historically African American university explored the relationship between eating habits and food selection factors. The process of obtaining informed, written consent and the need for confidentiality were reviewed. A data recording form was developed, and the challenges associated with incomplete data were discussed. A three-day food diary, including one weekend day, was used to assess eating habits. Characteristics of eating habits were evaluated using a computer-assisted analysis. Students also identified their reasons for choosing each food from the following list: taste, convenience, emotions, availability, advertisement, weight control, hunger, peers, family/cultural, cost, nutritive value, and health. Students cited limitations of their study including a small, homogeneous sample, potential lack of awareness for all reasons, a limited list of reasons that affect food choice, that few reasons were identified by class members, and that foods they ate may not have been available in the data base. The instructor's reconciling analyses with diaries was identified as a technique to minimize errors. Meal skipping and low consumption of milk products, fiber, and vegetables were identified as typical class member practices that may be common to a larger sample. Integrating research methods in various undergraduate classes can enhance student understanding of research articles and of research cited in course texts, while elevating the level of learning which takes place. In addition, the experience can be appropriate for students with and without research methods expertise.

P26

DEVELOPMENT OF LOWER BODY STRENGTH NORMS FOR THE BODY MASTERS TM.SUPER LEG PRESS IN FEMALES.

J.G. Alvarez, J.J. Mayo, R. Roberts, and S. P. Brown. Delta State University, Division of Health, Physical Education and Recreation, Cleveland MS, Health & Human Performance, University of Louisiana-Monroe, Monroe, LA; Dept. of Physical Therapy, Southwest Baptist University, Bolivar, MO

Muscular strength assessment is an important component of physical fitness testing. In the past decade fitness companies have marketed a host of new strength training products that are widely used in the fitness industry. However, standards for muscular strength, though updated recently, are still established using outdated equipment that is not accessible in most modern fitness facilities. The purpose of this study was to develop strength norms in college-aged females utilizing a popular resistance training machine. Using the Body Masters TM. Super Leg Press, 1-rep maximum data was collected on 78 college-age females (28 females < 20 yr; age = 18.7 ± 5.4, wt = 62.5 ± 19.3 kg, ht = 164.2 ± 13.5 cm; 50 females >19 yr; age = 21.8 ± 2.05, wt = 64.9 ± 14.7 kg, ht = 163.6 ± 6.5 cm). The data was then analyzed and interpercentile ranges were developed based on strength per body weight calculations. The results are shown below.

Rating	<20 years of age	>19 years of age
Excellent (81-100th %ile)	>2.14	>2.32
Good (61-80th %ile)	1.93 - 2.14	1.89 - 2.32
Average (41-60th %ile)	1.58 - 1.92	1.64 - 1.88
Fair (21-40th %ile)	1.13 - 1.57	1.28 - 1.63
Poor (0-20th %ile)	<1.13	<1.28

The norms developed in this study differ from published norms that are frequently referenced in fitness assessment texts. The norms developed from this study are for use when testing 1-RM strength on the Body Masters TM. Super Leg Press. Care must be taken in the future to ensure that norms are correctly developed based on equipment selection.

P27

TECHNOLOGICAL TOOLS FOR THE MANAGEMENT OF FITNESS TESTING DATA AND REPORT GENERATION.

J.G. Langley. Department of Exercise Science and Sport Management, The University of Tennessee, Knoxville, Knoxville, TN 37996-2700

The purpose of this tutorial is to provide instruction for utilizing software, namely, Microsoft Word and Excel for data management, as well as, report generation in a fitness-testing environment. Due to the increased need for client feedback, the tutorial goal is to inform individuals of the integration capabilities of these easily accessible and user-friendly software products and provide the knowledge necessary to create a similar program designed specifically for their facility. The template for instruction will be a specific fitness testing program designed for the University of Tennessee, Knoxville's Center for Physical Activity and Health. Topics to be discussed and demonstrated include development of a template, special pastes, formula generation basics, and links within documents and spreadsheets. The format of the tutorial will alternate between Microsoft Powerpoint discussion, and demonstration within the template. This tutorial is targeted for students, professors, and fitness directors interested in creating their own templates of endless potential.

P28

CRITERION-REFERENCED AND NORM-REFERENCED RELIABILITY OF THE MILE RUN/WALK AND PACER IN COLLEGE AGE MEN AND WOMEN

M.P. Donovan and M.T. Mahar, Department of Exercise and Sport Science, East Carolina University, Greenville, NC 27859

The mile run/walk (MILE) and PACER 20-m, multistage shuttle run are field tests used to estimate aerobic capacity. The purposes of this study were to estimate the test-retest reliability of the PACER and the equivalence reliability of the MILE and PACER from both a criterion-referenced and a norm-referenced framework. Participants were 33 men and 37 women (mean age = 21.1 ± 2.1 yr.). After practice with both tests, participants were administered two trials of the PACER and one trial of the MILE. Criterion-referenced reliability was estimated with proportion of agreement (*Pa*) and modified kappa (*kq*) using FITNESSGRAM® standards (Cooper Institute for Aerobics Research, 1999). The percent of men and women that passed the PACER was lower than the percent that passed the MILE (men: 56%, 75%; women: 38%, 70%, respectively). For the PACER, *Pa* = .91 (*kq* = .82) for women and *Pa* = .79 (*kq* = .58) for men. Criterion-referenced equivalence reliability of the MILE and PACER was moderate for men (*Pa* = .8 1, *kq* = .63) and low for women (*Pa* = .68, *kq* = .35). Norm-referenced test-retest reliability of the PACER was estimated with an intraclass correlation (R_{xx}) from a one-way analysis of variance model. For women, reliability estimates were high for two trials (R_{xx} = .90) and acceptable for one trial (R_{xx} = .81). For men, reliability estimates were low for two trials (R_{xx} = .73) and for one trial (R_{xx}=.57). Pearson correlations between the MILE time and PACER were moderately high (-.71 _ r _ -.79). The low equivalence reliability for women was due to the fact that nearly twice as many passed the MILE as passed the PACER. It is recommended that PACER standards for women in this age group be lowered to increase the agreement between the MILE and PACER.

P29

ACCURACY OF SEVERAL $V0_{2max}$ PREDICTION EQUATIONS BASED ON BRUCE MAXIMAL TREADMILL PERFORMANCE

J. P. Roy, *M. T. Richardson and *J. F. Smith. Dept. of Human Performance, Judson College, Marion, AL 36756, *The University of Alabama, Tuscaloosa, AL 35487

The laboratory test generally regarded as the best measure of cardiorespiratory endurance is the direct measurement of oxygen uptake during maximal treadmill exercise ($V0_{2max}$). Of the treadmill protocols, the Bruce is by far the most commonly used. Stepwise multiple regression analysis has been used to develop predictive equations for $V0_{2max}$ from performance time (time) on the Bruce protocol. The purpose of this study was to determine the most accurate prediction equation for determining $V0_{2max}$ in 30 healthy young men aged 20 - 35 years. The accuracy of three population-specific and one generalized prediction equations were studied: 1) $V0_{2max}$ [ACTIVE] (ml/kg/min) = 3.778 (time) + 0. 19, 2) $V0_{2max}$ [SEDENTARY] (ml/kg/min) = 3.298 (time) + 4.07, 3) $V0_{2max}$ [HEALTHY) (ml/kg/min) = 3.88 + 0.056 (time) (Bruce et al., 1973) and 4) $V0_{2max}$ [GENERALIZED] (ml/kg/min) = 14.76 - 1.38 (time) + 0.451 ($time^2$) - 0.012 ($time^3$) (Foster et al., 1984). $V0_{2max}$ (mean _ SD, 49.10 _ 13.00 mllkg/min) was assessed by open circuit spirometry using the Bruce protocol. R^2 and SEE values were calculated using a SAS program to cross validate the 4 predictions models with Bruce $V0_{2max}$ data. Results were as follows:

	Predicted $V0_{2max}$ (ml/kg/min) Mean ± SD	R^2	SEE (ml/kg/min)
ACTIVE	44.80±7.46	0.68	7.46
SEDENTARY	43.01±6.51	0.68	7.46
HEALTHY	43.55±6.63	0.68	7.46
GENERALIZED	41.68±8.22	0.68	7.46

It was concluded that all four prediction equations provide a reasonable estimate Of $V0_{2max}$ (68% of variance predicted) and although all the equations tended to underpredict measured $V0_{2max}$, there was no difference in predictive accuracy between the equations.

P30

EFFECTS OF ACTIVE AND PASSIVE WARM-UP ON RPE AND HIP RANGE OF MOTION

D.L. Wenos & R.E. Koslow. Dept. Health Sciences, James Madison University, Harrisonburg, VA 22807

The purpose of this study was to determine the acute effects of active and passive warm-up on proprioceptive neuromuscular facilitation (PNF) and ratings of perceived exertion (RPE) during hip joint range of motion (ROM). To date no studies have reported using metabolic indices to control intensity or duration of warm-up prior to stretching during PNF stretching. Borg's 10 point RPE scale was used to rate discomfort during the stretch phase of the PNF (slow-reversal-hold) technique. In this study, two active warm-up treatments (WT) were used as relative metabolic indicators of muscle temperature across individuals during treadmill running: 1) achieving an RER of 1.00, and 2) achieving 60% of heart rate reserve (HRR). Once the criteria of both of these treatments were met, subjects continued to run for an additional 3 minutes. Hydrocollator pads (HP) served as the passive warm-up treatment. These treatments and a control(C)were randomly assigned to increase hamstring muscle temperature of the dominant leg. WT were administered to twelve active, injury-free males (mean 25.3 yrs) with a minimum of 24 hours interspersed between each treatment. A timed PNF maneuver was conducted after each WT. ROM measurements were conducted immediately after PNF stretching and for successive intervals of 1, 5, 10, and 15 minutes. RPE feedback was solicited for the same time intervals as the ROM measurements. Average ROM did not significantly decline ($p > .05$) from the first measurement interval (105.4∞) to the last interval (101.3∞) within WT. There were no significant differences ($p > .05$) in ROM or RPE measurements taken prior to PNF stretching. Tukey's tests ($p < .05$) showed ROM for RER (107.4∞) was greater than all other treatments. ROM for HRR (102.8∞) and HP (103.4∞) did not differ from each other but were greater than C (98.8∞). Average heart rate monitored during the RER treatment was 70% of heart rate reserve. RPE was lowest for RER (4) and highest for C (8.5). RPE for HRR (6) and HP (6.5) were similar. In conclusion, an active warm-up prior to PNF stretching appears to be the most effective treatment to increase ROM. RPE results reinforce that active warm-up reduces the resistance to stretch. In a field setting, it is estimated that a warm-up of 70% of HRR would duplicate the muscle readiness equivalent to an RER of 1.00 prior to PNF stretching.

P31

THE USE OF THE TRANSTHEORETICAL MODEL AND EXERCISE BEHAVIOR

D. Williams and J.S. Hallam. Dept. of Health, Human Performance, and Recreation, Waco, TX 76798

The United States Department of Health and Human Services specifically identifies post secondary institutions as settings where young adults should be targeted for exercise promotion. One approach to exercise promotion programs is to design stage-based exercise promotion programs based on the Transtheorectical Model. The effect these types of programs have on the exercise behavior of college students is not known. The purpose of this study was to examine the use of the Transtheoretical Model processes and exercise stages of change in college students. Data were collected on 708 students and the resulting sample size was 699. All data collection instruments had established validity and reliability. Analysis of variance was used to assess statistical significance in the use of the ten processes of change between selected stages of change. The results show statistically significant differences in four of the ten processes between the selected stages of change ($p=.001$). The four statistically significant processes were consciousness raising, counterconditioning, reinforcement management, and self-liberation. The authors conclude that the Transtheoretical model has limited use in the development of exercise promotion programs for all stages of exercise for this sample.

P32

A COMPARISON OF RESPONSES TO TWO BACKPACK STYLE HYDRATION SYSTEMS DURING SIMULATED HIKING

L. McManus, P. Reneau. Exercise & Sports Sciences Department, Tennessee Wesleyan College, Athens, TN 37303

The purpose of this study was to compare HR, RPE, Thermal Sensation, and Comfort of wearing two different backpack style hydration systems. Seven subjects (age=22.6±3 yrs;ht=176.0±10.2 cm;wt=71.6±11.3 kg) participated in two one-half hour work bouts while wearing either a camelback (CB) or GIAI (GA) hydration system. Each work bout consisted of walking on a treadmill at a speed of 107.2 m/min (4 mph) and a 3% grade. HR, RPE, Thermal Sensation (0.0 very cold to 8.0 scale very hot), and Backpack System comfort (0.0 very uncomfortable to 5.0 very comfortable) were recorded every 5 min. Subjects could drink fluid from each system ad libitum but were also asked to drink from each system every 5 min. Additionally at the conclusion of each test subjects were asked to answer a questionnaire about the comfort of the system worn for that work bout. A repeated measures ANOVA was performed on all data. No significant difference ($p>.05$) was found between the CB & GA for HR, RPE, or Thermal sensation at any interval. Fluid intake (CA=193±90 ml; GA=202±110 ml) was also found to be not significantly different ($p>.05$). Comfort of each system was found to be significantly different ($p<.05$) at the 5^{th} (GA=3.7±0.49; CB=3.1±0.45), 10^{th} (GA=3.7±0.49; CB=3.1±0.45), and 15^{th} min (GA=3.7±0.70; CB=3.1± 0.45) but not significantly different ($0>.05$) at the 20^{th}, 25^{th}, and 30^{th} min. Subjects responded to the end of work questionnaire that the GA system was more comfortable to wear. These results indicate that wearing either system gives no physiological advantage concerning HR, RPE, or thermal sensation. But it appears that the GA system is more comfortable to wear.

Supported in part by PI Outdoors.

P33

VALIDATION TRIALS OF A SENSORMEDICS VMAX 229 METABOLIC MEASUREMENT SYSTEM

E.L. Buckalew, C.J. Tanner. Dept. of Exercise and Sport Science, East Carolina University, Greenville, NC 27834

One validation and three comparison studies were performed on the Sensormedics Vmax 229 Metabolic Measurement System (Vmax) with all subjects tested on an electronically braked cycle ergometer. *Study 1* compared the Vmax with two previously validated Sensormedic 2900 Metabolic Measurement Systems (2900) in Mixing Chamber (MC) mode at two submaximal workloads and at V02 max. It was found that the Vmax under-predicted $V0_2$ 10 to 20% and over-predicted RER 15 to 20% on average when compared to the 2900's (N=8). Installation of a new $C0_2$ module, $FI0_2$ line and new software preceded *Study 2*, which endeavored to validate the Vmax, in Breath by Breath (BXB) mode, against simultaneous Douglas Bag collection at three submaximal workloads. It was found that the Vmax over predicted $V0_2$, VE, RQ, and $FEC0_2$ values by 17.8, 13.8, 20.2, and 3 5.5%, respectively, at the lowest workload and under predicted $V0_2$ by 8.2% at the highest workload (N= 10). Following new Beta-software for the Vmax, *Study 3* compared the Vmax in BXB mode simultaneously for expired gases with a previously validated 2900 in MC mode at five submaximal workloads and at $V0_2$ max. It was found that the Vmax over predicted $V0_2$, RQ, $FECO_2$, $FIC0_2$, by 37.6, 6.8, 40.8, and 68.7%, respectively, at the lowest workload but were comparable (±5%) at the highest workload (N=6). After replacing the Vmax computer, 0_2 and $C0_2$ gas analyzers, and installing another beta-software revision, *Study 4* compared the Vmax with one of the 2900 systems, both in MC mode, at four submaximal workloads and at $V0_2$ max. The systems were statistically identical ($P<0.05$) for VE, $V0_2$, $VC0_2$, $FE0_2$ and $FEC0_2$ based on correlation and regression analysis (N=9). At this time we must conclude that BXB mode in the Vmax may not be suitable for a setting with a diverse range of performance measure needs. However, the latest study compares our newest version of the Vmax system, in MC mode, favorably with our trusted 2900 system. These series of studies support the growing awareness that blind faith in the validity of metabolic measuring systems, may be just that, blind.

P34

EFFECTS OF STRETCHING ON REACTION TIME IN COLLEGIATE FEMALES

D. W. Mesaros and W. K. Guion, Human Performance Laboratory, Department of Health and Kinesiology, Georgia Southern University, Statesboro, GA 30460

The specific benefits of pre-exercise stretching routines have been controversial. The purpose of this study was to determine if reaction time (RT) was influenced by low intensity, short duration stretches. Test participants were 30 active, college female students (M = 20.93±1.34 years) with normal vision or vision corrected to a minimum of 20/40. All participants were instructed and given practice on the Visual Choice Reaction Time Apparatus (VCRTA). Using their dominant-hand, a baseline reaction time (RT) was obtained by taking the average of three trials. Participants then completed 2-3 minutes of low intensity walking followed by 2 sets of 12 static stretches after which (RT) was reassessed following the same protocol as the baseline measurement. The mean for pre (RT) was .511±.057 while the post (RT) was .470± .053. T-test results indicated significant improvement in (RT), $p<.000003$. These results suggest that low intensity, short duration stretching may decrease reaction time and potentially better prepare participants for athletic performances. In addition, improved (RT) has been linked to decreases in injuries in select populations.

P35

MECHANICAL RESPONSE TISSUE ANALYSIS (MRTA): A PILOT STUDY TO RELIABLY ASSESS BENDING STIFFNESS (EI) OF THE HUMAN TIBIA

R.A. Thorne, T. W. Chittenden, A. S. Kaleth, D. F. Wootten, W. K. Ramp, W. G.Herbert. Health & Exercise Science Laboratory, Department of Human Nutrition, Foods & Exercise, Virginia Tech, Blacksburg, VA 24061

This presentation will describe the MRTA and a protocol to assess EI in the human tibia. Assessment of bone status has traditionally relied on absorpitometry and/or biochemical markers of bone turnover. MRTA is a newer technology for assessing the maximal bending stiffness of long bones. The key MRTA variable, EI, is the product of Young's modulus of elasticity and cross-sectional moment of inertia. EI quantifies a physical property in bone associated with its macro- and micro-architecture. In vivo scores for EI in the tibia of non-human primates correlate with fracture threshold in this same bone, when placed under stress in vitro [Roberts et al. J Biomech 1996 Jan;29(1):91-8]. Published human research relating bone stiffness to physical activity has been limited to the ulna. However, the tibia is centrally involved in many human activities and its EI may have implications for understanding bone remodeling and exercise-related clinical problems, e.g. stress fracture of the lower leg. No studies have been published to demonstrate the reliability of serial EI measurements in the tibia. We adapted the ulnar EI protocol of McCabe et al. [J Bone and Mineral Res. 1991;6(1):53-59] to assess tibial EI. Preliminary experience confirmed the importance of placement and pressure of the vibrating probe at the midpoint of the tibial long axis. Assessment of intra-trial reliability (five repeated trials, n=16) yielded high r values for EI (= 0.96). Variations among intra-trial sample means were small (less than ± 2.5 % from the overall mean for five trials). With careful attention to subject and probe positioning, reliable measurements of tibial bone stiffness may be obtained.

P36

PROPRIOCEPTIVE NEUROMUSCULAR FACILATATION CAUSES DIMINISHED MUSCLE ACTIVITY DURING RESPONSE TO RAPID LENGTHENING IN THE HAMSTRINGS

A.M. Carter, S.J. Kinzey, L.F. Chitwood, and J.L. Cole. Department of Exercise Science & Leisure Management, The University of Mississippi, University, MS 38677.

Stretching is commonly prescribed to prevent injury, prevent muscle soreness, prevent restricted range of motion, and enhance athletic performance. Researchers commonly address the effects particular modes of stretching on range of motion and performance. Proprioceptive neuromuscular facilitation (PNF) techniques cause the greatest improvements in joint range of motion in the shortest amount. This might be due to PNF causing an overall diminished muscular response to a sudden stretch. Twenty-four (24) females were recruited for participation (Mean HT=167.27 cm; WT=58.92 kg; AGE=21.42 yrs; %BFAT=18.41%; BMI=21.06 kg/m2). Subjects were assigned to two different groups (control, experimental). The testing session began when the subject was positioned on an apparatus that caused a sudden stretch of posterior thigh musculature. During the rapid stretch, muscle activity of the biceps femoris and semitendinosus was measured by surface EMG. Subjects in the control group rested for five minutes before the final bout of testing. The other subjects were stretched using the agonist contract/relax PNF technique three times before their final bout of testing. Each testing bout consisted of three rapid stretches. The subjects were unaware of the onset of the sudden stretch and all values from each trial were averaged. PNF in the biceps femoris caused a decrease in the muscle activity (0 - 120 ms post stimulus) in response to a sudden stretch ($F(1,22)=4.50$; $p = 0.04$). This decrease in muscle activity is likely due to acute desensitization of the muscle spindle. Desensitization of the muscle spindle imposes a greater risk for muscle and tendon injury. Finally, using this PNF technique prior to competition could be problematic especially if a reflexive activity is warranted.

P37

MYOELECTRICAL COMPARISON OF QUADRICEP AND HAMSTRING ACTIVITY WHILE PERFORMING ELLIPTICAL EXERCISE, WALKING AND BICYCLING

Barney F. LeVeau* Wendy D. LeVeau, and H.S. O'Bryant, Georgia State University, Atlanta, GA 30303* and Appalachian State University, Boone, NC 28608

The purpose of this study was to compare the electrical activity of five muscles, [rectus femoris (RF), biceps femoris (BF), vastus lateralis (VL), vastus medius (VM), and gluteus maximus (GM)] while walking on a treadmill (TM), using a stationary bicycle (BK) and producing forward motion on the elliptical device (CT). The subjects were 15 physically active, apparently healthy women (Mean ± SD: age = 26.9 ± 5.6y, height = 168.7 ± 5.5cm, body mass = 59.6 ± 7.9kg) with no previous musculoskeletal problems of the lower limbs. Electromyography (EMG) was used to determine the magnitude and timing of the muscular activity while performing on each of the exercise devices. The peak electrical activity (PEMG) for each muscle was normalized for a maximum voluntary isometric contraction. These data were averaged across three consecutive, consistent cycles to characterize a typical cycle pattern for each mode of exercise. An ANOVA was used to compare the percentage values of the three activities for each specified measurement (p=0.05) followed by a post hoc using Student-Newman-Kuels. The results show that the BF produced significantly higher PEMG during TM activity (44.7 ± 40.9%), while having similar PEMG for the CT (23.3 ± 12.8%) and BK (21.9 ± 15.7%) exercises. The PEMG for the GM was greatest during the CT (19.6 ± 25.4%). The BK and TM produced similar PEMG in the GM, (13.6 ± 5. 1 % and 13.3 ± 3.9%). The RF produced a significantly higher PEMG during the CT (42.7 ± 25.4%) than the BK (21.0 ± 12.9%) or TM (16.0 ± 12.8%). The VL and VM showed similar results during all three exercise modes. In general, performing on the CT produced greater PEMG in the GM and quadricep group than the TM and BK.

P38

EMG ANALYSIS OF TRUNK AND LOWER EXTREMITY MUSCULATURE IN TENNIS GROUNDSTROKES

S.K. Schiff, T.L. Uhl, B. Zeller, T.J. Chandler, and W.B. Kibler, Lexington Sports Medicine Center, Lexington, KY 40504

This preliminary descriptive study evaluated EMG activity of dominant (D) and non-dominant (ND) erector spinae (ES), rectus abdominis (RA), external oblique (ED), gluteus medius (GM), rectus femoris (RF), and biceps femoris (BF) in forehand and backhand strokes of 6 male (age=l6±0.89, wt=159±28.7) and 8 female (age=14.75±0.89, wt=127±15.68) junior elite tennis players. The data were collected from surface EMG through a telemetered system while the players hit fed tennis balls on a regulation tennis court. The study demonstrated simultaneous activity of multiple muscles in the trunk and lower extremities between 200 and 100 msec prior to ball impact, during acceleration of the body and racquet into the ball. All muscles except RA were minimally to moderately active in this activity. However, there was a gender difference in mean peak activity of several muscles in the strokes. In the forehand, males had twice as much activity in D-BF, D-ES, and ND-GM, suggesting more leg and trunk drive around a stable plant leg. In the backhand, males showed greater activity in D-BF, D-RF, and ND-EO, indicating females are more forward and are using the trunk and upper body to generate force. In tennis, force generated in the legs and trunk is key to successful strokes. This study provides baseline data on muscle activation sequences and introduces possible gender differences in activation, both of which can be subjects for further study.

P39

INFLUENCE OF MAGNETIC INSOLES ON SUBJECTIVE RATINGS OF MUSCLE SORENESS

H.H. Holmes, J.M. Green, P.A. Bishop, J.R.McLester Jr, The University of Alabama, Tuscaloosa, AL 35487, Western Kentucky University, Bowling Green, KY 42101.

Magnetic therapy has recently increased in popularity due to proposed benefits such as decreased pain and improved circulation. However, scientific research supporting magnetic therapy is sparse. We examined the effects of magnetic insoles on subjective ratings of muscle soreness over a 5 day period. In a double-blind design, volunteers not currently strength training were randomly assigned to a placebo (PL) (n=4) or a treatment (MAG) (n=4) group. To induce soreness, subjects completed 20 sets (10-12 reps) of calf raises at 75% of their pre-determined maximal workload. Magnetic insoles or identical placebos were then custom-fitted and placed in subjects' shoes to be worn for 5 consecutive days. Subjects rated their soreness (scale of 1-10) in the A.M. and P.M. each day. Between-group comparisons were made using an ANOVA. Soreness ratings were not significantly different (p = .96) between PL and MAG at any time point for any (A.M. or P.M) ratings (See Table). Results suggest that magnetic insoles do not decrease subjective ratings of muscle soreness.

	Day	1	2	3	4	5
A.M.	MAG	N/A	5.0 (±1.0)	7.7 (±0.7)	6.1 (±1.2)	4.3 (±1.6)
	PL	N/A	4.6 (±1.6)	5.9 (±3.0)	4.1 (±4.2)	2.2 (±2.7)
P.M.	MAG	2.9 (±2.8)	6.2 (±1.1)	6.1 (±2.3)	5.0 (±0.7)	1.6 (±1.0)
	PL	2.0 (±2.5)	6.1 (±0.6)	4.6 (±3.7)	3.6 (±4.2)	1.3 (±2.0)

P40

EFFECTIVENESS OF ASSESSING NUTRITIONAL KNOWLEDGE USING THE WORLD WIDE WEB

A. R. Wood, F. D. McConnell, S. H. Colclough, and P. D. McClellan. Department of HPERS, Middle Tennessee State Univ., Murfreesboro, TN 37132

The purpose of this study was to compare nutritional knowledge obtained from surveying undergraduate college students using the World Wide Web (WWW) or a computerized bubble answer sheet in a classroom. A previously validated instrument that included questions based upon (1) information commonly taught in basic nutrition classes and (2) nutrition information of specific interest to athletes was administered to each group. One hundred undergraduate exercise science (n= 52), and physical education (n= 48) majors were randomly assigned to a classroom or WWW treatment. Complete data were obtained for 44 subjects surveyed in the classroom (mean age = 23.14 ± 4.15 yr) and 42 using WWW (mean age = 22.64 ± 5.84 yr). The difference between correct responses in the WWW group (mean = 70.19± 25.16%) and classroom group (mean = 63.15 ± 22.00 %) was not significant (t = 1.37 p > .05). Means and standard deviations for data collected in the classroom related to questions on specific nutritional topics were carbohydrate (60.85 ± 16.57%), fat (67.76 ± 5.51%), protein (50.57 ± 22.13%), sports nutrition (85.23.15 ± 8.32%) and vitamin (57.39 ± 21.67%). In the WWW group the correct responses were carbohydrate (69.25 ± 19.13%), fat (71.13 ± 11.98%), protein (60.74 ± 11.72%), sports nutrition (88.80 ± 4.76%) and vitamin (47.02 ± 38.06%). None of the differences between groups were significant. In conclusion results from surveying nutrition knowledge of undergraduate college students using the World Wide Web are similar to those obtained using a traditional classroom survey technique.

P41

COMPARISON OF CALORIE, FAT, CARBOHYDRATE, AND PROTEIN INTAKE IN MALE VERSUS FEMALE COLLEGE STUDENTS

T.V. Seibles and C.M. DeWitt. Exercise Science. University of South Carolina Aiken, Aiken, SC 29801

The objective of this investigation was to compare the total calorie intake, as well as fat, carbohydrate, and protein consumption in male versus female college students. As part of a Nutrition and Exercise Science course, college students were asked to record their intake of calories, fats, carbohydrates, and proteins for a 24-hour Weekday period. For this investigation, data were collected on 21 males and 21 females. Each student received information on how to interpret food labels. For male subjects the average calorie intake for the 24-hour period was 2141 C, fat intake was 59 g, carbohydrate intake was 151 g, and protein intake was 58 g. For female subjects the average calorie intake for the 24-hour period was 1924 C, fat intake was 55 g, carbohydrate intake was 170 g, and protein intake was 42 g. The Student t-test was used to determine probability levels for intergroup differences in mean values. For calorie intake, fat intake, and carbohydrate intake, no significant difference ($p > 0.05$) existed between groups. However, males consumed a significantly greater ($p < 0.05$) quantity of protein compared to their female counterparts.
Conclusion: University of South Carolina Aiken Nutrition and Exercise Science males consume more protein versus females in a diet that is calorically similar.

P42

ANDROSTENEDIOL AND ANDROSTENEDIONE USE ON BODY COMPOSITION IN MEN PARTICIPATING IN A HIGH INTENSITY RESISTANCE TRAINING PROGRAM

G. Dominick, J. Quindry, K. Brittingham, L. Panton, J. Breuel, C. Earnest, M. Olson, and C. Broeder. ETSU, James H. Quillen College of Medicine, Johnson City, TN 37614

Fifty males (aged 35 to 65) participating in a 12-week high intensity resistance training program were randomly assigned to one of three groups (placebo (P), androstenediol (diol), or androstene-dione (dione)). This study's purpose was to determine what effects testosterone pre-cursor hormones would have on body composition in combination with resistance training. All subjects completed a comprehensive battery of physical, psychological, nutritional, hematological, and performance measures prior to starting the study. No subject participated in the study if any evidence of heart disease, metabolic disorder, or pretreatment testosterone levels exceeded standard clinical norms. Body composition was assessed using dual-photon x-ray absorption for %body fat, fat weight, fat-free weight, regional and total skeletal muscle mass estimates as described by Heymsfield et al.(1990). In addition, 9-skinfold measurements were taken at the chest, subscapular, tricep, bicep, mid-axillary, supra-iliac crest, abdominal, thigh, and calf. Six circumference measurements were taken including the chest, bicep, abdominal, hip, thigh, and calf regions. All anthropometric measurements were taken as described by Lohman et al. (1988). This studyís result indicated there were no significant body composition changes in any of the groups following the training program. However, the dione group gained 3.6 kg in body weight and this resulted in a 6% relative gain in percent body fat (1.4% absolute gain). In addition, no significant changes in any of the skinfold or circumference measurements were observed. No significant increases in SMM were observed pre to post for any of the groups. Thus, all groups showed a significant gain in strength per unit of FFW or SMM. However, it is important to note that since the skinfold measurements tended to decline (5%) while circumferences slightly increased (1.7%) in all groups, it is possible that DEXA procedures lacked the sensitivity to detect such subtle changes. The lack of body composition change in all groups was not related to a lack of training stimulus, since all groups exhibited highly significant gains in strength during post-measurement testing ($p = 0.03$). In conclusion, diol and dione use did not enhance body composition alterations beyond placebo and the normal neurological adaptations to resistance training that occur in men 35 to 65 yrs old participating in a 12-week high intensity resistance training program.

P43

ENDUROX SUPPLEMENTATION ON SUBMAX AND MAXIMAL CYCLING

J. Golden, L. Gilson, G. Dominick, J. Inglis and C.E. Broeder.
ETSU, James H. Quillen College of Medicine, Johnson City, TN 37614

Ten male volunteers were randomly assigned (double blinded) to either a placebo (Pl) or an Endurox (End) group (n=5 subjects per group). Subjects completed prior to and following three weeks of Endurox supplementation the following procedures: a maximal cycle ergometer trial; body composition using skin-folds, hydrostatic weighting, and bioelectrical impedance; a lactate threshold trial; and, a steady state cycle ergometer ride at 70% of each personís maximal watts based on the max aerobic capacity trial. The results of this study indicated that both groups were very similar in age (Pl = 24.0 yrs ± 2.0 yrs; End = 28.0 yrs ± 8.0 yrs), fat-free weight (Pl = 155.1 lb ± 10.6 lb; End = 149.2 lb ± 17.0 lb), fat weight (Pl = 27.0 lb ± 15.4 lb; End = 27.8 lb ± 15.9 lb), and percent body fat (Pl = 14.2% ± 7.0%; End = 15.3% ± 8.2%). However, the Endurox group was significantly shorter (Pl = 71.5 in ± 0.9 in; End = 69.2 in ± 1.7 in). In regards to maximal aerobic capacity and lactate threshold, there were no significant differences between the groups prior to nor following the Endurox treatment period for VO2max, maximal heart rate, maximal RER or lactate threshold expressed in watts. In addition, three weeks of Endurox supplementation appeared to have no effect on VO2max or lactate threshold as previously reported. During the steady state ride, Endurox supplementation did not significantly change a personís exercising heart rate, oxygen consumption per heart beat, plasma lactate levels, or blood glucose. However, Endurox supplementation did show a consistent trend in lowering RER indicating an increase in fat utilization from 15 minutes on. In conclusion, Endurox supplementation did not significantly alter VO2max parameters or lactate threshold levels as previously reported in commercial ads. However, Endurox did appear to improve a personís ability to utilize fat better during steady state cycling. Thus, these findings suggest Endurox may help delay muscle glycogen depletion or prevent hypoglycemia during steady state exercise and warrants additional testing using a cross-over placebo controlled design and greater subject numbers.

P44

EFFECTS OF ANDROSTENEDIONE ON SEX-HORMONE PROFILES IN MEN (35-65YRS OLD) PARTICIPATING IN A HIGH INTENSITY RESISTANCE TRAINING PROGRAM

J. Inglis, J. Quindry, K. Brittingham, L. Panton, J. Breuel, C. Earnest, M. Olson, and C. Broeder. ETSU, James H. Quillen College of Medicine, Johnson City, TN 37614

Fifty males (aged 35 to 65) participating in a 12-week high intensity resistance training program were randomly assigned to one of three groups (placebo (P), androstenediol (diol), or androstene-dione (dione). The primary purpose of this paper was to determine what effects testosterone pre-cursor hormones would have on sex-hormone profiles in combination with resistance training. All subjects participated in a comprehensive battery of physical, psychological, nutritional, hematological, and performance measures prior to starting the study. No subject participated in the study if any evidence of heart disease, metabolic disorder, or pretreatment testosterone levels above standard clinical norms were observed. Blood samples were taken after a 12 hr fast at pretraining, 1 mo, 2 mo, and posttraining. All blood samples were taken ± 1 hr from the initial blood draw. Androstenedione (andro), DHEAS, total and free-testosterone (TTES and FTES respectively), sex hormone binding globulin (SHBG), estrone, estrogen, lutenizing hormone (LH), and follicle-stimulating hormone (FSH), were measured in duplicate using either ELISA or radioimmuno-assay procedures (Diagnostic Systems Labs). The results of this study indicated that as expected, the dione and diol groups showed a significant increase in serum andro levels (183%) and (62%) respectively after the intervention period. After the 12-week treatment period, no significant changes were observed for TTES, FTES, SHBG, and estrone. However, estradiol significantly increased 92% and 57% for the dione and diol group respectively. In addition, DHEAS was significantly elevated for both groups at the end of the 12-weeks. When data were analyzed on a month by month basis. The dione group showed a significant increase in TTES at 1 mo and 2mo. However, by the end of post-treatment, TTES levels returned to normal. No significant changes in TTES were observed over time for the diol group. In contrast, estrogen was significantly greater in the dione group for all treatment periods while the diol group was greater for only the final measurement period. The results of this study indicates the main effect of oral dione or diol supplementation is a significant increase in estrogen levels, DHEAS, and down-regulation in an individual's testosterone synthesis within 1 month of continuous dione usage.

P45

THE EFFECTS OF A CREATINE-SUPPLEMENTED DIET ON MUSCLE INJURY IN MICE

J.M. Fennessy, G. L. Warren, M. L. Millard-Stafford, Department of Health and Performance Sciences, Georgia Institute of Technology, Department of Physical Therapy, Georgia State University, Atlanta, Georgia

There have been several anecdotal reports that creatine (Cr) the widely used ergonomic aid increases susceptibility to muscle injury. Therefore, the effects of a Cr-supplemented diet on muscle injury were studied in a group of 27 ICR mice. The mice were divided into three groups of 9 matched on their body weight (BW). The groups ingested either a 1% Cr diet (1.767g Cr / kg BW / day), a 0.5% Cr diet (0.850g Cr / kg BW / day), or a 0% Cr diet for 14 days. Susceptibility to injury of the left anterior crural muscles (ACM) was determined by measuring torque production about the ankle for 7 concentric contraction speeds, 7 eccentric contraction speeds, and an isometric contraction before and after the injury protocol was performed. All measurements were made in vivo on an isokinetic servomotor with the contractions being electrode stimulated. The injury protocol consisted of 150 eccentric contractions in order to induce injury in the ACM. In the post-injury testing, a 60% decrement in torque production was observed when averaged over the 15 contraction speeds for all three groups with the highest decrement, over 80%, being observed in the fastest concentric contraction speeds. However, there was no statistical difference between the decrements in torque production in the post-injury testing between the three groups, $p = 0.881$. The difference in muscle weights of the injured (left) limb versus the uninjured (right) limb for the placebo group suggests that Cr might be associated with a reduction in swelling. These results indicate that a Cr-supplemented diet does not exacerbate or promote muscle injury.

P46

KNOWLEDGE OF HIGH SCHOOL CROSS-COUNTRY RUNNERS ABOUT THE FEMALE ATHLETE TRIAD

J.J. Mayo, J.G. Alvarez and A. Lee. Health & Human Performance Department. University of Louisiana-Monroe, Monroe, LA; Delta State University, Division of Health, Physical Education and Recreation, Cleveland MS.

In 1992, the American College of Sports Medicine coined the term 'female athlete triad' to describe the interrelationship between disordered eating, amenorrhea and osteoporosis. Subsequently, efforts have been made to increase awareness in the athletic community. This study surveyed 57 high school cross-country runners (age = 15 ± 1 yr; ht = 162 ± 6 cm; wt = 49.8 ± 10.3 kg) regarding menses, knowledge concerning the female athlete triad, perception of unhealthy behaviors and susceptibility to future health problems like osteoporosis. Results indicated that over the past year, 66% of the subjects menstruated normally. A history of amenorrhea was reported in 26% of the athletes. Forty-six percent felt it was healthy and "ok" to occasionally miss a period. Eighty-one percent of the athletic cohort acknowledged their risk of developing osteoporosis but less than a third (28%) were aware of the relationship between amenorrhea and osteoporosis. Thirty-one percent of the subjects reported being told that weight reduction would improve performance. Also, 17% of the runners surveyed had participated in disordered eating patterns. These data suggest that the Female Athlete Triad continues to be a major health concern among physically active girls. Educational initiatives targeting those who work directly with female athletes (coaches, athletic trainers, and teachers) are essential for the early diagnosis, treatment and prevention of the female triad.

P47

THE ASSOCIATION BETWEEN LIFETIME RUNNING DISTANCE AND RUNNING ECONOMY

M. Craib, R.Whaley, R. Coglianese, and A. Utter. Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC 28608

The bulk of data on trained versus untrained runners suggest that trained subjects are more economical than untrained or less trained subjects. However, it is not known if trained runners (those preparing for a marathon) who differ widely in lifetime running kilometers also differ in running economy. It would appear logical that those with the greater volume of lifetime running kilometers would be more economical (e.g. use less oxygen at any given velocity). Greater experience with running would theoretically optimize the cost of locomotion. To explore this possibility 45 male and 5 female marathon runners were treadmill tested once in the two months before competing in the 1999 Charlotte marathon. Subject characteristics were: Mean +/- SD for age (y) = 41.5 +/- 11.2, height (cm) = 177.5 +/- 7.1, mass (kg) = 75.1 +/- 12.2, body fat (%) = 16.3 +/- 4.8, VO2 max (ml.kg-1.min-1) = 49.7 +/- 6.2, marathon time (hr:min) = 4:18 +/- 0:36, Life kilometers = 24,429 +/- 19,720. After a brief warm up of walking, VO2 in ml.kg-1.min-1 at 2.7, 2.9 and 3.1 m.s-1 was examined in the last minute of each 3-min submaximal speed. VO2 measurements at each velocity were then correlated with estimates of lifetime kilometers run made by the runners. Findings were as follows: at 2.7 m.s-1 r = -0.09, 2.9 m.s-1 r = -0.10 and 3.1 m.s-1 r = -0.11. These results suggest a very weak association between lifetime running kilometers and running economy, yet with a consistent trend towards a lower oxygen cost of running exhibited in the athletes with more running experience. Thus, in this sample, volume of work appears to explain little of the differences observed in submaximal VO2 (> 30% between least and most economical).

P48

EFFECT OF A SINGLE ECCENTRIC RESISTANCE EXERCISE SESSION ON LIPOPROTEIN(A)

R.W. Thompson, P.G. Davis, J.L. Nesbitt, E.M. Smarr, J.R. Burke, K.L. Drowatzky, G.A. Hand, and J.L. Durstine. Dept. of Exercise Science, University of South Carolina, Columbia 29208

Most studies reporting increased plasma lipoprotein(a) [Lp(a)] concentrations in response to exercise have involved high intensity exercise that may have produced skeletal muscle damage. Given the above findings and the findings of increased Lp(a) concentrations following acute myocardial infarction, Lp(a) has been suggested as an acute phase reactant. Assuming that eccentric exercise will result in significant injury to skeletal muscle and an increase in creatine kinase activity, the purpose of the present study was to determine the effect of a single eccentric exercise session on plasma Lp(a) concentration. We hypothesized that skeletal muscle injury would cause an increase in Lp(a). Creatine kinase was used as a marker for skeletal muscle injury. Using the biceps brachii of the non-dominant arm, six males and six females (age 20-39) who did not regularly participate in resistive exercise completed three sets of 35 maximal eccentric contractions (4-second contractions with 11 seconds recovery) with 5 minutes recovery between sets. Blood samples were taken the day before exercise (Day -1), immediately after the eccentric exercise (Day 0), and Days 1, 2, 3, 5, 8, 11, and 14 after exercise. Compared to Day -1 (66 ± 19 $U \cdot L^{-1} \cdot min^{-1}$, mean ± SE) (U=Units), ANOVA with post hoc least squares means showed modestly increased creatine kinase activity on Days 1, 2, 3 and 5 post exercise (150 ± 51, 166 ± 79, 141 ± 56, 163 ± 45 $U \cdot L^{-1} \cdot min^{-1}$; $p<0.05$). However, ANOVA by ranks showed no change in Lp(a) concentration from Day -1 through Day 14 post exercise. These results do not support the role of Lp(a) as an acute phase reactant in response to possible muscle damage resulting from eccentric exercise.

P49

ROLE OF SODIUM CONTENT ON TASTE PREFERENCE AND VOLUME OF FLUID INGESTED WHILE WORKING IN THE HEAT

B. Sirikul, P. Bishop, J. Lasuzzo, and I. Muir. Dept. of Human Performance Studies, The University of Alabama, Tuscaloosa, AL 35487

Prolonged hard activity in a hot environment results in hypohydration since most individuals do not drink enough during exercise/work to replace lost fluids. Hypohydration diminishes performance and increases the risk of heat injury. The composition and palatability of rehydrating beverages are important to promote adequate fluid consumption, and shifts in taste preference during extended exercise might influence rehydration. This study investigated the role of different amounts of sodium in voluntary rehydration in subjects who did a walking and arm curl exercise protocol (300 kcals/hr) in impermeable clothing at 30.1∞ C WBGT. Following a pre-exposure taste test, subjects were allowed to rehydrate ad libitum every 12 minutes of exercise with their choice of plain water, 9.9 mEq/l (LOW), 18.0 mEq/l (MED), or 36.3 mEq/l (HIGH) solution electrolyte-carbohydrate drinks. Pre-exercise LOW was perceived to be more palatable overall than MED and HIGH ($p=0.001$ for both). Post-exercise LOW was more palatable overall than MED ($p=0.017$) and HIGH ($p=0.001$). Addition of sodium to beverages increased the total volume of fluid consumed, and subjects were able to maintain body fluid levels (sweat loss= 1% of body weight). The mean volume of LOW consumed was significantly more than MED ($p=0.0457$) and HIGH ($p=0.0488$), but not significantly more than plain water. However, most subjects did show a preference for a particular beverage (no preference=1, plain water=2, LOW=8, MED=1, and HIGH=2). These results suggest that the addition of moderate amounts of sodium (~9.9 mEq/l) may augment palatability and sustain the thirst drive thereby increasing the amount of fluid consumed during activities in the heat.

O1

RELATION BETWEEN MUSCLE ACTIVATION AND THE SLOW COMPONENT RISE IN OXYGEN UPTAKE DURING CYCLING

M.J. Saunders, E.M. Evans, S.A. Arngrimsson, J.D. Allison, G.L. Warren, and K.J. Cureton Dept. of Exercise Science, The University of Georgia, Athens, GA 30602; Dept. of Radiology, The Medical College of Georgia, Augusta, GA 30303

During constant-rate high-intensity exercise, a steady state for oxygen uptake (VO_2) is not achieved and after the initial rapid increase, $V0_2$ continues to increase slowly. The mechanism underlying the slow-component rise in $V0_2$ during high-intensity exercise is unknown. It has been hypothesized that recruitment of additional muscle may be a contributing factor, but only limited electromyograph (EMG) data are available supporting this hypothesis. The purpose of this study was to determine if there is an association between the $V0_2$ slow component and muscle use assessed by contrast shifts in magnetic resonance images (MRI). The $V0_2$ slow component was measured in 16 subjects during two 15-minute bouts of cycling performed at high and low intensities. EMG and MRI transverse relaxation times (T_2) were obtained following 3 and 15 minutes to determine muscle activity at each intensity. Low-intensity cycling produced no VO_2 slow component, and no increases in muscle activity, except for a small increase ($p<.05$) in the T_2 of the vastus lateralis. During high-intensity cycling, VO_2, T_2 of the vastus lateralis, rectus femoris and whole leg, and EMG of the vastus lateralis rose from 3 to 15 minutes. Percent increases in $V0_2$ and muscle T_2 were related ($r=.63$) during high-intensity cycling, suggesting that the progressive recruitment of additional skeletal muscle fibers may explain a portion of the $V0_2$ slow component.

P50

EFFECTS OF REPEATED EXHAUSTIVE SWIM STRESS ON PAIN TOLERANCE.

P. R. Burghardt, J. M. Davis, H. Stock, Z. Zhao, J. L. Durstine, and G. A. Hand. Depts of Exercise Science, and Pharmacology and Physiology. University of South Carolina, Columbia, SC 29208.

The effect of repeated exhaustive swim stress (RES) on pain tolerance was assessed in 44 male rats. Animals were divided among cage controls (CC), handled controls (HC), and repeated exhaustive swim stressed (RES). Pain tolerance was determined by jump latency (time to jumping) during a hot plate test (HPT). Chronic RES consisted of five consecutive days of 90 minute swim sessions performed twice daily with 2% of the rat's body weight added during the RES. A control HPT (cHPT) was performed on all rats before initiation of training. Twenty-four hours after the training regimin was completed, a post-protocol HPT (pHPT) was performed. Rats were randomly assigned to either 2 doses of dexamethasone (DXA), 2 doses of diazepam (DZP), or vehicle (VEH) to elucidate if changes in jump latency were due to peripheral or central mechanisms. Three HPTs were performed 4 hours apart in all animals. No differences were found between the cHPT and the pHPT for CC rats. RES and HC rats both exhibited a decrease in jump latency after the five days of training/handling compared to cHPT. After the training period, both RES and HC responses were lower than CC responses. Jump latency in HC rats increased during the 4th HPT to a level not different than CCs. Administration of DXA had no effect on jump latency at either 1 mg/kg or 3 mg/kg such that the 4th HPT for RES rats was also not different than CCs. One mg/kg DZP had no effect on jump latency, however, injection of 2 mg/kg DZP resulted in jump latencies significantly lower than CC levels. The response of the HC rats in conjunction with the effect of DZP on RES pain tolerance suggests that the CCs' analgesia is centrally mediated and associated with the anxiety of handling. Further, pain tolerance does not appear to be altered by repeated exhaustive physical stress.

O2

MECHANISMS OF FATIGUE FOLLOWING SHORT-TERM MAXIMAL EXERCISE

J.C. Martin and S.M. Lamb. Dept of Exercise Science, The University of South Carolina, Columbia SC 29208

High intensity exercise has been shown to reduce muscular force and to prolong activation/relaxation kinetics. The purpose of this investigation was to determine if decreases in muscular power following a fatiguing bout of high intensity exercise were more highly influenced by reductions in muscular force or by prolongation of activation/relaxation kinetics. Nine trained cyclists performed maximal cycle ergometery on 145mm and 195mm cycle cranks before and after a fatiguing bout of high intensity exercise. Before fatigue, maximum power produced on the 145mm cranks (1066 +/- 71 watts) was not different from that produced on the 195mm cranks (1061 +/- 80 watts). The power-velocity relationships were similar when velocity was expressed as the product of pedal speed and cycle frequency (PS*f). Following the fatiguing bout, maximum power was significantly ($p<0.01$) reduced for both the 145mm (757 +/- 31 watts) and 195mm (781 +/- 45 watts) cranks. The reduction in maximum power for the 145mm cranks (410 +/- 63 watts) was not different from that for the 195mm cranks (380 +/- 57 watts; $p=0.22$) and the power vs. PS*f relationships were not different ($p=0.17$). These data support the notion that both prolongation of activation/relaxation kinetics and reduction in force contribute to the reduction in maximal power following a fatiguing bout of high intensity exercise. Although the difference was not significant, there was a trend for the power vs. PS*f relationship to be greater for the 195mm cranks in the fatigued state, suggesting that activation/relaxation kinetics may be slightly more affected than force production.

O3

BAR PLACEMENT IN THE SQUAT EXERCISE AND ITS EFFECT ON ELECTROMYOGRAPHIC ACTIVITY IN FOUR LEG MUSCLE GROUPS

V.C. Lewis, R.F. Moss, A. Caterisano, K. Woodruff, T.K. Pellinger, T. Khadra, and W. Booth, Dept. of Health and Exercise Science, Furman Univ., Greenville SC 29613

The purpose of this study was to measure the relative contribution of four superficial leg muscle groups while performing the squat exercise with two different bar placements (high rack vs. low rack). Seven experienced weightlifters volunteered for the study (Mean age = 23.3±3.3). Each subject, using both the low rack (LR) and high rack (HR) positions, performed weighted squats terminating downward motion when the thigh was parallel to the floor. The LR trial involved placing the bar at the top posterior deltoid with the HR placed just off the 7th cervical vertebrae. Foot placement was approximately shoulder width apart with resistance at 100-125% of each subject's body weight which was held constant for both trials. Trials were randomized to eliminate order effect. Following proper skin preparation, electrodes were placed on the belly of four different muscle groups: biceps femoris (BF), gluteus maximus (GM), vastus medialis (VM), and vastus lateralis (VL). Electromyographic (EMG) data were expressed as a percentage of total electrical activity in the four muscle groups tested. The results suggest that HR placement elicits a significantly greater response in the VM (33.1%) than the LR (16.01%) ($p=0.005$). However, LR placement elicited a greater response from the VL (40.62%) as opposed to HR (26.28%) which, though nonsignificant, suggests a possible trend ($p=.101$). BF and GM activity was not significantly different between the two experimental conditions. Many coaches believe that the HR position emphasizes quadriceps muscles over the hamstring muscles. However, the results of the current study suggest that the difference may be more related to which of the Vasti (Medialis or Lateralis) are being emphasized.

O4

THE EFFECT OF WEIGHTED SQUAT DEPTH ON EMG ACTIVITY OF FOUR SUPERFICIAL MUSCLE GROUPS DURING CONCENTRIC CONTRACTION

T.K. Pellinger, A. Caterisano, R.F. Moss, K. Woodruff, V.C. Lewis, W. Booth and T. Khadra, Dept. of Health and Exercise Science, Furman Univ., Greenville, SC 29613

It is a common belief among coaches and trainers that as squat depth increases, the relative activity of the hip extensors begins to increase over that of the quadriceps. The purpose of this study was to measure the relative contributions of four superficial leg muscle groups while performing the concentric phase of the squat at three different squat depths. Seven experienced lifters (mean age =22.3 ±3.3 yr.) performed randomized trials of weighted squats at partial, parallel and full depths, using a constant weight of between 100-125% of their body weight as resistance. Following proper skin preparation procedures, electrodes were placed on the bellies of four different muscle groups: vastus medialis(VM), vastus lateralis(VL), biceps femoris(BF) and gluteus maximus(GM). Subjects placed their feet shoulder width apart and placed the bar in the low rack position in each of the three trials. The resulting EMG data were quantified via integration (IEMG) and expressed as a percentage of total electrical activity elicited from the four measured muscle groups. There was a statistically significant difference ($p=.005$) in the relative contribution of the GM during the concentric stages between the partial (17.36%) and the full (33.39%) depth squats. There was no significant difference, however, between the relative contribution of the BF or the Vasti (VM; VL) at the different squat depths. The results suggest that the GM, rather than the BF, VM, or VL, becomes more vital in concentric contraction as squat depth increases. This information may be useful to coaches and trainers when designing strength programs for athletes, based on the muscle group specific demands of the sport/movement being performed.

O5

UNLOADING ELICITS DIFFERENT ADAPTATIONS IN AGED AND YOUNG MUSCLE FIBERS

W.C. Chandler, A.A. Britt, and M.R. Deschenes. Dept. of Kinesiology, The College of William & Mary, Williamsburg, VA 23187-8795

It is known that reduced neuromuscular activity results in loss of muscle mass, and muscle fiber atrophy. The objective of the present investigation was to determine whether skeletal muscle unloading induced similar alterations in muscle fiber size and composition in young and old animals. 16 young (8 mo) male Fisher 344 rats were randomly assigned to a 4 week intervention of hindlimb suspension, or served as controls. 16 aged (22 mo) male Fisher 344 rats were also equally divided into hindlimb suspension or control groups for a 4 week period. Cross-sections of soleus muscles were stained for ATPase activity to determine muscle fiber profiles (size and type). Our results demonstrate that, irrespective of fiber type, hindlimb suspension evoked significant ($p<0.05$) muscle fiber atrophy in young and aged rats. However, the atrophy was greater ($p<0.05$) in old compared to young animals. In examining cross-sectional areas according to fiber type, it was established that in young rats unloading did not alter the size of Type IIa or IIb/x fibers, unlike in aged muscles where unweighting induced significant atrophy of both Type II subtypes. Similarly, unloading did not affect fiber type composition in young soleus muscles, while aged animals displayed significant increases in the percentage of Type II fibers following hindlimb suspension. Our results demonstrate that the alterations in muscle fiber profile caused by unloading are modulated by age.

Supported by a grant from the Jeffress Memorial Trust

O6

EFFECTS OF FITNESS ON INDUCTION AND RESOLUTION KINETICS OF A MUSCLE METABOLITE OBSERVED BY 1H-MR SPECTROSCOPY

Lesley J. White, Robert A. Robergs, Wilmer L. Sibbitt, Jr. and William Brooks. Clinical and Magnetic Resonance Research Center, University of New Mexico. Department of Exercise and Sport Sciences, University of Florida

Previous research using 1H-MRS in vivo at 1.5 T has identified a new muscle metabolite at 2.13 ppm (peak X) following exercise that has not been observed at rest. The purpose of this study was to measure the generation and recovery kinetics of peak X between trained and untrained subjects to further understand the identity of this new peak. Thirteen healthy males were grouped according to training and VO2max. The trained (n=7) and untrained (n=6) groups had an average VO2max of 5.36±0.54 L/min and 3.48±0.56 L/min ($p<0.05$), and percent body fat of 7.8±2.9% and 18.8±9.5% ($p<0.05$), respectively. Exercise consisted of 45 min of continuous cycling at repeated intervals corresponding to 50% (3 min) and 110% (2 min) of the subject's ventilatory threshold. Spectra from the vastus lateralis were acquired before and after exercise (PRESS, TE 60 ms, TR 2,000 ms, 128 acquisitions) and through 60 min. of recovery. Peak X was observed in all subjects after exercise ($p<0.001$) but was not significantly different between groups ($p=0.75$). There was, however, a significant difference in peak X recovery between groups ($p<0.02$), declining in the trained group ($p<0.05$), but not in the untrained group. Thus, fitness does not appear to impact the magnitude of peak X, but does appear to alter the recovery kinetics. Since peak X is a major muscle metabolite generated by exercise and demonstrates training-sensitive recovery kinetics, the identity of this peak and its relationship to adaptive changes in muscle are critical topics for future research.

O7

EVALUATION OF STRESS FRACTURE RISK FACTORS BETWEEN TWO DISTINCT COLLEGE FEMALE POPULATIONS

W.R. Barfield,* J.F. Otteni, A.M. McBryde, J.S. Carter, and P.J. Nietert
*College of Chas & Dept of Orthopaedics, MUSC, Charleston, SC 29425

Stress fracture is a common clinical finding characterized by tenderness and localized pain. Females appear to be at greater risk than males due to a number of etiological factors including abnormal menses. The purpose of this study was to examine factors believed to predispose females to increased risk of stress fracture in a military college environment and in a flexible college environment. Thirty-six females volunteered to participate in the study (21 at The Citadel {Cit} and 15 from College of Charleston {CofC}). Both groups had baseline and six month follow-up bone mineral density (BMD) and serum hormone values (FSH, LH, 17β-estradiol, sex hormone binding gloublin {SHBG}) measured during fall and spring semesters (1998-99). Our hypothesis was that females at Cit would have greater hormonal changes from baseline values, and a higher percent change in BMD than the control group, CofC. Mean age was 18.95 for Cit and 20.93 for CofC. Mean height and weight for Cit were 65.33 in (+/-2.92) and 136.29 lbs (+/- 21.81) respectively. Mean height and weight values for CofC were 66.20 in (+/- 3.23) and 135.33 lbs (+/- 16.83). Baseline data demonstrate significant differences in BMD at the left hip p=0.046 with Cit females showing a slightly higher mean value (1.04) than CofC females (0.95). Baseline FSH values are also significantly different (p=0.036) with CofC females showing a slightly higher value. There was also a trend toward differences in LH at baseline (0.073) with CofC female values being higher than Cit values. LH values at six month follow-up from baseline showed a trend (p=0.088) toward differences in the two populations. These longitudinal data, though preliminary provide evidence of differing metabolic characteristics that impact-repetitive stress bony injury (ie. stress fracture).

O8

RELATIONSHIP BETWEEN THE FRAMINGHAM CORONARY HEART DISEASE PREDICTION ALGORITHM AND BRACHIAL ARTERY FLOW-MEDIATED DILATION

J.D. Allen, M. Welsch, K. Landry, S.R. Smith, M. Lefevre, and M. Windhauser. Dept. of Kinesiology & Pennington Biomed. Res. Center, Louisiana State Univ., Baton Rouge, LA 70803

Studies have shown coronary heart disease (CHD) risk factors are related to impaired flow-mediated dilation (FMD). Research linking FMD with established epidemiological risk factor composite scores is lacking. This study examined the relationship between CHD risk scores and brachial artery (BA) FMD in 17 men and 31 women without overt signs of CHD (age: 46±1lyr, range: 22-63yr). High-resolution ultrasonography measured BA diameters prior to, during, and immediately following 5min of forearm occlusion. Still images of the vessel in diastole were analyzed. Subjects were tested following 10 min of supine rest. CHD risk scores were calculated using the prediction algorithm developed and validated in 5345 subjects from the Framingham cohort. BA diameters increased from 3.50±0.63mm at baseline to 3.69±0.66mm (p=0.0001) at peak, within 90sec of release (5.82% increase, range: -3.75-17.48%), with no changes in HR and BP. Peak BA FMD was negatively associated with age (r=-0.40; p=0.005), total cholesterol (r=-0.39; p=0.006), LDL (r=-0.394; p=0.006), and systolic BP (r=-0.26; p=0.069). Total risk score (TR) and the 10yr predicted risk (PR) were also negatively associated with peak dilation (r=-0.433;p=0.005 and r=-0.538;p=0.0005 respectively). Further analyses revealed a significant decline in peak BA FMD between tertiles for both TR (p=0.019) and PR (p=0.022). In summary, cross sectional correlative and discrete analyses revealed a significant relationship between predicted CHD risk and impaired BA FMD.

Supported in part by a Grant from the National Dairy Council

O9

EVALUATION OF HEART RATE VARIABILITY AND ITS ASSOCIATION TO PHYSICAL FUNCTION IN PATIENTS WITH HEART FAILURE

C.M. Lee, M. Alomari, T. Parrish, D. Kalb, R. Wood, L. Li, and M. Welsch. Dept of Kinesiology, Louisiana State University, Baton Rouge, LA

Heart rate variability (HRV) and exercise capacity are independent predictors of mortality in patients with chronic heart failure (CHF), but few studies have assessed the relationship between physical function scores and HRV in CHF. Therefore this study compared HRV in 8 CHF and 8 age-matched controls (CON) and its relation to the 6-minute walk test. Additionally, we sought to determine if Eigenvalues (EV) computed from Poincare plots (PP) would detect differences between CHF and CON. Five-minute ECG tracings were collected in a seated position and functional capacity was assessed using a self-paced 6-minute walk test. HRV was evaluated by the standard deviation of normal RR intervals (SDNN), PP, and spectral analysis. In order to quantify PP, EV were transformed using the natural log (1n); 1nEV I representing the long axis and 1nEV2 representing the short axis of the PP. SDNN, the 1n of total power (TP) and low frequency (LF) power were reduced in CHF compared to controls. PP were characterized by a more narrow distribution in CHF compared to controls, with 1nEVI and the area (1nEVI*1nEV2) significantly lower in the CHF group. Furthermore, SDNN (r=0.8), 1nTP (r=0.76), 1n of high-frequency (EF) power (r=0.5 1), 1nLF (r=0.66), 1nEVI (r=0.6), 1nEV2 (=0.57) and 1nEVI*1nEV2 (r=0.66) were significantly ($P \leq 0.05$) correlated with the 6-minute walk test.

	Walk	SDNN (ms)	1nLF	1nHF	1nTp	1nEV1	1nEV2	1nEV1* 1nEV2
CHF	245±45*	23.5±45*	3.2±0.5*	3.4±0.7	4.9±0.3*	7.2±0.3*	5.2±0.5	37.6±4.1*
CON	521±98	54.7±7	5.0±0.3	4.4±0.4	6.8±0.3	8.3±0.2	6.3±0.3	52.0±3.3

*$p \leq 0.05$ vs. CON

These data confirm both time and spectral parameters of HRV are reduced in CHF. In addition, HRV indices including EV are significantly related to physical function. Furthermore, the use of EV to quantify PP appears to differentiate between health and disease. Thus future studies should aim to identify physiological correlates and the predictive value of this parameter. Further studies are needed to examine whether changes in the 6-minute walk test are associated with changes in HRV in CHF patients.

O10

THE EFFECTS OF A MODERATE-INTENSITY EXERCISE PROGRAM ON IMPROVING CORONARY ARTERY DISEASE RISK FACTORS IN PREVIOUSLY SEDENTARY AFRICAN AMERICANS

McCammon; M.R., Moreland, M.R. Hickner, R.C., #Shaw, D.K. and *Poehlman, G.S M.R., Pollock N.W. Human Performance Laboratory and #Department of Physical Therapy and *Department of Family Medicine, East Carolina University, Greenville, NC 27858-4353

Moderate intensity exercise is an effective means of improving coronary artery disease (CAD) risk status in previously sedentary individuals. Unfortunately much of the research on the exercise/CAD relationship has been performed on urban dwelling Caucasians. The purpose of this study was to evaluate the effectiveness of a moderate-intensity aerobic exercise program (<60% of estimated $V0_{2max}$) on improving CAD risk factors in rural African Americans. Eleven subjects (52.4±12.1 yr.) committed to a 12-week (3 days/week) exercise program where participation was actively encouraged by exercise leaders. Following the program exercise sessions were provided for 12-weeks; however, participation was voluntary, without active encouragement. Predicted $V0_{2max}$ improved ($p<0.05$) from 32.0±3.6 to 33.5±2.8 mL.(kg.min)$^{-1}$ pre- to post exercise with improvement maintained through follow-up period. Body fat decreased ($p<0.05$) from pre- to post-exercise (40.9±5. 1 % to 39.1±5.3%); however, it increased ($p<0.05$, 44.2+5.6%) after the 12-week follow-up. Cholesterol, triglycerides, HDLs and LDLs did not change ($p>0.05$). Although modest improvements in selected CAD risk factors occurred during the initial 12-weeks, these improvements were not maintained during the voluntary exercise period. Thus it appears that the lack of active encouragement from the exercise leaders may be partially responsible for the observed degradation in CAD risk status.

Supported by a Grant from the North Carolina Institute of Nutrition

O11

EFFECTS OF EXERCISE AND WEIGHT STATUS ON BLOOD PRESSURE IN MIDDLE-SCHOOL AGED YOUTH: THE CHIC STUDY

R.G. McMurray, J.S. Harrell, S.I. Bangdiwala, S. Deng and C.B. Bradley
Dept. of Exercise & Sport Science and School of Nursing, University of North Carolina, Chapel Hill, NC 27599-8700

This study examined the relationship between blood pressure (BP) and indicators of body fatness and physical activity (PA) levels in 2389, 6th-8th grade youth (12.7±1.0 yrs); 52% females, 48% males, 76.6% Caucasians, and 23.4% African Americans (AA). Blood pressures (BPsys /BPdia) were measured using a random sphygmomanometer, skinfolds (∑SF) were obtained from the triceps and subscapular sites, and PA was obtained using a questionnaire. BP of the males was significantly different from the females (M = 113±11 /64±12 vs. F = 112±11/ 67±10, p = 0.011). Pearson correlations between BPsys or BPdia and ∑SF or body mass index (BMI) were significant (p= 0.0001), ranging ftom r = 0.256 to 0.439. The correlations between BP and PA were significant (p<0.02), but low (r=-0.048 to -0.010). In addition, those youth that regularly participated in high intensity exercise (n=758) had lower BPs than youth that did not participate in high intensity exercise (n=664): 112±11 /63±11 vs. 113±11/ 66± 11). Multiple regression analyses, adjusted for race, indicated that BMI or ∑SF contributed more to the variance than PA (Partial R^2BPsys = 0. 193, BPdia = 0. 067; p = 0.0001). However, the relationship with PA was inconsistent, with over all PA levels being related significantly to BPsys (R^2 = 0.003; p = 0.005), while only participation in high intensity PA was related to BPdia (R^2 = 0.018; p = 0.0001). The results indicate that in youth exercise can contribute somewhat to lower BP, especially BPdia, independent of weight status. Therefore, efforts must be made to advocate exercise programs for all middle school-aged youth.

Supported by grant from NINR/NIH #NR01837

O12

THE EFFECT OF STRENGTH TRAINING ON GLYCOSYLATED HEMOGLOBIN A_{1c} IN ADULTS WITH TYPE 2 DIABETES

E.A. Arnold, J.A. Doyle, C.D. Lancaster, A.R. Oxford, E.J. O'Malley and K.H. Hall.
Dept. of Kinesiology and Health, Georgia State University, Atlanta, GA 30303

The purpose of this study was to determine the effect of strength training on glycosylated hemoglobin A_{1c}, (HbA_{1c}) in adults with type 2 diabetes. Twenty-one patients with type 2 diabetes were recruited and randomly assigned to an exercise or comparison group. Twelve subjects (57.4 ± 7.8 yr.) completed a 3 -month progressive strength training program 3 times per week, while 9 subjects (56.0 + 9.4 yr.) served as the comparison group. HbA_{1c}, muscular strength by one repetition maximum (MS), body circumferences (CIR), body composition by skinfolds (BC), body mass index (BMI), waist-hip ratio (WHR), dietary analysis, and physical activity by survey were assessed in both groups before and after 12 weeks of the intervention. The exercise group showed significant improvements in HbA_{1c} decreasing from 7.4 ± 1. I% to 7.0 ± .87% (p = 0.02) and in MS (p = 0.00), but did not show significant changes in BMI, WHR, CIR or BC. The comparison group HbA_{1c} increased significantly from 7.6 ± 1.2% to 8.1 ± 1.1% (p = 0.01) and there were no significant changes in MS, BMI, WHR, or CIR. However, there was a significant increase in BC (p = 0.04) from pre to post in the comparison group. These results indicate that strength training can improve HbA_{1c} in adults with type 2 diabetes without concomitant weight or fat loss.

Supported by the Hardy McCalman and Warren P. Sewell Foundations and Darnell Assc.

O13

CNS EFFECT OF CAFFEINE AND ADENOSINE ON FATIGUE DURING TREADMILL EXERCISE IN RATS.

Z.W. Zhao, J.M. Davis, J. Buggy, H. Stock, P. Burghardt and G.A. Hand.
Dept. of Exercise Science, and Dept. of Physiology and Pharmacology, University of South Carolina, Columbia, SC 29208

Systemic administration of caffeine has been shown to have ergogenic effects on endurance exercise. A possible mechanism is stimulation of the central nervous system (CNS) via blockade of adenosine receptors by caffeine. However, no studies have specifically addressed the CNS effects of either caffeine or adenosine on endurance exercise capacity. The purpose of the study was to investigate the effects of intracerebroventricular (icv) injection of caffeine and the adenosine receptor agonist, 5'-N-ethylcarboxamidadenosine (NECA) on treadmill run time to fatigue in rats (n=6).Caffeine(200μg), NECA(0.1μg), Caffeine+NECA (200 μg +0.1 μg), or vehicle were administered to rats either icv or intraperitoneally (ip) prior to treadmill running at 20 m/min and 7.5% grade. Run time to fatigue was determined. By comparison with vehicle treatment, the results showed that with icv injection, caffeine significantly increased run time (p=0.033), and NECA tended to decrease run time (p=0.056). Pretreatment with caffeine altered the effect of NECA such that run time in the Caffeine+NECA group was not different from that in the vehicle group (p=0.810). However, run time to fatigue following ip injection was very similar in all drug treatments (n=4, p=0.659). The results of the preliminary study support the hypothesis that caffeine increases endurance capacity by blocking adenosine receptors within the central nervous system.

Partially supported by Student Grant Program of Gatorade Sports Science Institute.

O14

LEPTIN'S MODULATION OF MONOCYTE INFLAMMATORY FUNCTION

K.C. Brittingham, J. Suttle, and C.E. Broeder.
East Tennessee State University - James H. Quillen-College of Medicine, Johnson City, TN 37614

Leptin, a recently discovered satiety factor, is thought to play an important role in the regulation of body weight and metabolism. However, leptin and its receptor (ObR), have also been classified in a family of proteins that modulate immune cell development and function, suggesting a possible immunomodulatory role for leptin. Interestingly, obese individuals often have compromised immune systems. Thus, the purpose of this study was to investigate the effects of leptin on monocyte function in pathogenic and non-pathogenic inflammatory events. The results of this study indicated for the first time that leptin has anti-inflammatory influences on monocyte function. Human peripheral monocytes pretreated with leptin demonstrated reduced inflammatory cytokine production of tumor necrosis factor-alpha (TNFα) and interleukin-I beta (IL-Iβ) after bacterial lipopoly- saccharide (LPS) activation. These reductions in cytokine production resulted from leptin-induced down-regulation of phosphorylated extracellular-signal regulated kinases (ERKs). Both ERK-1 and ERK-2 (ERK1/2) demonstrated reduced phosphorylation. The same reduction in phosphorylated ERK- 1/2 occurred in monocytes activated by a non-pathogenic stimulus, activated T cell membranes, via CD40:CD154 interactions. Leptin had a greater effect on reducing ERK-1 phosphorylation. Furthermore, reductions in monocyte inflammatory responses did not occur due to LPS tolerance or leptin-induced reduction in monocyte CD40 receptor expression. Leptin-induced reductions in moncyte:T cell interactions were also observed as a down-regulatory effect on human primary T cell expression of CD154. These results suggest that leptin plays a significant role in immune cell signaling. Thus, the results of this study may help to account for why obese people, especially those who become leptin resistant, have impaired immune function and significant increases in immune related diseases such as cancer, rheumatoid arthritis, and endothelium dysfunction leading to increases in oxidized LDL and cardiovascular disease.

O15

CONSISTENCY IN REGULATING CYCLING EXERCISE INTENSITY USING RATINGS OF PERCEIVED EXERTION

C.S. Katsanos, K.C. DeRuisseau, R.J. Moffatt, and E.M. Haymes.
Dept. of Nutrition, Food, and Exercise Sciences, Florida State University, Tallahassee, FL 32306

The ability to consistently regulate cycling exercise intensity when it is controlled by ratings of perceived exertion (RPE) was evaluated in nine physically active, mainly recreational cyclists, males (age 27.1±4.4 yr., V02max 52.03±5.8 ml·kg^{-1}·min^{-1}). Subjects performed three cycling exercise trials (TI, T2, T3) on separate days. During each trial subjects exercised at three different intensity-stages according to the following order: RPE of 11, 13, and 15, based on the 20-point Borg scale. During each intensity-stage subjects had three minutes to select, without being able to see, a resistance corresponding to the selected RPE value, while maintaining a constant self-selected cadence. Subjects then had to maintain the selected workrate (kpm·min^{-1}) for the next two minutes, followed by 2-4 min of seated-rest. Repeated measures ANOVA revealed no significant difference ($p>0.05$) in mean workrates (WR) and heart rates (HR), recorded during the same intensity-stage, across the three trials. For both WR and HR correlations were lower between TI and T2 compared to T2 and T3. Specifically, correlation values for WR between TI-T2 vs T2-T3 were: RPE 11: 0.26 vs 0.94; RPE 13: 0.55 vs 0.99; RPE 15: 0.62 vs 0.90. Corresponding correlation values for HR were: RPE 11: 0.68 vs 0.92; RPE 13: 0.74 vs,0.93; RPE 15: 0.71 vs 0.96. These findings suggest that RPE is a reliable tool to regulate exercise intensity during stationary cycling, providing that practice is included.

O16

THE ONSET OF THE $V0_2$ SLOW COMPONENT IS ASSOCIATED WITH INCREASED MOTOR UNIT ACTIVITY

S.E. Bearden, R.J. Moffatt, Florida State University, Tallahassee FL 32306

In abrupt transitions to heavy exercise (above the lactate threshold), a phenomenon known as the slow component has been reported. The term slow component is used because it is both slow to develop and slows the attainment of a steady state if one is achieved at all. The cause of the slow component is unknown, although elevated motor unit recruitment has been postulated. The purpose of this study was to examine the link between motor unit activity and oxygen consumption during abrupt heavy and moderate exercise transitions. Motor unit activity (MUA) was assessed by electromyography over the vastus lateralis, biceps femoris, and gastrocnemius. Gas exchange, using open-circuit spirometry, was measured every breath. Oxygen uptake (VO_2) kinetics were modeled using non-linear regression techniques into the initial fast component and the delayed onset slow component. At the transition from warm-up to moderate exercise both MUA and VO_2 rose quickly and smoothly to a higher steady state. The heavy bouts were more complex. Initially, MUA rose to an elevated level and $V0_2$ rose monoexponentially (fast component) as had occurred in the moderate bouts. However, at ~114 s into the transition MUA rose abruptly by an additional 5% ($p<0.05$) and $V0_2$ began to rise, signaling the onset of the slow component. The additional 5% MUA was converted to a predicted oxygen demand based upon the ratio of the initial EMG increase at the onset of heavy exercise (~14%) and the amplitude of the fast component. This predicted oxygen demand was not different from the observed slow component ($p>0.05$). In conclusion, the slow component is temporally and quantitatively associated with increased motor unit activity. These data suggest that the slow component of oxygen uptake may be caused by a delayed recruitment of motor units, which elevate the oxygen cost of the exercise.

O17

STANDING VS. SEATED SPIN CYCLING AT 65% AND 85% VO2MAX

D. Carroll, D. Johns, and P. Schuler. Dept. of Health, Leisure, and Exercise Science, The University of West Florida, Pensacola, FL. 32514

Introduction: The purpose of this study was to compare metabolic requirements of the seated vs. standing positions when mimicking an uphill climb on a spinning bicycle. Previous research measuring oxygen uptake during uphill climbing on a laboratory treadmill found that a standing climb is less efficient than a seated climb (1). In this study, it was hypothesized that a standing position would be less metabolically efficient than a seated position. Methods: Recreational cyclists, ten males and eleven females, (mean age 25.2+/-4.8 yrs, mean height 170.7+/-10.1 cm, mean weight 71.9+/-10.9 kg) participated in the study. Maximal oxygen consumption (VO2max) (mean 41.13+/-11.61 ml.kg-1.min-1) and maximal heart rate (MHR) (194.57+/-6.60bpm) was determined using a Monarch cycle ergometer to establish exercise intensity (65% and 85% VO2max). On a Schwinn spinning bike, subjects performed three minute segments of seated and standing positions at both 65% and 85% VO2max. Pedaling cadence was held constant at 50 RPM. Expired gas was collected and analyzed every 20 seconds using the portable metabolic measurement system (Aerosport KB1-C). Statistics: Paired sample t-testís were used to determine if there were significant differences between seated and standing climbs at both 65% and 85% VO2max. Statistical significance was set at $p<0.05$. A Bonferroni correction factor was applied (0.05/2) resulting in a p value of <0.025. Results: The average difference between seated and standing oxygen consumption at 65% VO2max was 6.23+/-2.77 ml.kg-1.min-1. The average difference between seated and standing oxygen consumption at 85% VO2max was 6.58+/-4.20 ml.kg-1.min-1. Discussion: The data obtained does support the original hypothesis. It was found that a seated position is more efficient than a standing position at both the 65% and 85% VO2max intensities.
References:1.Tanaka, H, et al. Can J Appl Physiol (2): 149-54, 1996.

O18

PHYSIOLOGICAL RESPONSES TO CYCLING DEPEND UPON PEDALING CADENCE DESPITE CONSTANT EXERCISE INTENSITY

J.C. Weinlein, R.W. McCoy, B.M. Turner, P.T. Buffington, and M.R. Deschenes.
Dept. of Kinesiology, The College of William & Mary, Williamsburg, VA 23187-8795

The aim of the present study was to determine whether different rates of pedaling would elicit disparate physiological responses to cycling exercise when intensity did not vary. Ten healthy, untrained men (20.6±0.4 yrs, 174.9±1.3 cm, 72.9±3.6 kg; mean±SE) performed two sessions of cycling at 50-55% of their predetermined peak oxygen consumption (VO_2). One session was conducted at a cadence of 40 rpm, and the other at 80 rpm. Rectal temperature (T_{re}), heart rate (HR), blood pressure (BP), and plasma lactate were measured before, during, and up to 15 min following exercise. T_{re} responses were similar during both exercise conditions, yet the post-exercise decrease in T_{re} was more pronounced ($p<0.05$) after the 40 rpm compared to the 80 rpm test. BP values were equally elevated at 15 min of exercise, but at 30 min of exercise and 5 min post-exercise, HR was higher ($p<0.05$) when pedaling at the slower cadence. During exercise, BP responses were similar under the two conditions. However, during recovery BP remained increased longer following the 40 rpm session than the 80 rpm test ($p<0.05$). Likewise, the significant elevations in plasma lactate were similar during the two exercise sessions, but persisted longer into the recovery period after pedaling at 40 rpm, compared to the faster cadence ($P<0.05$). These data suggest that even when relative intensity (% peak VO_2) is held constant, physiological responses to cycling exercise can vary according to pedaling cadence.

Supported by a grant from the Borgenicht Program for Aging Studies and Exercise Science

O19

EFFECTS OF BRIEF NEONATAL INJURY ON PAIN SENSITIVITY IN ADULT RATS

I.J. Smith, A. Hawkins, and C. Cleland. Department of Biology and School of Kinesiology and Recreation Studies, James Madison University, Harrisonburg, VA, 22807

Previously our laboratory showed that brief, neonatal inflammatory injury caused by the injection of carrageenan (CAR) or Freund's adjuvant (FA) to the rear paw of rats resulted in a permanent change in pain perception. Surprisingly, CAR produced a long-lasting decrease in pain sensitivity (hypoalgesia), while FA caused an increase in pain sensitivity (hyperalgesia). The purpose of this study was to determine if a third treatment, mustard oil (MO), causes a long-lasting increase or decrease in pain sensitivity. Rats (n=70) were ramdomly assigned to treatment or control groups that received subcutaneous injections (10 microliters) in the hind left paw on the first, fourth, and seventh days following birth. The treated rats received 0.1%, 0.5%, and 1% MO injections and the control group received saline injections. After reaching adulthood (8 weeks), heat sensitivity in the treated versus the untreated paw was compared by applying radiant heat to the bottom surface of the paw and measuring latency to withdrawl as the measure of sensitivity. Rats treated with 0.5% MO, but not 0.1% or 1%, withdrew their paws faster (0.40 s) than control treated rats ($p=0.01$). These results suggest that, in rats, brief neonatal inflammatory injury may cause permanent hyperalgesia. Because the hyperalgesic effects of MO are greater than that of FA, MO should be used in future hyperalgesia investigations rather than FA.

O20

STEADINESS OF SUBMAXIMAL ISOMETRIC QUADRICEPS MUSCLE FORCE IS SIMILAR IN YOUNG AND OLD ADULTS

S. Beam, D. Tunnel, J. Moody, J. Davis, P. DeVita, and T. Hortobágyi, Dept. of Exercise and Sport Science, East Carolina Univ., Greenville, NC 27858

Recent experiments on human upper extremity muscles suggested that elderly subjects are less steady than young adults in producing submaximal dynamic forces whereas no differences occurred in isometric force steadiness (e.g. Galganski et al.J. Neurophysiol. 69:2108, 1993). To expand on these findings, the purpose of the present work was to compare steadiness of quadriceps force production in elderly (age 72, n = 28) and young (age 20, n = 9) subjects. Subjects were instructed to produce steady 5-s isometric knee extension force at ~25 N using biofeedback from the Kin-Com dynamometer's computer monitor. The knee was at 45° flexion and after ~5 practice trials data were recorded for 5 trials. Six measures of steadiness were the standard deviation and the coefficient of variation of the force fluctuation over the initial 1st s, the middle 3 s, and the entire 5 s of each trial. Nine elderly subjects were re-tested 10 weeks after the initial test and the paired t-tests revealed no significant changes in any measures of steadiness ($p > 0.05$). Unpaired t-tests to compare each of the six measures of steadiness between the two age groups indicated no significant differences ($p > 0.05$). Confirming prior isometric steadiness data, age does not affect subjects' ability to steadily produce low level isometric force with the quadriceps muscle. In future studies dynamic force steadiness of lower extremity muscles will have to be determined as well as the role of steadiness may have in elderly people's mobility.

Supported in part by NIA and North Carolina Institute on Aging

O21

THE RELATIONSHIP OF LEG POWER TO FUNCTIONAL TASKS IN OLDER ADULTS

T.A. Miszko and M.E. Cress, Dept. of Exercise Science, The University of Georgia, Athens, GA 30602

Strength is important for living independently. With increasing age, strength and power decrease due to the loss of fast muscle fibers, which makes old muscle slower. This decrease in power may impact physical functional ability. The purpose of this study was to determine the contribution of leg extensor power (LEP) to tasks important for living independently. A bilateral measurement of LEP was conducted on 42 healthy older men and women (mean age = 71.5 $\pm$ 8.55yrs.). Anthropometric measurements (mean height = 168.48 $\pm$ 8.54cm., mean weight = 69.51 $\pm$ 12.40kg.) were measured, as well as selected functional tasks, stair climb, 6-min. fitness walk, and floor sit to rise. Power, (force x distance)/time, was calculated for each variable to create stair power (ST), floor power (FP), and walk power (WP) and Pearson r was determined. Results indicated that LEP was significantly correlated ($p<0.01$) with each functional task, SP $r = .64$ ($r^2 = .41$), FP $r = .81$ ($r^2 = .65$), WP $r = .81$ ($r^2 = .66$). In conclusion, leg power accounted for 64% to 81% of the variance in the performance of tasks important for independent living.

Supported by the UGA Gerontology Seed Grant

O22

SIMILAR STRENGTH GAINS AFTER HIGH AND LOW INTENSITY RESISTIVE TRAINING IN ELDERLY ADULTS

J. Moody, D. Tunnel, P. DeVita, and T. Hortobágyi
Dept. of Exercise and Sport Science, East Carolina University, Greenville, NC 27858

Muscle strength declines with age. Because greater mechanical stimulus of muscles is expected to induce larger gains in maximal strength, we compared the gains in maximal strength after high and low intensity resistive exercise training. Thirty elderly men and women (age 72) were randomly assigned to high intensity (n = 9), low intensity (n = 9) or a non-exercising control group (n = 10). Before and after a 10-week, 30-session, leg press strength training program subjects were tested for maximal effort eccentric and concentric quadriceps contractions at 90 °/s and for isometric strength. Subjects also performed a one-repetition maximum (1RM) test on the Cybex supine leg press machine. The two exercise groups were matched for training volume. There were no significant changes in muscle strength in the control group ($p > 0.05$). The group (high and low intensity) by time (pre-, posttraining) analysis of variance with repeated measures on time revealed no significant interaction terms for any of the strength measures. The between-group differences in gains were 1% in eccentric, 2% in concentric, 3% in isometric, and 11% in 1RM strength ($p > 0.05$). In the two training groups combined there were significant increases in eccentric (20%), isometric (26%), concentric (23%), and 1RM (34%) tests ($p < 0.05$). These data suggest that low intensity strength training may be a viable alternative to high intensity exercise training commonly recommended for maximal strength gains in elderly or individuals with different conditions including osteoarthritis.

Supported in part by NIA and North Carolina Institute on Aging

O23

THE EFFECT OF FOOT STRUCTURE ON POSTURAL SWAY

S.C. Cobb, L.L. Tis, B.F. Johnson, E.J. Higbie. Dept. of Kinesiology and Health, Georgia State University, Atlanta, GA 30303

The effect of foot structure, specifically forefoot varus, on postural sway was investigated in 32 subjects. The subjects had no history of chronic ankle instability or of acute ankle injury within the previous six months. The forefoot varus group consisted of 20 subjects (11m, 9f, age = 29.0 ± 8.4 yrs, ht = 148.1 ± 6.60 cm, wt = 654.0 ± 97.4 N) with > 7 degrees of bilateral forefoot varus. The control group consisted of 12 subjects (5m, 7f, age = 25.8 ± 6.0 yrs, ht = 148.3 ± 7.1cm, wt = 734.9 ± 193.6 N) with < 7 degrees of bilateral forefoot varus. Postural sway assessment consisted of bilateral single limb stance balancing during eyes open and eyes closed conditions on an AMTI Biomechanics Platform sampling at 120 Hz. Standard deviations of the x- and y- axes forces were used to represent mediolateral (M/L) and anteroposterior (A/P) postural sway, respectively. Subjects performed four 5 second trials of each stance and condition. The means of three randomly selected trials for each subject were normalized to body weight and used for data analysis. MANOVA revealed a significant group main effect ($p < .001$) for A/P postural sway scores and a group main effect approaching significance ($p = .051$) for M/L postural sway scores. Forefoot varus group A/P and M/L scores were approximately 21% and 19% greater than the control group, respectively. The results suggest that increased forefoot mobility associated with increased forefoot varus significantly increased A/P postural sway scores. These increased postural sway scores may increase acute lower extremity risk.

O24

EFFECTS OF SPEED AND GRADE ON PLANTAR PRESSURE MEASUREMENTS DURING TREADMILL WALKING.

T.S. Nofal and G.L. Warren. Dept. of Physical Therapy, Georgia State University, Atlanta, Georgia 30303

The purpose of this study was to determine the effect of speed and grade on peak plantar pressure, maximum force, pressure-time integral, and time-to-peak pressure during treadmill walking. College-aged, healthy male subjects (n = 17) participated in the study. The EMED Pedar in-shoe plantar pressure measurement system (Novel Electronics) was used to determine the plantar pressure measurements during 5 different combinations of speed and grade (1.12 to 2.01 m/s, 0 to 10%) of treadmill walking. Court shoes were provided for testing. Differences in the plantar pressure measurements for both feet at all five combinations of speed and grade for 9 plantar regions were tested using a ANOVA with repeated measures. The results of this study indicated that peak plantar pressure and maximum force increased significantly by 14-43% as speed increased from 1.12 to 2.01 m/s in all plantar regions ($P = 0.001$) except for the midfoot, central forefoot, and lateral forefoot. Pressure-time integral decreased significantly by 12ñ31% as speed increased ($P = 0.001$) in all plantar regions except for the medial heel and 4th & 5th phalanges. A reduction of 27-53% in time-to-peak pressure occurred in all regions of the foot as speed increased from 1.12 m/s to 2.01 m/s. However, there was no significant effect of grade on the plantar pressure measurements during treadmill walking. In conclusion, speed but not grade impacts plantar pressure measurements during treadmill walking.

O25

DETERMINATION OF PARAMETERS INDICATING EFFECTIVENESS OF THE FENCING LUNGE

Mark D. Geil, Ph.D., Department of Health and Performance Sciences, Georgia Institute of Technology, Atlanta, GA 30332-0110

Real-time kinematic analysis of fencing has been successfully accomplished in our laboratory using reflective spherical markers; however, the markers preclude a normal fencing bout. An alternative analysis uses recording on videotape at a competition site and subsequent digitization. However, the fencing uniform requires that athletes be covered in primarily white, increasing the difficulty in identifying landmarks for digitization. This investigation seeks to identify a set of parameters that could assess the effectiveness of the fencing lunge, with minimal requirements for digitization. The first parameter used to assess the lunge was the lunge distance, measured from the rear foot lateral malleolus to the front foot medial malleolus. Second, we defined two "effective" lunge distances: the ankle-to-knee distance (rear lateral malleolus to front medial femoral condyle), and the ankle-to-wrist distance (rear lateral malleolus to front radial epicondyle). Finally, we measured the angle of the front shank segment to the ground in the sagittal plane. These parameters were correlated with each fencer's national ranking. Kinematic data from 9 fencers were collected at 120 Hz at the 1999 Division I National Championships. Fencers with higher ranks revealed greater consistency in their lunge patterns. Mean normalized lunge distances were found to be 1.5 times leg length. The fencer with the largest shank angle was able to increase lunge distance by 10%. Fencers with shorter absolute lunge distances compensated with longer effective distances. The parameters proposed adequately characterize the spatial effectiveness of the fencing lunge and are readily obtainable with a minimum of digitization.

Supported by a grant from the United States Olympic Committee.

O26

EFFECTS OF DUTY CYCLE ON MAXIMAL POWER IN HUMAN CYCLING

S.M. Lamb and J.C. Martin. Dept. of Exercise Science, The University of South Carolina, Columbia, SC 29208

Maximal power for in vitro cyclic muscular contraction has been reported to alter with asymmetrical shortening vs. lengthening intervals. Specifically, increasing the ratio of muscle shortening to lengthening interval (duty cycle) from 1:1 to 3:1 increased power, whereas decreasing duty cycle to 1:3 reduced power. The purpose of this study was to determine if manipulating duty cycle could increase maximal human cycling power. Seven trained cyclists performed maximal single-leg cycle ergometery with duty cycles of 1:1, 1.4:1, and 1:1.4. Duty cycle was manipulated by positioning the ergometer sprocket off-center with respect to the crank axle. Maximal power, measured over a complete revolution, was greater ($p<0.05$) for the 1.4:1 duty cycle (657±58 watts) than for the 1:1 duty cycle (630±53 watts). Power produced with the 1:1.4 duty cycle(544±48 watts) was significantly reduced when compared with the 1:1 or 1.4:1duty cycle ($p<0.01$). The increased power produced with the 1.4:1 duty cycle resulted from higher peak power within the cycle and the increased contraction time interval inherent in the protocol. The reduced power for the 1:1.4 duty cycle resulted from decreased peak power and a decreased shortening period. These data demonstrate that maximal human single-leg cycling exhibited similar characteristics to those of previously reported for in vitro cyclic muscle contraction. The single leg model was used during the manipulation of the duty cycle; manipulating duty cycle for bilateral cycling requires a custom designed mechanism to move the cranks independently. Our selection of the 1.4:1 duty cycle was limited by mechanical constraints of the ergometer rather than by physiological limits and may not represent the optimal duty cycle. Future research is required to determine if higher duty cycles can further increase power and if similar results can be obtained during bilateral cycling.

VARIABILITY OF RUNNING AND WALKING AT GAIT TRANSITION SPEEDS

Li Li, Department of Kinesiology, Louisiana State University, Baton Rouge, LA 70803

O27

The purpose of this investigation was to explore the kinematic differences between walking and running in the gait transition region and to compare the variability of locomotion as estimated from stride parameters, joint angles, segmental angles and relative phase between segments. To allow for a comparison between two gait modes, the locomotor speeds of this study were limited to those close to the gait transition region in which people can both walk and run (1.34, 1.52, 1.70, 1.88, 2.06, 2.23 and 2.41 $m \cdot s^{-1}$). Fourteen college-aged subjects were recruited and tested. Results showed that the association between variability and running speed was not as strong as the association between variability and walking speed. Variability of walking presented a quadratic (or close to a quadratic) trend as the speed increased with a minimum near the velocity of 1.70 $m \cdot s^{-1}$. Variability associated with running was greater than walking in most part of gait transition region. Finally, running variability was higher than walking variability at lower speeds, but these differences diminished near the walking to running transition speed (2.41 $m \cdot s^{-1}$). Only analysis of segmental coordination coordination patterns on the basis of the relative phase demonstrated an actual decrease in variability in the running mode and an increase in the walking mode towards the gait transition. The importance of the relative phase analysis for understanding gait stability is discussed.

IMMUNE FUNCTION IN ELITE ADOLESCENT TENNIS ATHLETES

M.D. Austin, D.C. Nieman, M.W. Kernodle, D.A. Henson, G. Sonnenfeld, and D.S. Morton. Dept. of Health and Exercise Science, Appalachian State University, Boone, NC 28608

O29

The chronic response of the immune system to intensive training was measured in adolescent tennis athletes. Resting immune function was compared in 20 elite teenage tennis athletes recruited from the Van Der Meer Tennis Center in Hilton Head, South Carolina, and 18 matched nonathletic controls. Blood concentrations of leukocyte subsets did not differ between athletes and controls except for a slight decrease (16%) in the neutrophil count among the athletes (3.38±0.17 and 4.03±0.24 109 cells/L, respectively, P=0.03), and a 53% elevation in the natural killer (NK) cell count (0.58±0.06 and 0.38±0.05 109 cells/L, respectively, P=0.02). Salivary IgA output, and two measures of T cell function (mitogen-induced lymphocyte proliferation and interleukin-2 production) did not differ between groups. Infection logs (March 1-May 14, 1999) revealed no difference in the number of days sick with upper respiratory tract infections (URTI) among athletes and controls (4.2±0.9 and 6.6±1.7 days, respectively, P=0.226). In general, these data indicate that despite intensive training by tennis athletes (17.6±1.4 h/wk), immune function and incidence of URTI was normal. The elevation in NK cell count is consistent with previous studies in athletes who tend to have an enhanced recirculation and activity of NK cells.

Supported by a grant from the United States Tennis Association.

THE EFFECT OF PEDALING RATE ON QUADRICEP MUSCLE ACTIVATION AND RPE WHILE CYCLING AT CONSTANT EXERCISE INTENSITY

R.W. McCoy, B.M. Turner, and M.R. Deschenes, Department of Kinesiology, The College of William and Mary, Williamsburg, VA 23187

O28

Ten male subjects (20.6±1.2 yrs., 174.9±4.0 cm., 72.9±11.5 kg:mean±S.D.) pedaled an electrically braked ergometer at 40 and 80 rpm while maintaining a relative exercise intensity between 50 and 55% of their predetermined peak oxygen consumption. Surface electrodes were placed over the same locations of the vastus lateralis (VL) and vastus medialis (VM) muscles during both testing days to record the raw electromyographic (EMG) signal during the last 5 min. of a 30 min. exercise. The rectified and integrated EMG signal was normalized for the time of the cycle then averaged over 5 pedal cycles to represent the muscle activation intensity during both the 40 and 80 rpm test days. Results indicated that EMG intensities were significantly less ($p<.05$) for the 80 rpm condition for both the VL (33.3±16.8) and VM (36.4±20.6) muscles as compared to the 40 rpm condition, VL (45.7 ±15.5) and VM (45.2±21.2). The subjects also reported a significantly less Rating of Perceived Exertion (RPE) for the 80 rpm condition (11.6±1.1) as compared to the 40 rpm condition (12.6±2.0). Therefore, at the same exercise intensity a lower RPE for the 80 rpm condition may be due to a shift in the muscle recruitment as indicated by the change in the EMG signal.

EXERCISE INTENSITY EFFECTS ON PLASMA PROTEIN CARBONYLS

A.H. Goldfarb,FACSM, T. You, S. Bryer, S. Landes, & C. Murphy. Exercise & Sport Science Depart. Univ. of North Carolina Greensboro, Greensboro, NC 27402

O30

Males (N=6, 26 yr)cycled for 30 min at 60 and 80% VO2 max to determine if exercise intensity influenced the amount of protein carbonyls (PCs)in plasma as a marker of oxidative-stress. VO2 max's were determined on the cycle ergometer and subjects completed the two sessions in a randomized order. Subjects reported in the morning(12Hrs post-absorptive)and rested for 30 min. An indwelling venous catheter placed in the forearm enabled blood sampling at rest, 25 min of cycling and 10 min recovery. Resting PCs were similar prior to the 60% & 80% cycling, 0.305 +/- 0.136 and 0.334 +/- 0.080 umol/gm protein, respectively. PCs remained unchanged at the 60% workload (0.390 +/- .110 umol /gm protein). PCs were also unchanged during the recovery = 0.280 +/- .130 umol/gm protein. In contrast,cycling at 80% VO2 max increased PCs three fold to 1.09 +/- 0.24 umol/gm protein. PCs were elevated during recovery to 0.603 +/- 0.24 umol/gm protein. There were large variations in PCs from person to person but each subject demonstrated elevated PC at 80% VO2 max. These data indicate that exercise intensity influences the extent of oxidize proteins in plasma as a marker of oxidative-stress. This study further suggests that these oxidized proteins may be transiently elevated in human plasma to indicate oxidative-stress.

O31

THE ACUTE RESPONSE OF THE IMMUNE SYSTEM TO TENNIS DRILLS IN ADOLESCENT ATHLETES

D.C. Nieman, M.W. Kernodle, D.A. Henson, G. Sonnenfeld, and D.S. Morton. Dept. of Health and Exercise Science, Appalachian State University, Boone, NC 28608

The immune and hormonal responses to two hours of intensive tennis drills were measured in 20 adolescent, elite tennis athletes. Three blood samples were collected [pre-exercise (6:30-7:00 am), immediately post-exercise (9:30 a.m.), and 1-h post-exercise (10:30 a.m.)]. At 7:30 a.m., athletes began an intensive 2-h bout of tennis drills, training at a pace that elicited a heart rate of 159±4 beats/min (81±2.4% maximum heart rate), an RPE of 12.8±0.8 (or "somewhat hard"), and a blood lactate of 2.82±0.65 mmol/l. Four-to-five-minute rest breaks were taken every 15 minutes for a total exercise time of 1.5 h. Leukocyte and lymphocyte subset changes following exercise were moderate, with the neutrophil/lymphocyte ratio rising from 1.39±0.08 to 2.54±0.27 immediately post-exercise, and 2.73±0.33 1-h post-exercise. Salivary IgA output decreased moderately (30%) post-exercise before returning to normal 1-h post-exercise. Interleukin-2 production, mitogen-induced lymphocyte proliferation (optimal dose), interleukin-6, cortisol, and growth hormone did not increase significantly following exercise. These data indicate that a 2-h bout of tennis drills is associated with a mild perturbation of immunity.

Supported by a grant from the United States Tennis Association

O32

INFLUENCE OF CARBOHYDRATE ON THE CYTOKINE RESPONSE TO MARATHON COMPETITION.

M. Shute, D.C. Nieman, L. Smith, D.A. Henson, A.C. Utter, and M. Craib. Dept Health & Exercise Science, Appalachian State University, Boone, NC 28608

Strenuous endurance exercise, like trauma, can elicit a pro and anti-inflammatory cytokine response. Previous studies have shown that carbohydrate (CHO) compared to placebo (P) supplementation attenuates the cytokine response to 2.5 h running. The purpose of this study was to examine the influence of CHO versus P supplementation on the cytokine response to a competitive marathon. Fifty runners competing in the 1999 Charlotte Marathon were randomly assigned to CHO or P groups (double blind). Blood was drawn pre-, immediately post-, and 1.5 h post-race. Plasma samples were analyzed for interleukin (IL)-1 beta, tumor necrosis factor (TNF-alpha), gamma interferon (IFN-gamma), IL-1 receptor antagonist (IL-1ra), IL-4, IL-6, IL-8, IL-10, IL-12, and IL-13 using quantitative ELISA sandwich enzyme immunoassays. The data were analyzed using a repeated measures ANOVA, and significant interaction and time effects were set at $p<0.05$. IL-1 beta, IL-2, IL-4, IL-12, IL-13, TNF-alpha, and IFN-gamma did not change over time and/or were non-detectable for most samples. IL-6 and IL-8 (pro-inflammatory), and IL-1ra and IL-10 (anti-inflammatory) increased strongly post-race for all subjects combined. A significant interaction effect was observed for IL1ra, IL-8, and IL-10. The CHO versus P condition was associated with a significantly higher concentration of IL-8 (a neutrophil chemoattractant), while P was associated with significantly higher levels of IL-1ra and IL-10 post-race. In summary, marathon race exertion was associated with an elevation in just two pro- and two anti-inflammatory cytokines, a response similar to that seen following physical trauma, but of less magnitude than in sepsis. CHO attenuated alterations in IL-8, IL1-ra, and IL-10, potentially through its influence on plasma hormone concentrations.

Supported by a grant from the Gatorade Sports Science Institute

O33

THE EFFECT OF MUSCLE GLYCOGEN STATUS ON MUSCLE DAMAGE AND INFLAMMATION FOLLOWING INTERMITTENT, INTENSE EXERCISE

J.Walberg Rankin, H.L. Stevens, L.L. Smith. Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg VA 24061

The purpose of this study was to determine whether initial glycogen status influences indicators of muscle damage (creatine kinase, CK) and inflammation (interleukin 6, IL6) following intermittent, intense exercise. In random order, eight well-trained cyclists did a glycogen depletion ride and were fed a high carbohydrate diet (HC) or a low carbohydrate diet (LC) for 36 h prior to the exercise bouts. They cycled at 125-135% of VO2max (specific intensity depended on their baseline VO2max and Wingate test performance) for 1 min followed by 3 min of unloaded cycling. Exercise was terminated when they fatigued 30% from power in initial interval. Blood samples were taken before, at 15% fatigue, immediately after, 1 h, 2 h, and 24 h post exercise. Muscle biopsies confirmed that initial muscle glycogen was 36% lower in LC than HC. Total exercise time tended ($p = 0.09$) to be longer for HC than LC. HC cycled significantly longer (33.6 vs 18 min for HC and LC, respectively) than LC from the 15% to 30% fatigue point. The exercise bout caused a significant 368% increase in IL6, 39% increase in serum cortisol, and 51% increase in serum glucose at IPE, with no difference in the response between dietary treatments. The overall CK of LC was significantly higher than HC but the modest 54% increase in CK due to the exercise was similar for both treatments at 24 H. In conclusion, performance of high intensity, intermittent exercise was improved by having high initial muscle glycogen. This concentric exercise bout increased indicators of inflammation and damage. Low muscle glycogen did not affect the damage or inflammation response to exercise but caused a higher overall serum CK.

Funded by Gatorade Sports Science Institute

O34

EFFECT OF CARBOHYDRATE SUBSTRATE AVAILABILITY RATINGS OF PERCEIVED EXERTION DURING THE 1999 CHARLOTTE MARTHON.

C. Piccinni, A.C. Utter, J. Kang, R Suminski, E. Chaloupka, M. Craib, R.J. Robertson and D.C. Nieman. Department of Health and Exercise Science, Appalachian State University, Boone, NC 28608

Objective and Methods: The purpose of this study was to investigate the effects of carbohydrate substrate availability on ratings of perceived exertion (RPE) during the 1999 Charlotte Marathon. Forty-nine marathon runners were recruited as subjects. A double-blind study design was used in which subjects ran the marathon, and every 2 miles RPE and heart rate were measured. During the marathon, the subjects in the carbohydrate (C) feeding group ingested a 6% glucose and fructose solution at the rate of a liter per hour, whereas subjects in the placebo (P) group consumed an equal volume of artificially flavored placebo. **Results:** A significant time main effect was found for heart rate (HR) ($P<0.001$), however average HR and % HR max were not significantly different between C and P group. RPE increased over time ($P<0.001$) for both groups combined. Analysis of the group main effect ($P<0.05$) indicated that RPE was significantly lower ($P<0.05$) during the later stages of the marathon for C relative to the P group. **Conclusions:** These data indicate an attenuation in the intensity of exertional perceptions following C supplementation as compared to placebo feeding when competing in a marathon event, of which may be associated with increased carbohydrate substrate availability.

Supported by a Grant from The Gatorade Sports Science Institute and ASU Research Council.

AN ENERGY DEFICIENT DIET REDUCES LEAN BODY MASS BUT NOT PERFORMANCE IN PHYSICALLY ACTIVE MEN AND WOMEN

J.J. Zachwieja, D.M. Ezell, A.D. Cline, J.C. Ricketts, P.C. Vicknair, S.M. Schorle. Pennington Biomedical Research Center, Baton Rouge, LA 70808

O35

We determined the effect of moderate energy restriction on body composition and exercise performance. Physically fit men (n = 13) and women (n = 11) were studied during a 10 d baseline period and after 2 wks of dietary energy restriction (750 kcal/d; n = 16) or energy balance (n = 8). During this 24 day study, exercise energy expenditure averaged 465 ± 5.7 kcal/d and was accomplished through treadmill running at a self-selected pace. Body weight was maintained in the balance group 0.36 ± 0.24 kg), but energy restriction resulted in a weight loss of 1.29 ± 0.16 kg ($p < 0.01$). A majority of this weight loss (61%) came from the lean body mass compartment ($p = 0.09$), and urinary nitrogen excretion tended to be higher in the energy restriction vs. balance group (i.e., 13.2 ± 1.1 vs. 10.4 ± 1.0 grams/d; p 0.16). Muscle strength (leg & shoulder press; 1 repetition maximum) was maintained during the energy restriction period. Muscle endurance, assessed by leg squats to fatigue, and five mile run time were improved ($p < 0.05$ and 0.001, respectively) in all subjects following two weeks of energy restriction or balance. We conclude that short-term (2 weeks) energy restriction (750 kcal/d) does not impair exercise performance in physically active young men and women.

Supported by DoD contract # DAMD-17-97-2-7013

THE EFFECT OF CREATINE SUPPLEMENTATION ON SINGLE SPRINT CYCLE PERFORMANCE

R.S. O'Connor, J.A. Doyle, J.C. Rupp and W.R. Thompson.
Dept. Of Kinesiology and Health, Georgia State University, Atlanta, GA 30303

O36

The influence of oral creatine (Cr) supplementation on the indices of power output and anaerobic metabolism was investigated in two counterbalanced groups with each containing six subjects. The independent variables comprised the ingestion of 0.3 g/kg bw of creatine or placebo over a 5 day period. The exercise protocol incorporated 15 s of maximal sprint cycling against a resistance equivalent to 7.5% body mass. Following 30 minutes rest, one 30 s maximal effort trial was completed. Data were examined using a 2 - way ANOVA with repeated measures on time. No significant differences were recorded for body weight, peak power 15 s and peak power 30 s following supplementation. There were no significant differences in the total work produced between groups in 15 s of maximal sprint cycling following supplementation. Following the intervention a significant difference ($p = .028$) was displayed when examining the interaction between group and treatment in the total work accomplished in 30 s cycling. No significant differences were observed in blood lactate accumulation at rest, 1,3,5 and 7 minutes post exercise in 15 s cycling before and after supplementation. A significant difference ($p = .046$) was recorded in blood lactate accumulation 1 minute post exercise when examining the interaction between group and treatment in 30 s of sprint cycling. The contribution of glycolysis in addition to PCr in ATP resynthesis may have been greater in the creatine group resulting in greater work production and greater blood lactate accumulation.

EFFECTS OF ANDROSTENEDIOL AND ANDROSTENEDIONE USE ON STRENGTH IN MEN PARTICIPATING IN A HIGH INTENSITY RESISTANCE TRAINING PROGRAM

J. Thomson, J. Quindry, K. Bringham, L. Panton, J. Breuel, C. Earnest, M. Olson, and C. Broeder. ETSU/James H. Quillen College of Medicine, Johnson City, TN 37614

O37

Fifty males (aged 35 to 65) participating in a 12-week high intensity resistance training program were randomly assigned to one of three groups (placebo (P), androstenediol (diol), or androstene-dione (dione). This study's purpose was to determine what effects testosterone precursor hormones would have on a person's strength profile in combination with resistance training. All subjects completed a comprehensive battery of physical, psychological, nutritional, hematological, and performance measures prior to starting the study. No subject participated in the study if any evidence of heart disease, metabolic disorder, or pretreatment testosterone levels exceeded standard clinical norms. Strength was assessed using a 1-RM protocol for the bench press, biceps curl, triceps press-down, leg-extension, and leg-curl. Strength data was expressed in absolute terms and relative to a person's fat-free weight (FFW) and total body skeletal muscle mass (SMM) determined by dual-photon X-ray absorption as described by Heymsfield et al. (1990). Each subject trained 3 times a week with vary repetitions and resistances so that exercise intensity ranged between 70% and 100% of a person's pre-training 1-RM values. All training was performed under the guidance of a personal trainer with start/finish times, rest periods, reps, and sets carefully monitored. This study's result indicated that neither diol nor dione use enhanced a person's strength adaptations beyond the strength training and P condition. Strength gains ranged from 16.6% for upper and 29.1% for lower body strength improvements in absolute terms. When the training logs were analyzed based on the amount of weight lifted per minute, there was a trend for the dione group to lift more weight per unit time (P = 141 kg ± 33; diol = 159 kg ± 43; dione = 162 kg ± 30; p = 0.09). In relative terms, the dione group showed the greatest increase in weight lifted (kg)/SMM(kg) (20.8%) but was not significantly different from P (18.8%). When data was reanalyzed looking at adaptations in those subjects who were weakest and least experienced at resistance training, versus the strongest and most experienced subjects, diol or dione use did not enhance the training adaptations observed compared to the P group. In addition, because no significant increases in FFW and SMM occurred in any group, all gains in strength were most likely neurological in origin as expected in older men for such a short training period.

RECOVERY OF NEUROMUSCULAR FUNCTION MORPHOLOGY FOLLOWING 17 DAYS OF SPACEFLIGHT

A.A. Britt, S.E. Gordon, F.W. Booth, and M.R. Deschenes. Dept. of Kinesiology, The College of William & Mary, Williamsburg, VA 23187

O38

Spaceflight induces severe functional and morphological disturbances in skeletal muscle including decreased force production and myocyte atrophy. However, little is known about the effects of spaceflight on the neuromuscular junction: No data have been reported regarding the recovery of that synapse following return to Earth. The purpose of the present investigation was to determine the rate of re-adaptation of motor endplate morphology upon return to gravitational influences subsequent to 17 days of spaceflight. Soleus muscles were obtained from male Fisher 344 rats flown on the Neurolab space shuttle mission 1 and 14 days after landing on Earth. Muscles from ground-based controls animals were taken at the same time points. Rhodamine conjugated (α-bungarotoxin was used to stain acetylcholine receptors. Our results indicate that at 1 day post-spaceflight, endplate area was significantly ($p<0.05$) greater, while post-synaptic receptors were significantly less dispersed, than those observed in controls. At 14 days of recovery, endplate areas of spaceflown and control rats were similar, but synapses remained more compact in rats exposed to 0 gravity conditions. Our data suggest an incomplete restoration of normal neuromuscular junction morphology within 14 days of return to Earth following spaceflight.

Supported by a Howard Hughes Medical Institute grant through the College of William & Mary, and the NASA Biospecimen Sharing Program

O39

RESISTANCE TRAINING ALTERS NEUROMUSCULAR JUNCTION MORPHOLOGY

D.A. Judelson, W.J. Kraemer, and M.R. Deschenes. Dept. of Kinesiology, The College of William & Mary, Williamsburg, VA 23187-8795

Previously, it has been demonstrated that endurance exercise remodels neuromuscular junction (NMJ) structure. The purpose of the present study was to assess the morphological adaptations of the NMJ to resistance training. Twenty-four adult male Sprague-Dawley rats were randomly assigned to either a resistance training protocol, or served as sedentary controls. Resistance training consisted of climbing a ladder while wearing a weighted vest, 3 sessions/week, for 7 weeks. At the conclusion of the treatment period rats from both groups were sacrificed and soleus muscles were dissected out, and quickly frozen at resting length. Rhodamine conjugated α-bungarotoxin was used to visualize post-synaptic acetylcholine receptors in .50 μm thick longitudinal muscle sections. Histochemical techniques were performed on 10 μm thick cross-sections to determine muscle fiber size and type. Our results indicate that resistance training significantly ($p<0.05$) expanded motor endplate area and perimeter, while causing greater ($p<0.05$) dispersion of receptors within the endplate area. In contrast, no significant changes in muscle fiber size, or fiber type composition were found in trained animals. These data confirm that the stimulus of resistance training is sufficiently potent to elicit significant modifications of NMJ architecture, and that NMJ expansion is not concomitant with muscle fiber hypertrophy.

O40

OSTEOCALCIN RESPONSES TO HIGH-INTENSITY ANAEROBIC CYCLING EXERCISE

D.F. Wootten, W.K. Ramp, F.C. Gwazdauskas, and W.G. Herbert. Lab for Health & Exercise Science, Dept. of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, VA 24061

Exercise has been evaluated as a countermeasure for micro-gravity induced and age-related bone loss. Yet, the effects of physical activity on skeletal integrity may be postulated as positive or negative, depending upon the nature of the exercise stress. In this study, responses of osteocalcin (OC; a biochemical marker of osteoblastic activity) to very high-intensity cycling exercise were investigated in seven trained college-aged male cyclists. Subjects performed 1-min maximal cycling intervals at a workload ~130% of VO2 pk workload, followed by 3-min active recovery. Subjects repeated the cycling intervals until rpm's decreased to <70%, during any two intervals, of the rpm's achieved on the initial interval. Osteocalcin was measured at pre-exercise, 2 and 24 hr post exercise. Lactate was measured at pre-exercise, immediate post exercise (IPE), and 2 hr post exercise. Serum OC concentrations decreased ($p < 0.05$) from 11.4 ± 2.3 ng/ml (mean + SD) at baseline to 9.4 ± 2.6 ng/ml 2 hr post exercise and 9.0 ± 2.8 ng/ml 24 hr post exercise. Lactate increased ($p < .01$) from 1.8 ± .6 mmol/l at baseline to 13.0 ± 5.0 mmol/l at IPE and returned to baseline 1.9 ± .7 mmol/l at 2 hr post exercise. Researchers have demonstrated, in vitro, impaired osteoblastic function within an acidic microenvironment. Thus, it is speculated the mechanisms mediating the observed OC changes in this study may include plasma volume shifts, bone tissue acidosis associated with decreased perfusion, and/or bone tissue acidosis attributable to diffusion of accumulated hydrogen ions within the working muscle to bone interstitium. Additional research is needed to evaluate these hypotheses.

O41

HUMAN SKELETAL MUSCLE UNCOUPLING PROTEIN-3 mRNA LEVELS ARE ELEVATED IN RESPONSE TO ACUTE EXERCISE

R.C. Noland, R.C. Hickner, D. Zheng, and R.N. Cortright. Depts. of Exercise and Sport Science and Physiology, East Carolina University, Greenville, NC.

Rodent studies demonstrate that acute endurance exercise is associated with elevations in uncoupling protein (UCP) mRNA levels, but these observations have not been confirmed in human skeletal muscle. Therefore, we investigated the effect of a one hour isokinetic, cycle ergometry exercise bout (40 min at 65% VO_2 max, 10 min at 75% $V0_2$ max, and 10 min at 85% VO_2 max) on UCP mRNA levels in untrained and trained subjects. Following an overnight fast, vastus lateralis muscle and blood samples were obtained immediately prior to and 1 hour post exercise. Muscle samples were analyzed for UCP2 and UCP3 long (UCP3L) and short (UCP3S) forms by ribonuclease protection assay (RPA). RPA analysis (normalized for ciclophilin) demonstrated that both the UCP3L and UCP3S, but not UCP2 mRNA levels were significantly ($P<0.01$) elevated in untrained but not trained subjects following exercise. Blood analysis indicated significant ($P<0.01$) elevations in plasma non-esterified free fatty acid (NEFA) in both the untrained (0.60±0.08 to 0.94±0.08 niEq/L; mean ± SE) and trained (0.62±0.03 to 0.81±0.05) subjects following the exercise bout. However, the increase in NEFA from resting conditions in the untrained subjects was 60% vs. 30% in the trained subjects. These findings are the first to report that exercise elevates UCP3 gene expression in human skeletal muscle and support the hypothesis that blood NEFA are associated with muscle UCP mRNA levels.

THANKS TO SPONSORS & EXHIBITORS

.... from the Southeast Chapter of the American College of Sports Medicine

Sponsors:

Carolinas Health Care System

www.carolinas.org
800-821-1535

The Coca-Cola Company:POWERaDE

Atlanta, GA 30313

Gatorade Sports Science Institute

Barrington, IL 60010

Knoll Pharmaceuticals Company

Mt. Olive, NJ 07828

Exhibitors:

Physio-Dyne Instruments Corporation
Arlene Falk
PO Box 5025 Industrial Dr.
Quogue, NY 11959
516-653-4569

ParvoMedics/Consentius Technologies
Pat Yeh, Ph.D.
8152 South 1715 East
Sandy, UT 84093
800-942-7255

Cosmed-JMC Distributors
Dan Shelby
1808 N. Harsted St.
Chicago, Il 60660
312-642-7222

Lippincott, Williams & Wilkins
Alan Goodman
351 W. Camden St.
Baltimore, MD 21201
800-892-2609

VacuMed
John Hoppe
4483 McGrath St. #102
Ventura, CA 93003
800-235-3333

Lewis Medical Instruments
Jean Black
11800 Coakley Circle
Rockville, MD 20852
301-984-6112

Human Kinetics
Susan Goode
1607 N. Market St.
Champaign, IL 61820
217-351-5076 ext 2335