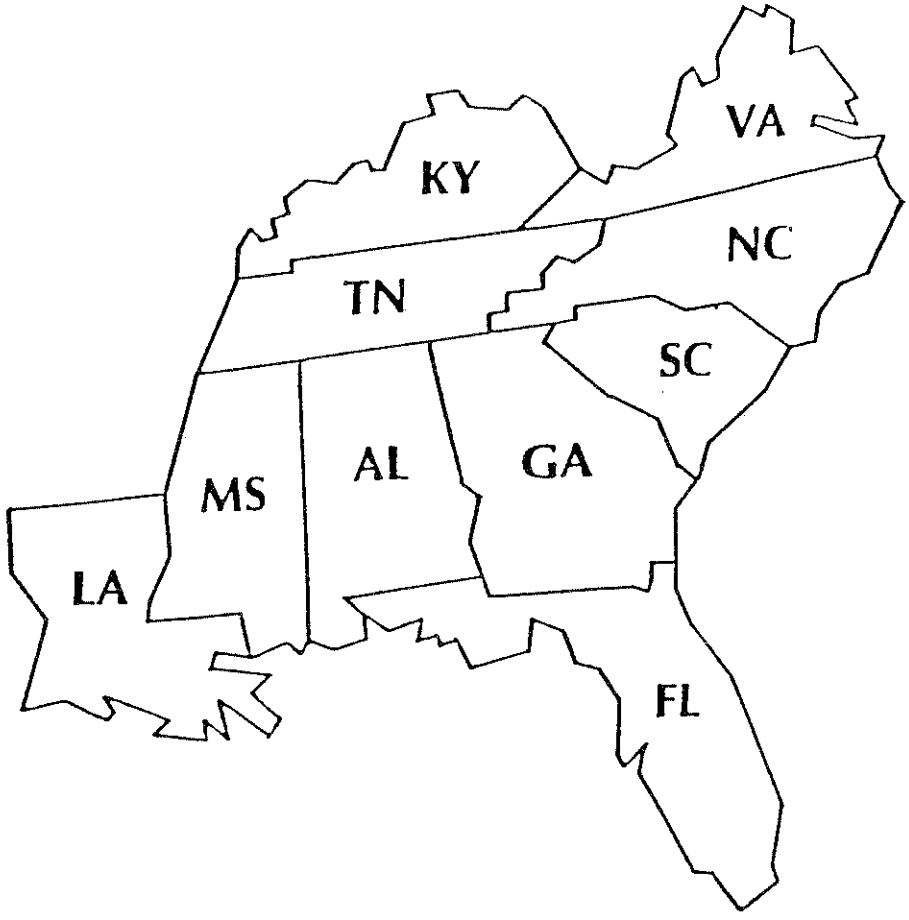
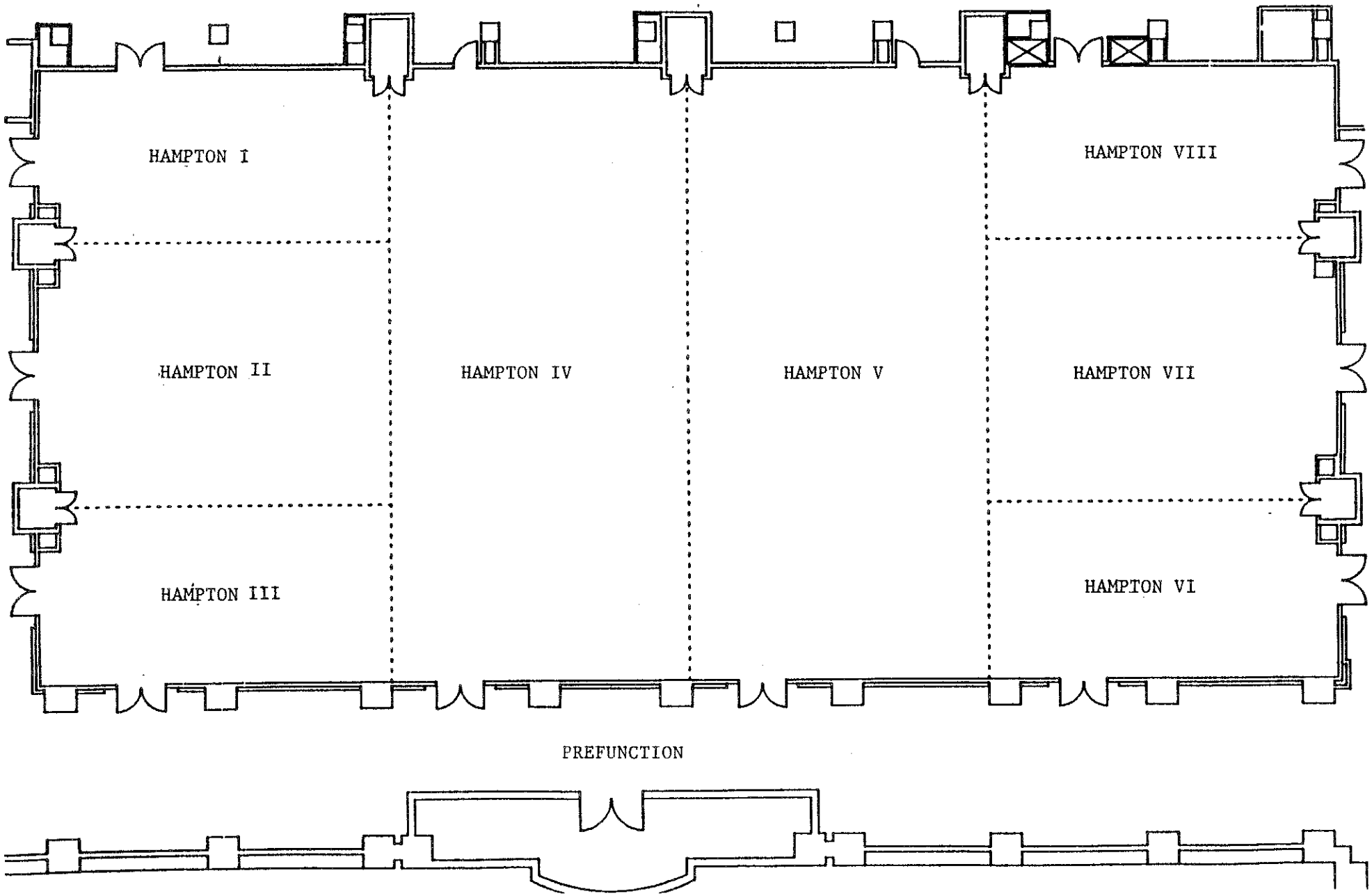
AMERICAN COLLEGE of SPORTS MEDICINE

Southeast Regional Chapter

January 28-30, 1993
20th Annual Meeting
Waterside Marriott Hotel and Convention Center
Norfolk, Virginia

ABSTRACTS




HAMPTON I
HAMPTON II
HAMPTON III
HAMPTON IV
HAMPTON V
HAMPTON VIII
HAMPTON VII
HAMPTON VI
PREFUNCTION

Twentieth Annual Meeting

SOUTHEAST REGIONAL CHAPTER
AMERICAN COLLEGE OF SPORTS MEDICINE

Waterside Marriott Hotel and Convention Center
Norfolk, Virginia

January 28-30, 1993

Officers

President:
Gay Israel, East Carolina University

Past President:
Stephen Messier, Wake Forest University

President-Elect:
J. Mark Davis, University of South Carolina

Executive Board:
Mindy Millard-Stafford, Georgia Tech
Bob Moffatt, Florida State University
Barbara Ainsworth, UNC-Chapel Hill
Michael Berry, Wake Forest University
Kevin Tipton, Auburn University (Student Rep)
Shala Davis, University of Virginia (Student Rep)
Alan Rogol, University of Virginia (Physician Rep)
Jeff Chandler, Lexington Clinic, (Clinical Consultant)
Phil Sparling, Georgia Tech (National ACSM Rep)

Executive Secretary:
Vaughn Christian, Appalachian State University

Meeting Host: Old Dominion University
Mel Williams
Richard Krieder
Elizabeth Dowling
Diego Redondo
Brian Leutholtz

Publisher and Editor:
Kent Johnson, David Lipscomb University (Newsletter Editor & Publisher)

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 via featured addresses, poster presentations, tutorials, symposium and free communications.

Planning Committee

J. Mark Davis, Program Chair
Mel Williams, Host Chair
Jeff Chandler, Clinical Track Chair
Bob Moffatt
Alan Rogol
Michael Berry
Kevin Tipton
Gay Israel
Sephen Messier
Mindy Millard-Stafford
Barbara Ainsworth
Vaughn Christian
Shala Davis

List of Reviewers

Barbara Ainsworth
Michael Berry
Ron Bulbulian
Kirk Cureton
Larry Durstine
Bruce Gladden
Jay Graves
Joe Houmard
Stephen Messier
Russ Pate
Paul Ribisl
Jeff Rupp
Mindy Millard-Stafford
Kevin Tipton
Art Weltman
Jay Williams
Dalynn Badenhop
Jerry Brandon
Jeff Chandler
Shala Davis
Harry DuVal
Alan Goldfarb
Emily Haymes
Robert McMurray
Bob Moffatt
Janet Walberg-Rankin
Alan Rogol
Phil Sparling
Michael Stone
Dianne Ward
Melvin Williams

Chronology of SEACSM Meetings & Officers

	Date/Place	Pres./PastPres/PresElect	Executive Board
1st	Fall 1973 Gattlinburg, TN		
2nd	Fall 1974 Atlanta, GA	Andrew Kozar	
3rd	Fall 1975 Charlottesville, VA	Clyde Partin	
4th	Fall 1976 Murfreesboro. TN	Rankin Cooter	
5th	Fall 1977 Lexington, KY	Ed Howley	Steve Blair Ron Byrd Joe Smith
6th	Feb. 16-17, 1979 Atlanta, GA	Dennis Wilson Ed Howley Ron Byrd	Earl Allen Thad Crews Art Weltman
7th	Feb. 8-9, 1980 Charlotte, NC	Ron Byrd Dennis Wilson Paul Ribisl	Bruce Gladden Jay Kearney Russ Pate
8th	Feb 6-7, 1981 Charleston, SC	Paul Ribisl Ron Byrd Bill Herbert	Joe Chandler Tom Chronan Kirk Cureton Harvey Murphy (ES)
9th	Feb 5-6, 1982 Blacksburg, VA	Bill Herbert Paul Ribisl Russ Pate	Kirk Cureton Joe Chandler Harvey Murphy Tom Cronan Jon MacBeth (ES)
10th	Feb 4-5, 1983 Gainesville, FL	Russ Pate Bill Herbert Kirk Cureton	David Cundiff Scott Powers Earl Allen Jon McBeth (ES)
11th	Feb 3-4, 1984	Kirk Cureton Russ Pate Chris Zauner	Emily Haymes Phil Sparling Mike Stone Ron Bos (ES)
12th	Jan 31- Feb 2, 1985 Boone, NC	Chris Zauner Kirk Cureton Robert McMurray	Harry Duval J.W. Yates John Billings Diane Spitler Ron Bos (ES)
13th	Jan 23-25, 1986 Athens, GA	Robert McMurray Scott Powers	Diane Spitler John Billings Terry Bazzarre Larry Durstine Russ Pate (N) Ron Bos (ES)
14th	Jan 29-31, 1987 Charleston, SC	Scott Powers Robert McMurray Diane Spitler	Terry Bazzarre Larry Durstine Janet Walberg Steve Messier Allen Moore (S) Russ Pate (N) Ron Bos (ES)

	Date/Place	Pres./PastPres/PresElect	Executive Board
15th	Jan. 28-30, 1988 Winston-Salem, NC	Diane Spitler Scott Powers Phil Sparling	Janet Walberg-Rankin Steve Messier Gay Israel Dalynn Badenhop Mark Senn (S) Russ Pate (N) Ron Bos (ES)
16th	Jan 19-20, 1989 Atlanta, GA	Phil Sparling Diane Spitler Emily Haymes	Dalynn Badenhop Mark Davis Gay Israel David Peltzer (S) Art Weltman Kirk Cureton (N) Ben Kibler (MD) Ron Bos (ES)
17th	Feb. 1-3, 1990 Columbia, SC	Emily Haymes Phil Sparling Harry DuVal	Jerry Brandon Mark Davis Diane Ward Art Weltman Maria Burgess (S) Ben Kibler (MD) Kirk Cureton (N) Ron Bos (ES)
18th	Jan. 31-Feb. 2, 1991 Louisville, KY	Harry DuVal Emily Haymes Steve Messier	Jerry Brandon Jeff Rupp Amanda Timberlake Dianne Ward Maria Burgess (S) Kevin Davy (S) Alan Rogol (MD) Kirk Cureton (N) Ron Bos (ES)
19th	Jan. 30-Feb.1, 1992 Auburn University	Steve Messier Harry DuVal Gay Israel	Mindy Millard-Stafford Bob Moffatt Amanda Timberlake Jeff Rupp Kevin Davy (S) Bill Deuy (S) Alan Rogol (MD) Ben Kibler (MD) Phil Sparling (N) Ron Bos (ES)
20th	Jan. 28-30, 1993 Norfolk, VA	Gay Israel Steve Messier Mark Davis	Bob Moffat Michael Berry Barbara Ainsworth Mindy Millard-Stafford Kevin Tipton (S) Shala Davis (S) Vaughn Christian (ES) Jeff Chandler (CC) Alan Rogol (MD) Phil Sparling (N)

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

Chronology of SEACSM Award Winners

	Scholar Award	Service Award	Student Award
1989	Hugh Welch	Ron Bos	
1990	Russell Pate	Harvey Murphy	
1991	Wendell Stainsby	Paul Ribisl	Paul Davis
1992	Robert Armstrong	Phil Sparling	Brian Hinson

SEACSM APPRECIATES THE SUPPORT OF THE SPONSORS

AIRCAST

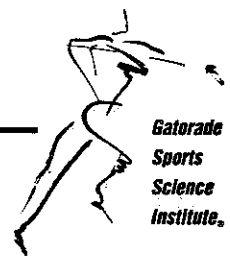
ADVANCED MECHANICAL TECHNOLOGY, INC.

GATORADE SPORTS SCIENCE INSTITUTE

LEWIS MEDICAL INSTRUMENTS, INC.

ROCHE BIOMEDICAL LABORATORIES, INC.

SENTARA LEIGH HOSPITAL, PHYSICAL THERAPY SPECIALTY CENTER



The Gatorade Sports Science Institute Extends a Warm Welcome to all Southeastern American College of Sports Medicine Annual meeting Attendees!

SOUTHEAST CHAPTER OF THE AMERICAN COLLEGE OF SPORTS MEDICINE

1993 Annual Meeting Program

Waterside Marriott Hotel and Convention Center
Norfolk, Virginia

Thursday, January 28

12:00 - 6:00 REGISTRATION

12:00 - 2:00 EXECUTIVE BOARD MEETING
(Jefferson Board Room)

2:00 - 7:00 SPEAKER READY ROOM
(Hampton VIII)

2:00 - 6:00 VISIT EXHIBITS
(Hampton IV)

3:30 - 4:30 FREE COMMUNICATIONS: **Muscle Metabolism and Injury/Soreness**
Chair: Lucille Smith, East Carolina University
(Hampton V)

(3:30 - 3:45) ***Effect of the menstrual cycle phase on lipid metabolism at rest and during exercise.** MR Brammeier, JA Berend, NA Jones, SC Holliman, & AC Hackney. Applied Physiology Laboratory, University of North Carolina, Chapel Hill.

1

(3:45 - 4:00) ***Vitamin E and dehydroepiandrosterone effects on muscle scavenger enzymes at rest and during exercise.** AH Goldfarb, BT Boyer, J Fatouros & MK McIntosh. Departments of Exercise & Sport Science, and Food & Nutrition. University of North Carolina Greensboro.

2

(4:00 - 4:15) ***Running downhill does not injure mouse soleus muscles.** D Lowe, G Warren, D Hayes, B Prior, & R Armstrong. Department of Exercise Science, University of Georgia.

3

(4:15 - 4:30) **Massage does not attenuate delayed onset muscle soreness.** DL Char, C Goya, & JT Lightfoot. Florida Atlantic University.

4

* This abstract was selected by the reviewers as one of the top 30 abstracts

3:30 - 4:30 FREE COMMUNICATIONS: **Validation of Experimental Techniques I: Exercise Physiology**
Chair: Beverly Warren, Appalachian State University
(Hampton II)

(3:30 - 3:45) ***Use of aero style handlebars does not affect lung volumes or pulmonary function.** MJ Berry, WE Pollock, K van Nieuwenhuizen & PH Brubaker. Department of Health and Sports Science, Wake Forest University

5

(3:45 - 4:00) **Comparison of heart rate, ventillation, and perceived exertion at similar oxygen uptakes on four different exercise ergometers.** RF Moss & C Clark. Health and Exercise Science Department, Furman University

6

(4:00 - 4:15) ***Relationship of stride frequency and Caltrac estimated energy expenditure during walking and running.** EM Haymes, DT Lee & LR Martinez. Department of Nutrition, Food & Movement Sciences, Florida State University

7

(4:15 - 4:30) **Determination of optimal load for a constant-load ergometer relative to isotonic leg strength**. HA Wagner & JH Williams, Virginia Tech

8

3:30 - 4:30 FREE COMMUNICATIONS: **Biomechanics**
Chair: Kathy Simpson, University of Georgia
(Hampton VI)

(3:30 - 3:45) **A kinematic analysis of the tennis serve: establishment of a biomechanical data base.** R Shapiro, RL Stine, TJ Chandler & WB Kibler. University of Kentucky & Lexington Clinic

9

(3:45 - 4:00) **Bench-step kinetics: Comparison of two steps at three heights.** BF Johnson, KD Johnson, & SA Winnier. Department of HPRD, Georgia State University

10

(4:00 - 4:15) ***The effects of abdominal support on lumbar spine kinetics during lifting.** R McCoy, M Woodhouse, D Redondo, & L Shall. The College of William and Mary, Old Dominion University & Eastern Virginia Medical School

11

(4:15 - 4:30) **The effects of abdominal support on intra-abdominal pressure and intra-abdominal force during lifting.** D Redondo, M Woodhouse, R McCoy, & L Shall. The College of William and Mary, Old Dominion University, & Eastern Virginia Medical School

12

* This abstract was selected by the reviewers as one of the top 30 abstracts

3:30 - 4:30 FREE COMMUNICATIONS: **Training Effects on Body Composition and Blood Lipids**
Chair: J. Larry Durstine, University of South Carolina
(Hampton VII)

(3:30 - 3:45) **Effect of aerobic step training on body composition and mood states in females.** RN Henry & KD Johnson. Department of Exercise Science, David Lipscomb University

13

(3:45 - 4:00) ***The effect of moderate-progressive exercise on metabolic measures during weight loss in children and adolescents.** M Sothern, M Loftin, J Curcio, K von Almen, H Schumacher, R Farris, EM Haas, & RM Suskind. Department of Pediatrics, LSUMC School of Medicine, University of New Orleans

14

(4:00 - 4:15) ***Contrast of exercise training upon percent fat and blood lipid changes between men and women cardiac patients.** CE Fidler, PM Ribisl, DB Bergey, P Brubaker, HS Miller, & WJ Rejeski. Departments of Medicine and Health & Sports Science, Wake Forest University

15

(4:15 - 4:30) **Plasma lipid, cardiovascular endurance and body composition responses to interval-step aerobic dance training.** PE Mosher, B Pickett, M Ferguson, & R Arnold. Exercise Science Department, University of Tennessee, Chattanooga

16

4:30 - 4:45 **BREAK**

4:45 - 5:45 **TUTORIALS**

Use of "skinned fibers" in skeletal muscle research.
Jay H. Williams, Virginia Tech
Chair: David Essig, University of South Carolina
(Hampton II)

New Technologies in the Evaluation of Muscular Strength. James E. Graves. University of Florida
Chair: Michael Berry, Wake Forest University
(Hampton VII)

*This abstract was selected by the reviewers as one of the top 30 abstracts

4:45 - 5:45 (continued) **TUTORIALS**

Nutrition, Fatigue and the Overtraining Syndrome: The Role of Nutrition on Physiological, Immunological and Psychological Responses to Exercise. Richard B. Kreider, Old Dominion University
Chair: Arthur LaPerriere, University of Miami
(Hampton V)

Exercising the Diabetic Patient. Dalynn T. Badenhop, East Carolina University School of Medicine
Chair: Karl N. King, Moses Cone Hospital, Greensboro, NC
(Hampton III)

The impact of hormone replacement therapy and exercise on cardiovascular risk profile among postmenopausal women. Elizabeth A. Dowling, Old Dominion University
Chair:Mindy Millard-Stafford, University of Georgia
(Hampton VI)

5:45 - 6:15 **SEACSM WOMEN'S DROP IN**
Contact: Barbara Ainsworth
(Hampton I)

7:45 - 9:00 **KEYNOTE ADDRESS**
(Hampton V - VIII)

Steven Blair, Ph.D
Director of Epidemiology,
Institute for Aerobics Research
Dallas, TX

"Exercise and Chronic Disease: Emerging Evidence for a Protective Effect"

SPONSORED BY SENTARA LEIGH HOSPITAL, PHYSICAL THERAPY SPECIALTY CENTER

BUSINESS MEETING
Gay Israel, President, SEACSM

9:00 - 11:00 **SEACSM SOCIAL**
(Hampton I - IV)

Friday, January 29

7:00 - 12:00 REGISTRATION

7:00 - 7:30 **SEACSM CONTINENTAL BREAKFAST**
(Hampton V)

7:30 - 8:20 **Breakfast Speaker - PRESIDENTIAL ADDRESS**
(Hampton V)

Robert Cantu, M.D.
President, American College of Sports Medicine
Emerson Hospital, Concord, MA

"Medical Risks of Boxing/ Is Boxing a Sport?"

SPONSORED BY SENTARA LEIGH HOSPITAL, PHYSICAL THERAPY SPECIALTY CENTER

7:30 - 5:30 SPEAKER READY ROOM
(Hampton VIII)

9:00 - 5:00 EXHIBITS - VISIT THROUGHOUT THE DAY!
(Hampton IV)

7:30 - 10:30 **POSTER PRESENTATIONS: Group 1(#51 through 56)**
Authors present from 9:45 - 10:30
See author index to poster abstracts.
Chair: Joni DeSmet, Old Dominion University
(Hampton IV, Exhibit Area)

8:30 - 9:30 **TUTORIALS**

Healthy People 2000 Objectives for Physical Activity and Fitness: Program Ideas. Barbara Ainsworth, University of North Carolina- Chapel Hill.
Chair: Dianne Ward, University of South Carolina
(Hampton VII)

Nutrition and Weight Training. Janet Walberg-Rankin, Virginia Tech
Chair: Mel Williams, Old Dominion University University
(Hampton V)

8:30 - 9:30 **TUTORIALS**
(continued)

Role of Exercise Science in Manned Space Exploration. Philip Bishop, University of Alabama
Chair: Ron Bulbulian, University of Kentucky
(Hampton II)

Role of Eccentric Contractions in Developing Muscle Strength and Hypertrophy. Tibor Hortobagyi, East Carolna University
Chair: Ann Swank, University of Louisville
(Hampton VI)

8:30 - 11:00 SPECIAL SYMPOSIUM ON RUNNERS INJURIES - **Clinical Tract**
Chair: Michael Woodhouse, Norfolk State University
(Hampton III)

SPONSORED BY SENTARA LEIGH HOSPITAL, PHYSICAL THERAPY SPECIALTY CENTER

(8:30 - 8:55) **Stress Fractures.** Sheldon Cohn, Orthopedic Associates of Virginia, Norfolk, VA.

(8:55 - 9:20) **Overuse Syndromes of the Knee.** John Schaffer, Vann Orthopaedic Associates, Norfolk, VA

(9:20 - 9:45) **Ankle and Foot Problems in Runners: A Bit of the Unusual.** Michael Romash, Sports Medicine and Orthopedic Center, Norfolk, VA.

(9:45 - 9:55) **BREAK (symposium only)**

(9:55-10:20) **Patellofemoral Problems.** Larry Shall, Orthopedic Associates of Virginia, Norfolk, VA

10:20-10:45 **The McConnell approach to patellofemoral pain syndrome.** Lynette Henderson & Susan Lambert, Physical Therapy Specialty Center, Norfolk, VA.

10:45-11:00 **Panel Discussion, Questions and Answers**

9:30 - 9:45 **BREAK - Coffee**
(Hampton IV, Exhibit Area)

9:45 - 10:45 **SEACSM SPECIAL TOPICS LECTURE**
(Hampton V)

Robert Gregor, Ph.D.
Professor
Department of Physiological Sciences
UCLA

"Biomechanics of Lower Extremity Function During Cycling"

SPONSORED BY ADVANCED MECHANICAL TECHNOLOGY, INC. (AMTI)

10:45 -11:00 **BREAK**

11:00 -12:00 **SEACSM SCHOLAR LECTURE**
(Hampton V)

Michael Pollock, Ph.D.
Professor
Center for Exercise Science
University of Florida

"An Historical Perspective on the Development of the Proper Training Stimuli for Fitness"

SPONSORED BY SEACSM

10:45 -12:30 **POSTER PRESENTATIONS: Group 2(#57 through 62)**
Authors present from 11:45 - 12:30
See author index to poster abstracts.
Chair: Cathy Ferdensi, Old Dominion University
(Hampton IV, Exhibit Area)

12:00 - 1:15 **LUNCH**

1:15 - 2:10 **SEACSM INVITED LECTURE: BASIC SCIENCE**
(Hampton V)

Timothy White, Ph.D.
First Vice-President, American College of Sports Medicine
Professor, Department of Physical Education/Exercise Physiology,
University of California, Berkeley

"Skeletal Muscle Regeneration and Plasticity Following Injury"

SPONSORED BY SEACSM

2:10 - 2:15 **BREAK**

2:15 - 3:45 SPECIAL SYMPOSIUM ON HEAD AND NECK INJURIES - **Clinical Track**
Chair: Alan Rogol, University of Virginia School of Medicine
(Hampton III)

(2:15 - 2:50) **Catastrophic sports injuries; which sports are at greatest risk and why?** Robert Cantu, President ACSM, Department of Neurosurgery, Emerson Hospital, Concord, MA

(2:50 - 3:30) **Recovery of mild football-induced concussion.** Wayne Alves, Department of Neurosurgery, University of Virginia Medical School, Charlottesville, VA

(3:30 - 3:45) **Questions and Answers**

2:15 - 3:45 SYMPOSIA

Exercise and Sport Biomechanics: A Student Research Symposium.
Chair: Stephen Messier, Wake Forest University University
(Hampton VI)

Glucose Transporters and Their Metabolic Regulation. Joseph A. Houmard, Madhur K. Sinha, G. Lynis Dohm, & Patricia L. Dolan, East Carolina University
Chair: Joseph A. Houmard, East Carolina University
(Hampton VII)

Maximal Aerobic Power - Its history, assumptions and criteria.
Edward T. Howley & Hugh Welch, University of Tennessee
Chair:Edward T. Howley, University of Tennessee
(Hampton II)

Update on Clinical Exercise Testing. Paul Ribisl, Peter H. Brubaker, Wake Forest University; Henry S. Miller, Jr. Bowman Gray School of Medicine; William G. Herbert, Virginia Tech
Chair: Paul Ribisl, Wake Forest University
(Hampton V)

3:45 - 4:00 **BREAK - REFRESHMENTS**
(Hampton IV, Exhibit Area)

3:45 - 6:00 **POSTER PRESENTATIONS: Group 3 (#63 through 68)**
Authors present from 5:15 - 6:00
See author index to poster abstracts.
Chair: Gwen Schaeffer
(Hampton IV, Exhibit Area)

4:00 - 5:00 FREE COMMUNICATIONS: **Exercise Epidemiology**
Chair: David Neiman, Appalachian State University
(Hampton II)

(4:00 - 4:15) **Physical activity patterns, peak VO_2 and related measures in obese female minority children & adolescents.** R Suskind, M Loftin, M Sothern, J Curcio, K von Almen, H Schumacher, R Farris, & R Brown. Department of Pediatrics, LSUMC School of Medicine, University of New Orleans.
17

(4:15 - 4:30) ***Cardiovascular risk and self-reported physical activity in a group of African American male Department of Transportation employees.** VN Schnyder, CB Berry, BE Ainsworth, & TJ Hodge. Winston-Salem State University, University of North Carolina, Chapel Hill
18

(4:30 - 4:45) ***Parental influences on childhood fitness and physical activity levels.** CB Bradley, RG McMurray, & JS Harrell. University of North Carolina, Chapel Hill.
19

(4:45 - 5:00) ***Factors related to errors in the recall of physical activity (PA) on self-report PA questionnaires.** LF Cunningham & BE Ainsworth, University of North Carolina, Chapel Hill
20

4:00 - 5:00 FREE COMMUNICATIONS: **Physical Performance in Athletes**
Chair: David Hunter, Hampton University
(Hampton V)

(4:00 - 4:15) **Anaerobic and aerobic power outputs, and blood lactate levels, before and after the taper phase in pediatric swimmers.** FJ Servedio & LC Colvin. The University of Southern Mississippi.
21

(4:15 - 4:30) ***Tapered training improves 5 km race performance in highly-trained distance runners.** BK Scott & JA Houmard. East Carolina University.
22

*This abstract was selected by the reviewers as one of the top 30 abstracts

4:00 - 5:00 FREE COMMUNICATIONS: **Physical Performance in Athletes** (continued)

(4:30 - 4:45) **Relationship between lactate and upper body Wingate performance in intercollegiate swimmers.** MA Martino, JF Smith, PA Bishop, T Buhre, P Reneau, & R Farley, University of Alabama.

23

(4:45 - 5:00) ***Physiological and performance parameters of elite and sub-elite U.S. racewalkers.** M Craib, M Felton, JT Kearney, L Mino, & J Miller. United States Olympic Training Center.

24

4:00 - 5:00 FREE COMMUNICATIONS: **Neuroendocrine and Immune Responses to Exercise**
Chair: Robert McMurray, University of North Carolina, Chapel Hill
(Hampton VII)

(4:00 - 4:15) ***Thyroid hormone changes following aerobic and anaerobic exercise.** T Gulledge & AC Hackney. University of North Carolina, Chapel Hill.

25

(4:15 - 4:30) ***Effects of 25 weeks of competitive swim training on immune function.** E Bertun, RB Kreider, RE Ratzlaff & J Edwards. Old Dominion University.

26

(4:30 - 4:45) ****Serotonergic agonists and antagonists affect endurance performance in the rat.** SP Bailey, JM Davis, & EN Ahlborn. University of South Carolina.

27

(4:45 - 5:00) ***Cardiovascular and plasma catecholamine response to static exercise in normotensive blacks and whites.** WJ Duey, DR Bassett, Jr., AJ Walker, ET Howley, D Ely, MO Pease, DJ Totok, & P Mancuso. The University of Tennessee.

28

4:00 - 5:00 SYMPOSIUM

Lipids and Lipoproteins: Alterations due to cigarette smoke and cessation from smoking. Robert Moffatt, Florida State University & J. Larry Durstine, University of South Carolina
Chair: Robert Moffatt, Florida State University
(Hampton VI)

** Winner of Graduate Student Research Award (Advisor, J. Mark Davis)

* This abstract was selected by the reviewers as one of the top 30 abstracts

4:00 - 5:30 CLINICAL TRACK: **Physicians Case Abstracts & Clinical Research**
Chair: Alan Rogol, University of Virginia Medical School
(Hampton III)

(4:00 - 4:15) **Recurrent stinger - football.** DM Caborn & Brent Johnson, Department of Sports Medicine, University of Kentucky.
29
Discussor: Robert Cantu, Department of Neurosurgery, Emerson Hospital

(4:15 - 4:30) **Back Pain- soccer.** DL Jackson, B Hynninen, & DNM Caborn, Department of Rehabilitive Medicine, University of Kentucky.
30
Discussor: Robert Cantu, Department of Neurosurgery, Emerson Hospital

(4:30 - 4:45) **Elbow and shoulder pain- baseball pitcher.** B Reuter & Ben Kibler, Lexington Clinic Sports Medicine Center, Lexington, KY.
31
Discussor: David Caborn, Department of Sports Medicine, University of Kentucky

(4:45 - 5:00) **Anterior Knee Pain - runner.** David L. Jackson, Brett Hynninen, & David NM Caborn, Department of Rehabilitive Medicine, University of Kentucky
32
Discussor: L.C. Almekinders, University of North Carolina, Chapel Hill

(5:00 - 5:15) **Eye Injury- ice hockey.** George C. Wortley, Lynchburg Family Practice Residency, Lynchburg, VA.
33
Discussor: Brent Johnson, Department of Sports Medicine, University of Kentucky

(5:15 - 5:30) **Outcome and compliance in the treatment of chronic overuse sports injuries: A retrospective study.** L. C. Almekinders & S.V. Almekinders, University of North Carolina, Chapel Hill & North Carolina State University
34
Discussor: David Jackson, Department of Rehabilitative Medicine, University of Kentucky

5:00 - 6:00 **SEACSM STUDENT SYMPOSIUM**
(Hampton V)

Timothy White, Ph.D. & Steven Blair, Ph.D.
University of California-Berkeley & Institute of Aerobics Research

"Recommendations for a Successful Academic/Professional Future"

SPONSORED BY SEACSM

6:00 - **Student Mixer** (Announcement at Student Symposium or see flyer in registration packet)

6:00 - EXERCISE, DINNER, REUNIONS!

Saturday, January 30

8:00 - 10:00 REGISTRATION

8:00 - 11:30 SPEAKER READY ROOM
(Hampton VIII)

8:00 - 9:00 FREE COMMUNICATIONS: **Resistance Exercise**
Chair: Michael Stone, Appalachian State University
(Hampton VI)

(8:00 - 8:15) ***Effects of short-term exercise cessation on muscle strength and size in power athletes.** T Hortobagyi, JA Houmard, RA Johns and RG Israel. East Carolina University.

35

(8:15 - 8:30) ***Is oxygen consumption elevated following an acute bout of high intensity resistance training.** K Mitchell & C Broeder. East Tennessee State University.

36

(8:30 - 8:45) **The effect of isolated lumbar extensor strength training on maximum dynamic lifting capacity.** TF Lackney and JW Yates. University of Louisville.

37

(8:45 - 9:00) **The effects of low level weight training on strength, flexibility, and body composition in an elderly population.** BM Boulet, AM Swank, P Douglas-Gillett, and S Roberts-Bradley. University of Louisville.

38

* This abstract was selected by the reviewers as one of the top 30 abstracts

8:00 - 9:00 FREE COMMUNICATIONS: **Validation of Experimental Techniques II: Lactate Metabolism**
Chair: Bruce Gladden, Auburn University
(Hampton II)

(8:00 - 8:15) ***Methods of lactate threshold detection: Whole blood versus plasma**. EW Smith, DD Pascoe, M Skelton, D Kremer, & LB Gladden. Auburn University
39

(8:15 - 8:30) **Peak Lactate determination and lactate differences between whole, lysed, venous, and arterial blood following maximal exercise.** M Murphy, P Bishop, J Smith, & R Godsen. University of Alabama.
40

(8:30 - 8:45) **Comparison of capillary and venous blood lactate and Glucose values.** CJ Womack & JA Flohr. The University of Virginia & James Madison University.
41

(8:45 - 9:00) ***Determining lactate uptake by classical paired tracer method can produce large errors.** PD Watson, MI Lindinger, MT Hamilton, & DS Ward. Univ of South Carolina & Univ. of Guelph
42

8:00 - 9:00 FREE COMMUNICATIONS: **Sports Nutrition**
Chair: Janet Walberg-Rankin, Virginia Tech
(Hampton V)

(8:00 - 8:15) ***Effect of timing of carbohydrate ingestion between repeated exercise bout designed to simulate a soccer or rugby effort.** K Tipton, LA Weinreb, CJ Wetzstein, SJ Hewlings, NR Green and EM Haymes. Florida State University.
43

(8:15 - 8:30) ***Are the metabolic responses following a 720-Kcal meal reproducible in active college age females.** C Broeder, L Kennedy-Honeycutt, K Mitchell, & M Marks. East Tennessee State University.
44

(8:30 - 8:45) ***Effect of amino acid & carnitine supplementation on markers of protein catabolism and body composition during 25 weeks of swim training.** R Kreider, V Miriel, E Bertun, T Somma, & S Sechrist. Old Dominion University.
45

(8:45 - 9:00) **The effect of exercise intensity on food intake, hunger, mood, and nonexercise activity level in untrained, overfat women.** RA Stern. Georgia State University.
46

* This abstract was selected by the reviewers as one of the top 30 abstracts

8:00 - 9:00 FREE COMMUNICATIONS: **Cardiovascular & Thermoregulatory Responses to Exercise and Stress**
Chair: Michael Overton, Florida State University
(Hampton VII)

(8:00 - 8:15) **Cardiovascular responses of elderly fainters and nonfainters to head-up tilt before and after exercise training.** J Carroll, C Wood, M Pollock, J Graves, V Convertino, Mississippi State University, University of Florida, & Kennedy Space Center.
47

(8:15 - 8:30) ***Time course of rectal temperature responses to work in encapsulating protective clothing- a pilot study.** P Reneau, P Bishop, & J Smith. University of Alabama.
48

(8:30 - 8:45) **The effects of varying doses of exercise on acute stress reactivity.** ML Hobson & WJ Rejeski. Wake Forest University.
49

(8:45 - 9:00) ***Acute exercise and cardiovascular responses to stress in rats**. GA Anderson & JM Overton. University of Louisville & Florida State University
50

8:00 - 9:00 SYMPOSIUM ON SHOULDER INJURIES - **Clinical Track**
Chair: Jeff Chandler, Lexington Clinic Sports Medicine Center
(Hampton III)

(8:00 - 8:30) **Overview of Shoulder Instability,** David Caborn, Department of Sports Medicine, University of Kentucky

(8:30 - 8:45) **Operative management of shoulder instability.** Brent Johnson, Department of Sports Medicine, University of Kentucky

(8:45 - 9:00) **Non-operative management of shoulder instability.** Tony Brosky, Department of Sports Medicine, University of Kentucky

9:00 - 10:30 SYMPOSIUM ON BACK INJURIES - **Clinical Track**
Chair: David Jackson, Dept. Rehabilitative Medicine, Univ. of Kentucky
(Hampton III)

(9:00 - 9:40) **Chiropractic management of low back pain.** Scott Banks, Logan College of Chiropractic, Virginia Beach, VA.

(9:40-10:20) **The value of radiographs in low back pain.** David L. Jackson, Department of Rehabilitative Medicine, The University of Kentucky, Lexington, KY.

(10:20-10:30) **Panel Discussion**

* This abstract was selected by the reviewers as one of the top 30 abstracts

8:00 - 10:00 POSTER PRESENTATIONS: Group 4(#69 through 74)
Authors present from 9:15 - 10:00
See author index to poster abstracts.
Chair: Coleen Guilfoyle, Old Dominion University
(Hampton IV, Exhibit Area)

9:00 - 9:15 **BREAK**

9:15 - 10:30 **SEACSM INVITED SYMPOSIUM**
Chair: Brian Leutholtz, Old Dominion University
(Hampton V)

Steve Fleck, Ph.D. United States Olympic Training Center,
"Physiological Basis of Exercise Prescription for Strength Training"

and

William Kraemer, Ph.D., Penn State University
"Neuroendocrine Basis of Adaptations to Strength Training"

SPONSORED BY GATORADE SPORTS SCIENCE INSTITUTE

10:30 -10:45 **BREAK**

10:45 -11:45 TUTORIALS

Federal Regulation of the Exercise Physiology Laboratory: Effect of OSHA and CLIA "88". Walter Thompson, The University of Southern Mississippi
Chair: Gay Israel, East Carolina University
(Hampton VI)

The Role of Molecular Biology in Exercise Physiology. David A. Essig, University of South Carolina
Chair: Allan Goldfarb, University of North Carolina, Greensboro
(Hampton II)

"Excess" $V0_2$ of high-intensity exercise: Mechanisms, significance and application. Glenn A. Gaesser, University of Virginia
Chair: Art Weltman, University of Virginia
(Hampton VII)

Water Soluble Vitamins in Sport and Exercise. Robert E. Keith, Auburn University
Chair: Emily Haymes, Florida State University
(Hampton V)

10:45 -11:45 TUTORIAL - **Clinical Track**

Treatment Concepts for Rotator Cuff and Tennis Elbow Including Physical Exams of the Shoulder and Elbow. Robert Nirschl, Virginia Sports Medicine, Arlington, VA
Chair: David Caborn, Department of Sports Medicine, University of Kentucky
(Hampton III)

11:45 - 1:45 **SEACSM LUNCHEON**
(Marriot Ballroom, 4th floor)

SEACSM LUNCHEON SPEAKER

Laverne Woods
Member of Mt. Everest Peace Expedition

"Climbing Mount Everest: Health and Hypoxia in the Himalayas"

SPONSORED BY SEACSM

1:45 - SEACSM EXECUTIVE BOARD MEETING
(Jefferson Board Room)

1:45 - HAVE A SAFE TRIP HOME! SEE YOU IN GREENSBORO!

Let us help you in...

3308 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709
919-549-8263

Roche Biomedical offers:

- Laboratories, accredited by the National Institute on Drug Abuse, across the US
- National specimen collection and courier service
- Rapid turnaround
- Comprehensive testing services, including more than 1,600 health testing procedures

- And now, *ANABOLIC STEROIDS* testing!

Roche Biomedical Laboratories
a subsidiary of Hoffmann-La Roche Inc.

POSTER SESSION 1

Friday, January 29

7:30 - 10:30
Authors present 9:45 - 10:30
(Hampton IV)

51 **Predictions of lean body weight of high school wrestlers.** PG Love and BF Johnson. Georgia State University.

52 **Cardiorespiratory responses to postprandial exercise.** T Boone and D Diboll. The University of Southern Mississippi.

53 **Effect of exercise duration upon excess post-exercise oxygen consumption (EPOC) during arm ergometry.** B Tinnin, BR Abadie, B Wax, R Tollison, D O'Nan, and J Lamberth. Mississippi State University.

54 **Acute blood cholesterol variations are not explained by changes in perceived stress or by changes in diet and exercise habits.** RN RN Godsen, S Balinsky and J Hamilton. College of Charleston.

55 ***An evaluation of existing methods of estimating body fat in black females.** LJ Brandon. Georgia State University.

56 ***Subcutaneous fat thickness and percent fat measurements in children using magnetic resonance imaging, calipers and underwater weighing: A case study.** LC Colvin and J Sylvester. Glenwood Regional Medical Center.

*This abstract was selected by the reviewers as one of the top 30 abstracts

AIRCAST®
INCORPORATED

POSTER SESSION 2

Friday, January 29

10:45 - 12:30
Authors present 11:45 - 12:30
(Hampton IV, Exhibit Area)

57 **Estimation of energy expenditure during handball singles match play.** M Loftin, P Anerson, L Lytton, P Pittman, and B Warren. University of New Orleans.

58 **Physiological response to arm exercise during moderate intensity leg ergometry.** BR Abadie. Mississippi State University.

59 **The effects of immediate visual feedback on running economy and selected hemodynamic variables in male subjects.** D Diboll, T Boone, and R Lindsey. The University of Southern Mississippi.

60 **The effect of caffeine consumption on heart rate and rate of perceived exertion during maximal exercise testing.** C ashley, P Ochoa, M Ritta and P Bishop. University of Alabama.

61 **The effects of a mental and physical training program on ventilatory responses during rest: A physiological evaluation.** YA Lim, T Boone, R Kazelskis, and WR Thompson. Life College and The University of Southern Mississippi.

62 **$V0_2$max improvement independent of training intensity when caloric cost is similar.** IS Kallish and JC Rupp. Georgia State University.

POSTER SESSION 3

Friday, January 29

3:45 - 6:00
Authors present 5:15 - 6:00 pm.
(Hampton IV, Exhibit Area)

63 **Validity of ratings of perceived exertion in older adults.** MK Chance, BR Abadie, R Boling, and J Lamberth. Mississippi State University.

POSTER SESSION 3 (continued)

64 **Lipid and lipoprotein profiles of diabetic women and men with coronary artery disease.** PG Davis, WA Webster, DW Blackhurst, PK McCarter, and JL Durstine. Greenville Hospital Systems and University of South Carolina.

65 **Examination of ST segment depression during graded exercise tests as an indicator of myocardial perfusion defects.** JA Stewart, JC Rupp, Georgia State University.

66 **Upper extremity exercise following median sternotomy.** KJ Shields, DK Shaw, HS Jennings, and CD Cound. Riverview Hospital Association and Saint Thomas Hospital.

67 **An EMG analysis of the tennis serve: Establishment of a biomechanical data base.** R Shapiro, RL Stine, TS Horn, TJ Chandler, and WB Kibler. University of Kentucky.

68 **The effects of exercise on standing balance, pain and coping resources for older people with arthritis: comparison of land and water exercise.** KD Johnston, BF Johnson, JC Rupp, and LJ Brandon. Georgia State University.

POSTER SESSION 4

Saturday, January 30

8:00 - 10:00 am
Authors present 9:15 - 10:00 am
(Hampton IV, Exhibit Area)

69 **The effect of nutritional knowledge and exercise on dietary habits of the elderly.** JL Moul, BJ Warren, and RM Hohl. Appalachian State University.

70 ***Position of blood pressure measurement and the antihypertensive effects of aerobic exercise: A meta-analysis.** GA Kelley. Johnson C. Smith University.

*This abstract was selected by the reviewers as one of the top 30 abstracts

71 **Relationship of total cholesterol to physiological and behavioral variables in white and hispanic children.** J Roden, CGR Jackson, ZV Tran, D Shaw, and SC Baird. University of Northern Colorado.

72 **What are the dietary practices of 8-12 year-old black females and what do they know about fat, fiber, and cholesterol?** Myers -Oakes, B Saxer, and K Saxer. Wake Forest University.

73 ***Prevalence of cardiovascular risk factors in a group of african american and white high school students.** SR Vickers, CB Berry, BE Ainsworth, and NR Oakley. Winston-Salem State University.

74 ***Blood pressure and the JHAC scale in employeed african american men.** TJ Hodge, CB Berry and VN Schnyder. Winston-Salem State University.

*This abstract was selected by the reviewers as one of the top 30 abstracts

SEACSM APPRECIATES THE SUPPORT OF THE EXHIBITORS

AIRCAST

LEWIS MEDICAL INSTRUMENTS, INC.

MARQUETTE ELECTRONICS

MOSBY MEDICAL PUBLISHERS

NORDITRACK

ROCHE BIOMEDICAL LABORATORIES, INC.

SENTARA LEIGH HOSPITAL, PHYSICAL THERAPY SPECIALTY CENTER

WELLNESS INSTITUTE AND RESEARCH CENTER

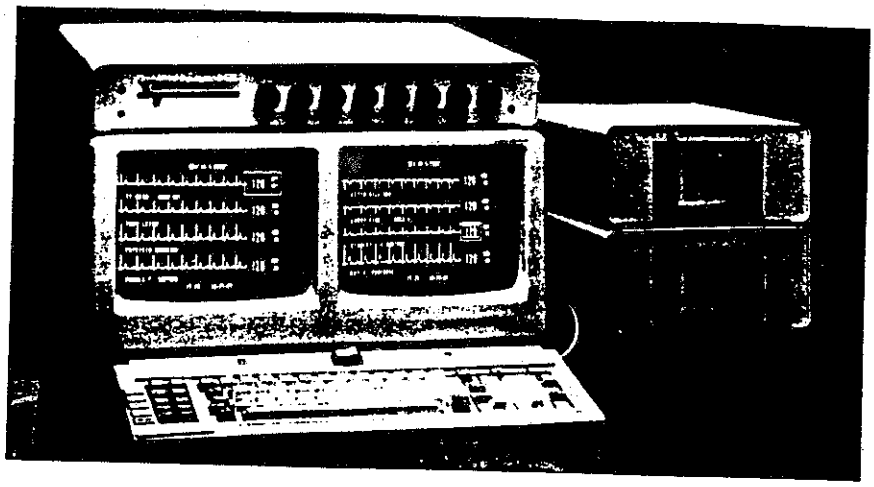
LEWIS MEDICAL INSTRUMENTS INC.

EATON PATIENT TELEMETRY

G-3800 EIGHT PATIENT TELEMETRY SYSTEM

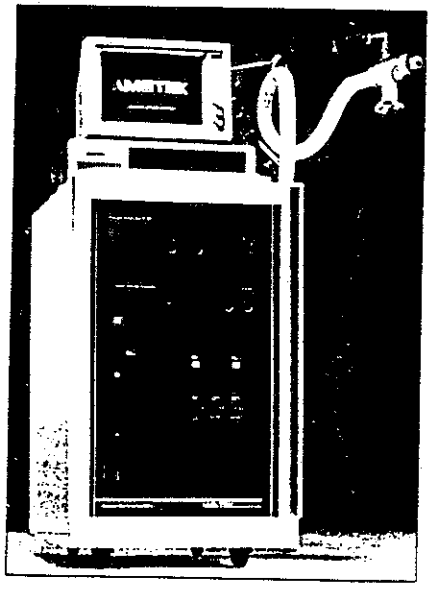
Whether it's used as a hospital step down unit, for general floor monitoring, in cardiac rehabilitation or for exercise and sports medicine applications, Eaton Medical Group's Eight Patient Telemetry unit delivers outstanding performance and value. Its compact size, easy-to-read monitor and recorder strips, and user-friendly keyboard make it a favorite of technician and physician alike. And patients will like it too because it permits a high degree of patient mobility.

EATON MEDICAL GROUP



- *Stress Testing*
- *Holter Monitoring*
- *Echocardiographs*
- *Treadmills*
- *Telemetry*
- *EKG Machines*
- *Rehab Equipment*
- *Ergometers*
- *Defibrillators*
- *Pulmonary Function*
- *Electrodes*
- *Supplies*
- *Service*

AMETEK



Model OCM-2 Oxygen Uptake System

The New OCM-2 System is designed to provide highly accurate measurements of oxygen uptake and other physiological parameters, while allowing maximum flexibility in the analysis and graphic display of the data.

This is accomplished by the coupling of precise analytical equipment with a true state-of-the-art data acquisition and analysis software package.

With the OCM-2, there is no compromise. Accurate, reliable, durable devices are interfaced with a highly sophisticated, flexible, easy-to-use program, to make the OCM-2 stand alone in the field of exercise testing.

Components
APPLIED ELECTROCHEMISTRY GAS ANALYZERS

☐ The S-3A/I OXYGEN ANALYZER
The laboratory standard, utilizes advanced zirconium oxide technology to provide unsurpassed accuracy in O_2 analysis, a vital measurement in the calculation of metabolic parameters.

☐ The CD-3A CARBON DIOXIDE ANALYZER
Utilizes infrared technology together with microprocessor controlled linearization to provide accurate, fast-response CO_2 analysis.

☐ K.L.E. TURBINE VOLUME METER
Inspired volume is accurately measured with this unique unidirectional turbine which is inertially compensated.

☐ ANCILLARY EQUIPMENT
The simple internal configuration of the OCM-2 includes a 4 liter mixing chamber and drying tube. A two-way breathing valve, mouthpiece, and tubing connections complete the self-contained system.

MONARK

1-301-984-6112 - DC Metro Area
1-800-433-8398 - All Other Areas
1-301-816-0320 - FAX

CALL US FOR SPECIAL PRICING ON MONARK ERGOMETERS, CYCLES AND REPLACEMENT PARTS

SPECIAL SHOW PRICES

11800 Coakley Circle, Rockville, Maryland 20852

MUSCLE METABOLISM AND INJURY/SORENESS

1

EFFECT OF THE MENSTRUAL CYCLE PHASE ON LIPID METABOLISM AT REST AND DURING EXERCISE

M.R. Brammeier, J.Z. Berend, N.A. Jones, S.C. Holliman, and A.C. Hackney, FACSM. Applied Physiology Laboratory, UNC, Chapel Hill, NC 27599.

This study examined the interaction of menstrual cycle phase and diet on lipid metabolism during rest and submaximal exercise. Seven eumenorrheic women completed a resting metabolic rate test and a discontinuous exercise protocol under the following conditions: low carbohydrate (~35% of total caloric intake) - follicular phase (LCHO-FP), high carbohydrate (~75%) - follicular phase (HCHO-FP), low carbohydrate - luteal phase (LCHO-LP), high carbohydrate - luteal phase (HCHO-LP). The exercise protocol consisted of 3 intervals of 6 minutes exercise, separated by 6 minutes rest, at 30%, 50%, and 70% VO2max. All dietary conditions were maintained for 3 days prior to each experimental session. Lipid oxidation (OX) and utilization (UTL) were assessed from indirect calorimetry techniques using respiratory gases obtained during steady state. Significant ($p<0.05$) interaction effects of menstrual cycle phase and diet conditions were found for rest and at 30% exercise only. The level of lipid OX and UTL was found to be greater in the LCHO-LP condition than all other conditions. The significant results were as follows (* denotes significantly different from all other menstrual cycle - diet conditions);

	LCHO-LP	HCHO-LP	LCHO-FP	LCHO-FP
OX ($g \cdot min^{-1}$)				
Rest	.071±.007*	.037±.006	.060±.005	.044±.008
30%	.251±.029*	.151±.016	.191±.028	.155±.032
UTL ($\% \cdot min^{-1}$)				
Rest	59.1± 3.5*	35.3± 5.3	51.9± 2.9	38.0± 4.8
30%	51.0± 7.7*	26.2± 3.1	39.0± 6.9	28.5± 5.7

We postulate that these findings are due to the elevated ovarian hormones in the LP mobilizing lipids in the situation of inadequate CHO intake. Furthermore, this effect seems to be negated when high CHO is ingested in the LP.

2

VITAMIN E AND DEHYDROEPIANDROSTERONE EFFECTS ON MUSCLE SCAVENGER ENZYMES AT REST AND DURING EXERCISE

A.H. Goldfarb, B.T.Boyer, J.Fatouros and M.K. McIntosh, Exercise & Sport Science,& Food & Nutrition Departments, University of North Carolina Greensboro, Greensboro, NC 27412

Exercise can increase lipid peroxidation, an indicator of oxidative stress. The purpose of this study was to determine the effect of vitamin E (E) and/or dehydroepiandrosterone (DHEA) on scavenger enzymes. Sixty four male rats were individually caged and received one of four treatments. Half the animals were injected daily with either corn oil (CON) or DHEA (100mg/kg) for 6 weeks. Diets in half the animals were supplemented with E (250 IU/day) for 6 weeks. Animals (n=32) ran on a rodent treadmill for one hour at 21 m/min up a 12% incline. One animal from each treatment group was killed each day. Quadriceps muscles were removed and separated on dry ice into superficial white and deep red sections and freeze clamped between prechilled blocks placed into liquid nitrogen. Soleus muscles were then obtained and treated in a similar manner. Samples were stored in a -70°C freezer until analyzed. Run time was unaffected by the treatments. Lipid peroxidation increased as a result of the run dependent on treatment and tissue. Vitamin E treated rats showed reduced lipid peroxidation after exercise. DHEA significantly increased lipid peroxidation in both fast-twitch muscles. Muscle catalase activity was not significantly affected by exercise. DHEA increased catalase activity in the muscles tested. Total glutathione peroxidase (GPX) activity in soleus muscle was increased by exercise. Soleus Muscle total GPX activity in E treated rats was reduced. These results suggest that DHEA increases lipid peroxidation and vitamin E may help to attenuate the exercise-induced response despite alterations in scavenger enzyme activity.

RUNNING DOWNHILL DOES NOT INJURE MOUSE SOLEUS MUSCLES.

D. Lowe, G. Warren, D. Hayes, B. Prior, and R. Armstrong.
The University of Georgia, Athens, Georgia 30602

Maximal isometric tetanic force (P_o) is reduced by 20-40% in both rat and mouse soleus muscles following 10 high-force (180-200% P_o) eccentric contractions performed in vitro (Lowe et al., MSSE 24: S142, 1992; Warren et al., The Physiologist 35: 201, 1992). Eccentric-biased exercise (running 16 m/min down a 16° incline for 90 min) performed by rats results in injury to soleus muscles (Armstrong et al., JAP 54: 80, 1983). The purpose of this study was to determine if the mouse soleus muscle is also susceptible to injury when mice perform a similar protocol. Eight female mice (18-26 g) were run for 300 min on a treadmill at 20 m/min, down a 17° incline. Fifteen min following the cessation of exercise, soleus muscles were isolated, placed in a bath containing an oxygenated Krebs solution and muscle force producing capabilities were measured.

Measurement	Control (n=11)	Exercised (n=8)
P_o (g)	15.30 (SE=0.8)	14.43 (SE=1.1)
Peak isometric twitch tension (g)	2.57 (SE=0.2)	2.78 (SE=0.2)
Max rate of tension development (g/sec)	340.8 (SE=22.9)	362.0 (SE=17.7)
Max rate of relaxation (g/sec)	443.9 (SE=19.9)	404.8 (SE=25.6)
Active muscle stiffness (g/mm)	21.93 (SE=0.9)	21.19 (SE=0.8)

None of the measurements are significantly different ($\alpha = 0.05$). Also, soleus muscles from 4 additional mice were examined 48 h post-exercise for light level histological evidence of injury. Minimal signs of damage were found, e.g., there was no evidence of necrotic fibers or of an inflammatory response. These findings suggest that under these exercise conditions the mouse soleus muscle undergoes minimal, if any, injury. An explanation for these results is that the forces experienced by the mouse soleus muscle during downhill running are less than that in the rat soleus muscle.

3

MASSAGE DOES NOT ATTENUATE DELAYED ONSET MUSCLE SORENESS

D.L. Char, C. Goya*, J. T. Lightfoot. Florida Atlantic University, Boca Raton, Fl 33431

Tentative results from our lab have suggested that massage may attenuate delayed onset muscle soreness (DOMS). Therefore, the purpose of this study was to investigate the effects of massage on DOMS. Thirty-one subjects (19 female, 12 male) were randomly assigned to three treatment groups. One group (4 female, 6 male) recieved petrassage (MASS) immediately post-exercise and also at twenty-four hours post-exercise for ten minutes on the left calf only. The stretch (STR) group (7 female, 3 male) performed simple static stretching prior to exercise. The control (CON) group (8 female, 3 male) recieved no treatment. The subjects visited the lab three times; each visit was separated by 24 hrs. On the first visit the subjects underwent an exercise bout consisting of 4 sets of 15 repetitions of eccentric isotonic exercise. Each repetition was at a workload equivalent to100 percent of the subject's bodyweight. Each set of repetitions was separated by a one minute rest period. Both the STR and CON groups rested for 10 minutes post-exercise and at twenty-four hours post-exercise, while the MASS group recieved petrassage. Plasma creatine phosphokinase (CPK) levels were determined pre-exercise, 24, and 48 hours post-exercise. Leg volumes were determined pre-exercise, immediately post-exercise, at 24, and at 48 hours post-exercise. The subjects were asked for a subjective rating of DOMS (on a 0-6 point scale of increasing value) at the completion of visit one, and at the start of visits two and three. There were no differences in soreness levels between the groups over the 48 hour period. In the MASS group, CPK showed a trend toward an increase at 48 hours as compared to the STR group ($p = 0.11$). The pre-exercise and 24 hour CPK levels were not different between groups. Leg volumes showed an increase in all groups pre- to post-exercise; at 24 hours and 48 hours all groups showed no change in leg volume from post-exercise. There were no differences between left and right leg volumes or soreness ratings in any of the groups at any time. Given our data, it appears that massage does not prevent or attenuate DOMS. Furthermore, the application of massage may augment CPK release after eccentric exercise.

Funded in part by AHA 90GIA/649.

4

5

USE OF AERO STYLE HANDLEBARS DOES NOT AFFECT LUNG VOLUMES OR PULMONARY FUNCTION

M. J. Berry, W. E. Pollock, K. van Nieuwenhuizen and P. H. Brubaker, Department of Health and Sport Science, Wake Forest University, Winston-Salem, NC 27109

Changes in body position have been shown to affect lung volumes and pulmonary lung function. The purpose of this investigation was to determine if there were differences in lung volumes and pulmonary function in cyclists in an upright riding position using standard racing handlebars and in a riding position assumed when using aero style handlebars. Eleven subjects, 10 men and 1 women, with a mean (±SD) age, height, body mass and $\dot{V}O_2$ max of 28.7±9.9 yr, 177.6±6.2 cm, 70.3±9.1 kg and 61.7±2.9 ml/kg/min, respectively, served as subjects. Differences in tidal volume, .89±0.07 vs .93±0.04 L; expiratory reserve volume, 1.99±0.13 vs 1.91±0.11 L; inspiratory reserve volume, 2.51±0.19 vs 2.51±0.16 L; and residual volume - as determined from helium dilution, 2.03±0.14 vs 2.03±0.12 L, were not significantly different when measured in the aero position versus the standard racing position. Differences in maximum voluntary ventilation, 173.3±4.5 vs 173.7±4.4 L; percentage of vital capacity expired in 1 sec, 83±2 vs 84±2%; forced expiratory volume in 1 sec, 4.3±0.1 vs 4.4±0.1 L; forced vital capacity, 5.29±0.2 vs 5.31±0.2 L, forced midexpiratory flow rate, 4.2±0.3 vs 4.3±0.3 L/sec; and maximal forced expiratory flow rate, 10.4±0.5 vs 10.1±0.4 L/sec, were not significantly different when measured in the aero position versus the standard racing position. Failure to find any differences in lung volumes and pulmonary function when comparing the two riding positions would suggest that the pulmonary system is not compromised when a rider assumes an aero riding position.

6

COMPARISON OF HEART RATE, VENTILATION, AND PERCEIVED EXERTION AT SIMILAR OXYGEN UPTAKES ON FOUR DIFFERENT EXERCISE ERGOMETERS

R. F. Moss and C. Clark. Health and Exercise Science Department, Furman University, Greenville, SC 29613

Cross training has become an important part of the university's community exercise program. In order to ensure similar work intensities on the various ergometers, treadmill, stair stepper, rower, stationary cycle; twenty volunteers, 15 men and 5 women, were tested on each ergometer over a 5 stage protocol which would range from light to heavy workloads. Expired ventilation was analyzed for composition of O_2 and CO_2 content and volume of expired air was determined. Using an automated metabolic system, VO_2 was determined for each stage. Perceived exertion was also recorded at the end of each stage. Analysis of data found no significant differences in heart rate or ventilation at similar VO_2 levels for each ergometer. Heart rate was linear across all ergometers and ventilation showed the classic exponential rise. However, perceived exertion was significantly different between the treadmill and stationary cycle (Scwhinn Airdyne), at simialar VO_2 levels, with the rower and stair stepper intermediate between these. Because the acute physiologic adaptations are very similar among the different ergometers; an interconversion table, was developed, based on heart rate, that will allow participants to train on the different ergometers at similar workloads; therefore, they will obtain the same aerobic benefits from all ergometers without an increased risk of overuse.

Supported by a Furman Advantage Grant

RELATIONSHIP OF STRIDE FREQUENCY AND CALTRAC ESTIMATED ENERGY EXPENDITURE DURING WALKING AND RUNNING

E.M. Haymes, FACSM, D.T. Lee & L.R. Martinez, Department of Nutrition, Food & Movement Sciences, Florida State University, Tallahassee, FL 32306

In a recent study (Haymes & Byrnes, 1991) the Caltrac personal activity computer estimate of energy expenditure did not adequately discriminate between running speeds of 4 through 8 mph. The purpose of the present study was to determine if Caltrac estimated energy expediture during walking and running is related to stride frequency. Eight women and 8 men walked at speeds of 2, 3 & 4 mph and ran at speeds of 5, 6 & 7 mph on a horizontal treadmill. Subjects completed both 4 min and 8 min bouts at each speed. Two Caltrac monitors were attached to a belt over opposite hips. One Caltrac was programmed to give caloric expenditure and the other to give activity counts. Oxygen uptake was measured continuously during exercise and metabolic rate was calculated using RER. Stride frequency was counted by one investigator during 2 min of each 4-min bout and 3 min of each 8-min bout. Caltrac estimated energy expenditure and activity counts were both significantly different between 2, 3, 4 and 5 mph, but there were no significant differences between the running speeds of 5, 6 and 7 mph. Metabolic rate was significantly different between all walking and running speeds except 2 and 3 mph. Significant differences in stride frequency were found between 2, 3, 4 and 5 mph, but no differences in stride frequency were observed during running at 5, 6 and 7 mph. Caltrac activity counts and stride frequency were significantly higher for women than men at all speeds. Stride frequency was significantly correlated with activity counts (r =.94), Caltrac estimated energy expenditure (r =.82) and metabolic rate (r = .77). It is concluded that failure of the Caltrac to adequately discriminate between running speeds of 5, 6 and 7 mph is related to the lack of significant change in stride frequency between these speeds.

7

DETERMINATION OF OPTIMAL LOAD FOR A CONSTANT-LOAD ERGOMETER RELATIVE TO ISOTONIC LEG STRENGTH

H.A. Wagner and J.H. Williams. Health and P.E. Department, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

This study investigated the determination of an optimal resistive force for use during a short-term, high-intensity cycling power test. Twenty-four college females [age (yrs) x=22.0 ±0.50; weight (kg) x=60.3 ±1.46] gave consent and participated in a 1 repetition maximum (RM) test of the leg extensors and 5 maximal 15 s cycling tests using a modified Monark cycle ergometer. The 1RM test was performed using a Nautilus leg extensor machine. Even increments between six to ten % 1RM test were utilized to determine the resistive force applied to the flywheel. The 5 tests were divided into 2 testing sessions occurring at least 48 h apart. Each subject warmed-up at 50 - 50 rpms for 2 - 5 minutes without resistance prior to testing. Each test consisted of a maximal cycling bout of 15 s with 20 minutes rest between tests. The variables measured included peak power (PP) and average power (AP). These values were collected by a microcomputer interfaced with the cycle ergometer. In general, PP decreased at a resistance greater than 9 % 1RM. The average reported PP values over the 15 s test were 363±15, 413±19, 465±19, 520±21, and 460±41 for loads 6 to 10 % 1RM respectively. Similar results were reported for AP. The differences in PP for loads between 8 and 10 % 1RM were statistically different. Results show that PP varies based on loads of % 1RM and the optimal range is between 8 and 10 % 1RM.

8

9

A KINEMATIC ANALYSIS OF THE TENNIS SERVE: ESTABLISHMENT OF A BIOMECHANICAL DATA BASE.

R. Shapiro+, FACSM, R.L. Stine+, T.J. Chandler*, FACSM and W.B. Kibler*, FACSM.
+University of Kentucky; *Lexington Clinic, Lexington, KY 40506

In order to appropriately determine the correct course for performance or injury assessment and injury repair or rehabilitation, the intervention should be determined by existing knowledge of how the particular movement is performed. When evaluating the shoulder and arm motion associated with the tennis serve, a data set for comparison is not readily available. The purpose of this investigation was to establish baseline parameters for injury and performance assessment for the tennis serve. Shoulder and elbow joint kinematics were measured in 13 male and 3 female highly skilled players during the serve. Reflective markers were attached bilaterally to the hip, shoulder, elbow, and wrist. The racquet and ball were also marked. Subjects were videotaped using 4 high-speed (200 Hz) video cameras. Standard three-dimensional analysis techniques utilizing the DLT were employed to extract coordinate data via the Expertvison software package. Angular displacements and velocities were calculated for shoulder internal and external rotation and elbow flexion and extension. Racquet and ball velocities were also calculated. Average maximum (AM) shoulder external rotation displacements were 52 $\pm$ 13° for males and 47 $\pm$ 10° for females. AM internal rotation velocities were 1294 $\pm$ 220 deg/sec for males and 967 $\pm$ 283 deg/sec for females. AM elbow flexion displacements were 56 $\pm$ 13° for males and 31 $\pm$ 16° for females. AM elbow extension displacements were 151 $\pm$ 8° for males and 150 $\pm$ 9° for females. AM elbow extension velocities were 912 $\pm$ 236 deg/sec for males and 1091 $\pm$ 270 deg/sec for females. Maximum racquet velocities were 25.92 $\pm$ 3.12 m/sec for males and 22.80 $\pm$ 2.23 m/sec for females. Linear ball velocities were 38.89 $\pm$ 4.92 m/sec for males and 36.2 $\pm$ 3.12 m/sec for females. These data provide a useful data base for subsequent assessment of tennis athletes.

10

BENCH-STEP KINETICS: COMPARISON OF TWO STEPS AT THREE HEIGHTS

Johnson, B. F., Johnston, K. D. and Winnier, S. A. Biomechanics and Ergonomics Laboratory, Department of HPRD, Georgia State University, Atlanta, GA 30303.

The purpose of this study was to compare the peak vertical ground forces (PVGF), loading rates (PVLR) and impulses (PVI) on the descent foot when performing two different bench-step aerobic movements at three different heights with the same stepping cadence. Fifteen volunteers (mean age 24.4 years) with minimal bench-step aerobic experience randomly performed bench-stepping under six conditions: standard (STA) sagittal bench-stepping at bench heights of 6-, 8- and 10-in. and straddle (STR) bench-stepping at bench heights of 6-, 8- and 10-in. The subjects performed using a standardized audiotape to determine cadence at a rate of 30 steps per minute under each condition. The subjects performed each condition for 45s with measurements taken at approximately 30s. The vertical ground forces were measured with an AMTI computerized force platform operating at 1500 Hz. A repeated measures ANOVA ($p<0.05$) technique and Tukey's post-hoc test were used to determine statistical differences. The results indicated a range of mean PVGF between 1.4$\pm$0.22 BW and 1.74$\pm$0.32 BW for the group with the STR 6-in. step producing the smallest force and the STA 10-in. the largest force. Mean PVI ranged from 0.1097$\pm$0.015 BW·s for STR 6-in. to 0.1417$\pm$0.0302 BW·s for STR 10-in. Mean PVLR for the group ranged from 10.0334$\pm$3.9122 BW·s^{-1} for STR 6-in. and 13.7606$\pm$3.6764 BW·s^{-1} for STR 10-in. STA 6-in. bench-stepping produced significantly smaller PVGF, PVI and PVLR than both STA 8- and 10-in. stepping and smaller PVLR than STR 8- and 10-in. stepping. STA 10-in. stepping was significantly greater in PVGF and PVI than all STR stepping heights. STR 6-in. produced significantly smaller PVGF than STR 8- and 10-in. stepping, smaller PVI than STA 8- and 10-in. and STR 10-in. and smaller PVLR than STA 8- and 10-in. and STR 10-in. STR 10-in. produced smaller PVGF than STA 10-in. and greater PVGF than STR 6-in., smaller PVI than STA 8- and 10-in. and greater PVLR than STA 6-in. and STR 6- and 8-in. In conclusion, bench-stepping performed from a 6-in. bench produced generally smaller PVGF, PVI and PVLR when compared to greater bench heights and would likely decrease the chances for foot and shank injuries when compared to stepping from greater heights. STA 10-in. bench-stepping imposed the greatest loads on the ground foot and would likely increase the chances for injury to the foot and shank when compared to other conditions. No clear-cut differences could be determined between STA and STR stepping techniques across all conditions.

THE EFFECTS OF ABDOMINAL SUPPORT ON LUMBAR SPINE KINETICS DURING LIFTING.

McCoy, R., Woodhouse, M., Redondo, D., & Shall, L.,
The College of William and Mary, Williamsburg, VA;
Norfolk State University, Old Dominion University,
Eastern Virginia Medical School, Norfolk, VA 23529

The purpose of this study was to evaluate the peak values of the compression force (FC), shear force (FS), muscle force (FM), and moment (EM) around the lumbar/sacral (L_5/S_1) joint in nine healthy young men (age = 24.7 yrs; wt = 824 N; ht = 1.80 m) during a lifting task from a squat to a standing position. A weight belt (WB), a weight belt with a rigid abdominal pad (WBAP), and an elastic binder (BNDR) served as supportive conditions along with a no support condition (NS) while the subjects lifted a weighted box corresponding to 90% of their maximal lifting ability. The subjects were video taped and analyzed at 60 Hz with the raw data filtered using a digital filter (6 Hz). Ground reaction force data were synchronized with the video and recorded at 180 Hz on-line to a micro-computer. The forces and moments about L_5/S_1 were calculated using a static model of the lower extremity and trunk throughout the lifting task. Data were analyzed using a MANCOVA with system weight as the covariate. Though the peak compression force, muscle force, and extensor moment were lower for the WBAP condition when compared to the other conditions, these values were not significantly different ($P<.05$). The peak shearing force was lower for the supported conditions when compared to the NS condition, though these values were not significantly different. These data do not support the use of abdominal supports for decreasing $L_5\backslash S_1$ kinetics during a lifting task.

	FC (N)		FS (N)		FM (N)		EM (N m)	
	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)
NS	6783	(2524)	4432	(1355)	8256	(2677)	606	(165)
BNDR	6602	(2397)	3691	(1110)	7776	(2348)	591	(150)
WB	6997	(3273)	3786	(888)	8251	(3184)	639	(215)
WBAP	6505	(2515)	3899	(997)	7656	(2210)	580	(143)

Supported by the Orthopaedic Associates of Virginia, Ltd.

11

THE EFFECTS OF ABDOMINAL SUPPORT ON INTRA-ABDOMINAL PRESSURE AND INTRA-ABDOMINAL FORCE DURING LIFTING

Redondo, D., Woodhouse, M., McCoy, R., & Shall, L.,
Old Dominion University, Norfolk State University, The
College of William & Mary, Eastern Virginia Medical School
Norfolk, VA 23529

The purpose of this study was to evaluate the peak intra-abdominal pressure (IAP) and its relieving effect on the lumbar spine in nine healthy young men (age = 24.7 yrs; wt = 824 N; ht = 1.80 m) during a lifting task from a squat to a standing position. A weight belt (WB), a weight belt with a rigid abdominal pad (WBAP), and an elastic binder (BNDR) served as supportive conditions along with a no support (NS) condition while the subjects lifted a weighted box corresponding to 90% of their maximal lifting ability. IAP was obtained from a transducer inserted into the stomach via the nasal passage (Narco Biosystems, MMS-100) recorded on-line to a micro-computer at 1000 Hz. The relieving force (FIAP) due to the IAP was calculated as the product of the IAP and the cross-sectional area of the intra-abdominal cavity. Data were analyzed using a MANCOVA with system weight as the covariate. There were no significant differences ($P<.05$) between the four conditions for IAP, time to peak IAP (TTPIAP), total IAP (TIAP), or FIAP. Consequently, these data fail to substantiate the use of abdominal supports as an aid to significantly increase IAP and FIAP during a lifting task.

	IAP (KPa)		TTPIAP (s)		TIAP (KPa)		FIAP (N)	
	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)	$\bar{X}$	(s.d.)
NS	20.1	(3.3)	0.20	(0.46)	23.6	(5.6)	944	(166)
BNDR	20.2	(5.4)	0.14	(0.25)	22.1	(5.4)	986	(254)
WB	21.0	(4.6)	0.30	(0.29)	24.0	(7.0)	1002	(211)
WBAP	20.4	(4.6)	0.24	(0.32)	25.2	(6.8)	977	(209)

Supported by the Orthopaedic Associates of Virginia, Ltd.

12

13

EFFECT OF AEROBIC STEP TRAINING ON BODY COMPOSITION AND MOOD STATES IN FEMALES

R.N. Henry, K.D. Johnson. Department of Exercise Science, David Lipscomb University, Nashville, TN 37205; P.D. McClellan, Middle Tennessee State University, Murfreesboro, TN 37132

Aerobic step training impacts body composition and mood states. The purpose of this study was to determine the effect of a 12-week, three-times-per-week step training program on body composition and various mood states. Fourteen previously sedentary females ($\bar{x}$ age = 27.93 ± 7.80 years) at David Lipscomb University volunteered for the experimental group, and 10 for the control group ($\bar{x}$ age = 26.00 ± 7.50). All subjects were initially weighed hydrostatically to determine body composition, and completed the *Profile of Mood States* questionnaire to test six separate mood states and total mood displacement. The experimental group engaged in a supervised 12-week step training program three times per week for 35 minutes. The control group did not change exercise habits, which ranged from mild, infrequent exercise to no exercise. Neither group of subjects altered eating habits. All subjects were re-tested at the end of the training period. Pre-test to post-test improvements in the experimental group were significant ($p<0.05$) in body composition ($p=0.004$), depression-dejection ($p=0.02$), anger-hostility ($p=0.03$), vigor-activity ($p=0.01$), confusion-bewilderment ($p=0.02$), and total mood displacement ($p=0.02$). Changes from pre-test to post-test were not significant in tension-anxiety ($p=0.08$) or fatigue-inertia ($p=0.07$). The control group did not show a significant change in body composition or any of the psychological variables. In summary, a program of aerobic step training elicits positive results in both physiological and psychological parameters.

14

THE EFFECT OF MODERATE-PROGRESSIVE EXERCISE ON METABOLIC MEASURES DURING WEIGHT LOSS IN CHILDREN AND ADOLESCENTS.

M Sothern, M Loftin*, J Curcio, K von Almen, H Schumacher, R Farris, EM Haas, RM Suskind
Department of Pediatrics, LSUMC School of Medicine, *University of New Orleans

The short term effects of a 10 week weight reduction program on specific metabolic, exercise and anthropometric measures were evaluated in children and adolescents, 7-17 years of age. Pre and post differences were observed in resting energy expenditure (REE), estimated VO_2 max, percent body fat and fat free body (FFB) in a group of 10 subjects enrolled in a medically supervised outpatient weight reduction program. The multi-disciplinary program included a 600-800 KCAL protein sparing modified fast (PSMF), behavior modification, nutrition intervention and a moderate intensity, (45-55% of VO_2 max) progressive exercise program (MPE) with weekly supervised group exercise sessions. Exercise frequency gradually increased from 2/wk @ wk.1 to 6/wk @ wk.10; exercise duration, from 20 min./session @ wk.1 to 60 min./session @ wk.10. Expired gases for REE were measured via Medical Graphics 2001 metabolic system. VO_2 was estimated from a sub maximal cycle ergometer exercise test using a modified protocol from Legge & Banister (JAP, 1986). Percent fat was estimated from sum of skinfolds and calculations based on Slaughter, et al (Hum Biol, 1988) youth specific equations. Statistical analysis consisted of paired t-tests. Significant increases were noted in estimated VO_2 max ($p < .05$) along with significant decreases in overall body weight and percent body fat. There were no significant changes in REE or FFB. No medical problems or discomfort were observed in the subjects during the ten week period. An MPE program was appropriate for use with a PSMF and may contribute to a maintenance of FFB and REE. In addition, the MPE program was of sufficient intensity, frequency and duration to promote a significant increase in estimated VO_2 max in obese children and adolescents.

15

CONTRAST OF EXERCISE TRAINING UPON PERCENT FAT AND BLOOD LIPID CHANGES BETWEEN MEN AND WOMEN CARDIAC PATIENTS.

CE Fidler, PM Ribisl, DB Bergey, P Brubaker, HS Miller, and WJ Rejeski. Departments of Medicine and Health & Sport Science, Wake Forest University, Winston-Salem, NC.

Little previous research is available on the effectiveness of exercise training upon blood lipids and body composition in women with CHD. Using a retrospective design, we contrasted the blood lipids and percent fat of 70 pairs of men (**M**) and women (**W**) patients (57.3 & 57.6 yrs) with diagnosed CHD who participated in a 3-month multiple intervention program including exercise training 3 days/wk. Variables included total cholesterol (TC), total cholesterol to HDL-cholesterol ratio (TC/HDL), HDL-cholesterol, Triglycerides (TRG), and percent fat (%). Dependent measures were analyzed for group (**M** vs **W**) by treatment (0 mo. vs 3 mo.) effects with mixed model ANOVAs and appropriate follow-up tests. Results are below:

Variable	Men @ 0 and 3 mo. (Mean+SD)		Women@ 0 and 3 mo. (Mean+SD)	
% FAT	22.9 ± 4.70	21.7 ± 4.96	30.9 ± 8.37	29.4 ± 7.78
TC	221.3 ± 46.7	219.3 ± 42.6	247.2 ± 63.0	239.2 ± 56.5
TC/HDL	6.62 ± 2.50	6.18 ± 2.02	5.75 ± 2.55	5.45 ± 2.00
HDL	36.2 ± 9.85	37.2 ± 9.38	47.2 ± 14.0	47.7 ± 13.8
TRG	232.7 ± 271.9	204.1 ± 163.8	210.2 ± 183.4	213.3 ± 249.4

Upon entry, **W** had a significantly greater ($P \leq 0.01$) percent fat than **M**. After 3 mo. of exercise training, both **M** and **W** patients significantly decreased ($P \leq 0.01$) % fat; however, **W** still had a significantly greater ($P \leq 0.01$) % fat than **M**. Neither group made significant changes in TC levels though **M** maintained significantly lower ($P \leq 0.01$) TC levels than women at 0 and 3 Mo. Initially, **M** had a significantly greater ($P \leq 0.05$) TC/HDL ratio and a significantly lower ($P \leq 0.01$) HDL level than **W**. With intervention, both **M** and **W** decreased their ratio, but only the change for **M** was significant ($P \leq 0.05$). Neither **M** nor **W** significantly changed their HDL levels. There was no significant difference between **M** and **W** in TRG levels at 0 or 3 mo.; neither was there a significant change in TRG levels for **M** or **W** with exercise training. These results suggest that **M** and **W** with CHD can decrease % fat through exercise training; however, only men experience significant improvements of certain variables in the blood lipid profile, i.e. TC/HDL ratio.

16

PLASMA LIPID, CARDIOVASCULAR ENDURANCE AND BODY COMPOSITION RESPONSES TO INTERVAL - STEP AEROBIC DANCE TRAINING

P.E. Mosher, B. Pickett, M. Ferguson and R. Arnold. Exercise Science Department, University of Tennessee, Chattanooga, TN 37402

Twenty-three untrained college-age females were assessed to determine the effects of a 12 week interval-step aerobic dance training program on plasma lipoprotein levels, max VO_2 and body composition. A non-exercising control group (n=19) was also tested. Pre and post training fasting blood samples were obtained during the follicular phase of the menstrual cycle and assayed for total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C). VO_2 was measured during a treadmill test and body composition was determined by skinfold measurements. Three day nutritional logs were also obtained and analyzed for fat, protein and CHO content. The training group met 3 times per week for 50 minutes and each session included a 4-5 minute warmup, seven, 3 minute intervals of step benching each followed by equal intervals of traditional aerobic dance patterns. A 4-5 minute cooldown was also included. ANOVA for repeated measures revealed significant increases in VO_2 max ($p<.01$) and HDL-C ($p<.05$) as well as significant decreases in percent body fat ($p<.01$). No changes were observed for nutritional intake, LDL-C, TC or TG. These data suggest that interval step aerobic dance may provide the threshold of training necessary to alter lipoprotein profiles in college-age females.

Supported by a UT-Chattanooga faculty developmental grant

17

PHYSICAL ACTIVITY PATTERNS, PEAK VO_2 AND RELATED MEASURES IN OBESE FEMALE MINORITY CHILDREN & ADOLESCENTS

R Suskind, M Loftin*, M Sothern, J Curcio, K von Almen, H Schumacher, R Farris, R Brown
Department of Pediatrics, LSUMC School of Medicine, *University of New Orleans

Research findings with respect to physical activity and fitness levels for obese children have yielded equivocal results. Recent technological advances present a more direct method of examining activity patterns through the use of a heart rate monitor. The purpose of this investigation was to observe 24 hour physical activity (PA) patterns, peak oxygen uptake (VO_2) and related physiological measures in minority female youth. In this pilot study a group of 19 obese (IBW ≥ 140%) female minority subjects were screened for entrance into a clinical weight reduction program. A sub-group of 5 girls (mean age: 12 years, SD ± 2.0) were tested for body composition, peak VO_2, resting blood pressure, cholesterol and triglyceride levels and PA pattern over a 24 hour period. Relative fat (%) was estimated from skinfold data (Slaughter, et al., Hum Biol, 1988). Peak VO_2 was measured during treadmill walking using a modified Balke protocol. A Sensormedics MMC was used for VO_2 assessment and heart rate (HR) was measured with a Polar Vantage XL monitor. Mean values are as follows: BW 91.1 kg; Ht. 1.6 m; % fat 48.2; Peak VO_2 21.3 ml/kg/min; Resting SBP 120.8 mmHg; Resting DBP 61.8 mmHg; Cholesterol 184.8 mg/dl; HDL 46.4 mg/dl; LDL 115.2 mg/dl; Triglycerides 116.2 mg/dl; Total no. of min of PA ≥ 140 BPM was 45.1 min; ≥ 160 BPM was 19.3 min. Sustained PA ≥ 140 BPM for 5, 10, and 20 minute sessions respectfully were 2.0, 0.9 & 0.3. There were no sustained periods ≥ 160 BPM. Physical fitness values and sustained physical activity ≥ 140 BPM were very low. Blood pressure, total cholesterol, LDL, and triglyceride levels were slightly elevated indicating higher heart risk parameters in this group. These data suggest that physical fitness and activity patterns may be lower in obese minority female children and adolescents than non-obese female youth.

18

CARDIOVASCULAR RISK AND SELF-REPORTED PHYSICAL ACTIVITY IN A GROUP OF AFRICAN AMERICAN MALE DEPARTMENT OF TRANSPORTATION EMPLOYEES

V.N. Schnyder, C.B. Berry, B.E. Ainsworth and T.J. Hodge, Wellness Laboratory, Winston-Salem State University, Winston-Salem, NC 27110

Forty eight male African American road workers from four counties in North Carolina volunteered to participate in a study of cardiovascular risk. Mean and standard deviation for variables of interest are presented: age = 37.5±10.2; education = completed high school; percent body fat from skinfolds (%BF) = 20.4±9.2; body mass index (BMI) = 30.3±7.2; diastolic blood pressure (DBP) = 88.8±11.8; systolic blood pressure (SBP) = 140.9±15.6; total serum cholesterol (CHOL) = 214.5±62.7; high density lipoprotein (HDL) = 49.6±19.3; CHOL/HDL = 4.8±2.1; resting heart rate (RHR) = 75.6±10.3; waist/hip ratio (W/H) = 0.89±0.1. The Paffenbarger Activity Index (PAI) and the Lipid Research Clinic (LRC) questionnaires were used to assess physical activity (PA) habits. This group of men had a less than desirable cardiovascular risk profile as 31 % were obese, 35 % had both SBP ≥ 140 and DBP ≥ 90, 36 % had CHOL/HDL ratios at 5 or above and 73 % reported engaging in leisure time PA which required less than 1000 kcal per week. When classified by their own perception of their PA habits using the LRC scoring system, half were classified as active, however, there were no significant ($p>0.05$) differences between the inactive and active in terms of any of the measured variables. It is likely that because these workers were in jobs which were classified as manual labor that their perception was that they were physically active. However, the level of activity was not enough to influence body fat, blood pressure, RHR or serum cholesterol.

Supported by NIH grant # S206 RR008040-19

PARENTAL INFLUENCES ON CHILDHOOD FITNESS AND PHYSICAL ACTIVITY LEVELS

C.B. Bradley, R.G. McMurray, and J.S. Harrell. University of North Carolina, Chapel Hill, NC 27599-8700.

The purpose of this study was to determine the effects of parental attitudes and exercise habits on the physical activity (PA) levels and aerobic capacity (VO_2max) of their children. One parent from 1253 families completed both the Exercise Benefits and Barriers Scale (EBBS) about their attitudes towards exercise and a questionnaire on their PA habits. The children completed a self-reported PA questionnaire (SRPAQ) and had their VO_2max predicted using the PWC_{170} test. Results indicated that boys and fathers were more physically active than their female counterparts. Further, the VO_2max of the boys was higher than the girls: 44.9±9.7 vs 39.2±8.6 ml/kg/min; p=0.0001. Multiple regression indicated that the parents' EBBS scores were weakly associated with the child's VO_2max (R^2=0.007; p=0.047). The mother's EBBS was significantly associated with the child's VO_2max (R^2=0.011; p=0.025), while no association was evident for fathers (R^2=0.008; p=0.64). Neither parent's EBBS were related to the daughter's VO_2max; however, the mother's score was weakly associated with the son's VO_2max (R^2=0.019; p=0.055). The children's VO_2max were compared based on the upper and lower quartiles of the parental EBBS and PA, with no significant differences found (p>0.07). The children's SRPAQ scores were not associated with parent's attitudes (p=0.72) or PA (p=0.82). These results suggest that factors other than parental attitudes and exercise habits are more influential in determining the fitness and activity levels of children. Thus, to improve the fitness of children, we need to examine factors in the child's environment which may be more important than the parents attitudes and PA habits.

Supported by NIH grant #NR01837: Cardiovascular Health in Children Study.

19

FACTORS RELATED TO ERRORS IN THE RECALL OF PHYSICAL ACTIVITY (PA) ON SELF-REPORT PA QUESTIONNAIRES

L.F. Cunningham, B.E. Ainsworth, FACSM. Applied Physiology Laboratory, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599.

This study was conducted to identify factors associated with the recall of PA using self-report questionnaires. Subjects included 47 adults stratified by age (19 - 45 years), PA status (active, inactive), and gender (23 men, 24 women) for study inclusion. For one week subjects recorded leisure-time PA in a record book. Types of PA recorded were limited to 74 activity types included in the PA recall questionnaire. PA was recalled for the same week using a one-week version of the Minnesota Leisure-Time PA questionnaire (LTPA). PA was scored in kcal per day as total, heavy (≥ 6 METs), moderate (4.5-5.5 METs), light intensity (≤ 4 METs), and household PA. Factors studied were age, sex, aerobic fitness using a submaximal treadmill test, body fatness using skinfolds, self-esteem using Coopersmith's inventory, social physique anxiety using Hart's inventory, and a developed inventory to assess one's perception of their LTPA status. Difference scores were computed to determine the amount of over- or underestimation of LTPA by subtracting the LTPA scores from the PA record scores for total, heavy, moderate, light, and household PA. LTPA questionnaire data were skewed and log-transformed for analyses. To identify the associations between the over- or underestimation of recalled PA and the factors, stepwise multiple regression analyses of the difference scores on the factor scores were performed. Results showed the following weak associations: *Total LTPA* - overestimation with increasing age (p = 0.09). *Heavy LTPA* - overestimation with increasing social physique anxiety (p = 0.01) and fitness levels (p = 0.07). *Moderate LTPA* - underestimation with increasing self-esteem (p = 0.09). *Household LTPA* - overestimation with increasing fitness (p = 0.11). The strength of the relationships was reduced by the large variability between the LTPA and PA record scores (up to ± 500 kcal/day) representing gross under- and over-estimations of PA on questionnaires. These errors in recall ultimately limit the validity of PA questionnaries. Further inquiries are needed to undertand the patterns of over- and underestimation of PA habits on self-reported PA questionnaires.

20

21

ANAEROBIC AND AEROBIC POWER OUTPUTS, AND BLOOD LACTATE LEVELS, BEFORE AND AFTER THE TAPER PHASE IN PEDIATRIC SWIMMERS

F.J. Servedio and L.C. Colvin, Laboratory of Applied Physiology
The University of Southern Mississippi, Hattiesburg, MS 39406

This investigation examined anaerobic power (AN) and aerobic power (AER) via arm-crank exercise (ACE), before and after a two-week taper phase at the end of a swimming season. These data were correlated with blood lactate values (BL) measured following each exercise bout. Four girls and 5 boys (age = 9.7 ± 1.7 yr, ht = 140.3 ± 11.0 cm, wt = 37.1 ± 9.7 kg) from a year-round age-group swim team participated. AN generated over 30 sec was measured utilizing a modified Wingate power test (ACE at 0.05 kg·kg body weight^{-1}). A progressive resistance ACE protocol was used to measure AER. BL were measured from finger stick samples of 50 microliters whole blood. Power and BL mean values (± SD) are below.

	PRE-TAPER			POST-TAPER		
	Rest	Anaerobic	Aerobic	Rest	Anaerobic	Aerobic
Power Outputs (W)		408.47 (202.80)	99.88 (29.26)		478.86 (195.07)	110.48 (27.77)
Lactate (mM·L^{-1})	1.17 (0.34)	3.68 (1.56)	4.15 (1.74)	1.24 (0.38)	2.36 (0.75)	3.41 (2.50)

Statistical analysis revealed moderate relationships between BL and Pre-taper AN ($r=0.64$), and BL and Pre-taper AER ($r=0.63$). There was a significant relationship between BL and Post-AN ($r=0.82$, $p<.05$), and no relationship between BL and Post-AER ($r=-0.02$). These data indicate variable BL values depending on the type of test and when it is performed.

22

TAPERED TRAINING IMPROVES 5 KM RACE PERFORMANCE IN HIGHLY-TRAINED DISTANCE RUNNERS.

B.K. Scott and J.A. Houmard, East Carolina University, Greenville, NC 27858.

The purpose of this study was to determine if a 7-day reduction in training volume or "taper" could improve distance running performance. Three groups of 8 distance runners were examined: **1)** Taper-Run **2)** Taper-Cycle and **3)** Control. The taper groups reduced weekly training volume by ≈75% with Taper-Run using running as the exercise mode while Taper-Cycle utilized cycle ergometers. Control continued normal training practices. Maximal and submaximal (≈80% VO_2max) treadmill run measurements and muscular strength (peak isometric and concentric torque) were assessed at 7-10 days pre-taper, 1-day pre-taper, and post-taper. A self-paced 5 km run upon a treadmill served as the index of performance. Taper-Run improved 5 km performance by ≈3% (17.27 ± 0.51 to 16.68 ± 0.47 min, $P<0.005$) and although VO_2max was unaltered, time to exhaustion during the maximal test increased by ≈30 sec ($P=0.05$). Significant decreases ($P<0.01$) in submaximal oxygen consumption in absolute (-0.15 l/min) and relative (-2.3 ml/kg/min) terms and calculated caloric expenditure (-0.7 kcal/min) were evident in Taper-Run. In Taper-Cycle 5 km run performance was maintained, although HR and post-run lactate levels were higher compared to the pre-taper condition ($P<0.05$). Maximal heart rate was also signficantly elevated ($P<0.01$) by ≈4 beats/min. No alterations in muscular strength were evident in any groups. These findings indicate that a week of tapered run training can improve performance, primarily through enhancing running economy. A similar regimen of cycle training maintains performance.

RELATIONSHIP BETWEEN LACTATE AND UPPER BODY WINGATE PERFORMANCE IN INTERCOLLEGIATE SWIMMERS

M.A. Martino, J.F. Smith, P.A. Bishop, T. Buhre, P. Reneau, and R. Farley, Exercise Physiology Department, University of Alabama, Tuscaloosa, AL 35487-0312

The purpose of this study was to examine the relationship between the upper body Wingate Anaerobic Test (UBW) and lactic acid production in varsity intercollegiate swimmers. After a standardized warm-up, 30 subjects (18 M, 12 F) completed the UBW on a Monark 864 ergometer mounted on a table. Resistances were set at .062 and .048 g/kg of total body weight for males and females respecively. Pedal revolutions were counted using an optical sensor interfaced with a computer and utilizing SMI Power software. Peak power (PP), mean power (MP), fatigue index (FI), peak watts/kg (PW), and mean watts/kg (MW), were determined for each subject. Fingertip blood samples were taken at 1,3, and 5 min post exercise and lactate (LA) was analyzed using a YSI 23-L. The data were analyzed using Pearson correlation coefficient procedures. Correlations between LA and PP, MP, PW, and MW were as follows:

	PP	MP	FI	PW	MW
Males (LA5)	*.58	**.71	.12	**.72	**.85
Females (LA5)	.41	.55	-.47	.41	.52

*p<.05 **p<.01

Even though the women were more heterogenous than the men, the correlations between lactate and the Wingate power values for females were insignificant.

PHYSIOLOGICAL AND PERFORMANCE PARAMETERS OF ELITE AND SUB-ELITE U.S. RACEWALKERS

M. Craib, M. Fenton, J.T. Kearney, L. Mino, & J. Miller. Sports Science, U.S.O.C., Colorado Springs, CO.

A comparison of elite (E) and Sub-elite (S-E) male (M) and female (F) racewalking (RW) physiological data were made in an attempt to explain differences in performance. Height, weight, skinfold % fat, VO_2 max ml/kg·m^{-1}, economy at 3.08 m·s^{-1} (F) or 3.33 m·s^{-1} (M), velocity at blood lactate of 4 mmol·l^{-1} (m·s^{-1}), peak heart rate and peak blood lactate (mmol·l^{-1}) were assessed on 21 M 20k (n=14) & 50k (n=7) RW and 14 F 10k RW. RW were separated into E and S-E groups based upon their performance times and race place at the time closest to their physiological assessment. Group comparisons of performance times and physiological variables between E and S-E RW showed significant differences for the following variables:

		E M (n=9)		S-E M (n=12)		E F (n=7)		S-E F (n=7)	
		X	SD	X	SD	X	SD	X	SD
Race times	20k	1:27:22*	1:52	1:34:25*	4:64	10k 48:02*	0:45	50:51*	1:22
	50k	4:13:49*	10:42	4:33:14*	5:14				
VO_2 max		64.0	4.4	60.7	4.7	53.2*	2.9	49.7*	4.5
Peak Blood Lactate		7.2*	1.6	9.6*	2.0	8.2	1.8	8.9	1.5
Vel at 4 mmol·l^{-1}		3.81*	0.19	3.58*	0.16	3.38	0.14	3.27	0.16

*p ≤ .05

These data suggest that differences in performance ability between E and S-E racewalkers are related to submaximal and maximal lactate accumulation in males and VO_2 max in females.

25

THYROID HORMONE CHANGES FOLLOWING AEROBIC AND ANAEROBIC EXERCISE

T. Gulledge and A.C. Hackney, FACSM. Applied Physiology Laboratory, UNC, Chapel Hill, NC 27599.

This study examined the changes in the total levels of thyroxine (T4) and triiodothyronine (T3) following aerobic and anaerobic exercise. Five males (age, 23 - 29 yr; VO2max, 44.0 - 56.1 ml/kg/min) completed three experimental sessions on separate days consisting of 60 min rest, 60 min continuous aerobic exercise at 65% VO2max, and ~60 min of anaerobic exercise (repetitive intervals of 2 min @ 110% VO2max, followed by rest). Blood samples were collected immediately before and after each experimental session, also on an hourly basis for the 8 hours following each session. Diet and physical activity level were controlled prior to each session and the time of day for each experimental session was standardized. Furthermore, the work performed in each exercise session was equated. The levels of T4 were not significantly changed immediately following either aerobic or anaerobic exercise. However, T3 was found to be significantly ($p<0.03$) increased immediately after the aerobic exercise (153.5 to 190.9 ng/dl) but was unchanged immediately following the anaerobic exercise. During the 8 hour recovery period following the aerobic exercise T4 was significantly ($p<0.05$) greater than the levels observed during the control session (8.7 versus 12.2 ug/dl [overall 8 hour means]). The aerobic T4 8 hour recovery levels did not differ from that of the anaerobic T4 8 hour recovery levels. However, the anaerobic 8 hour recovery T4 levels were not different from control recovery levels. The T3 8 hour recovery levels following both aerobic and anaerobic exercise did not differ from the control session. These data would suggest that the thyroid hormones are affected by aerobic exercise but not by anaerobic exercise. Furthermore, the effect of aerobic exercise on T3 seems transient while with T4 the effect seems more prolonged.

26

EFFECTS OF 25 WEEKS OF COMPETITIVE SWIM TRAINING ON IMMUNE FUNCTION.

E. Bertun[1], R. B. Kreider[1] FACSM, R. E. Ratzlaff[2] & J. Edwards[1]. Wellness Institute & Research Center, [1]Department of HPER & Exercise Science and the [2]Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529-0196.

The purpose of this study was to determine if incremental increases in exercise intensity and volume affected the immune function of competitive college swimmers training 18 ± .4 hrs·wk^{-1}. Nine swimmers (S) were age-matched with ten controls (C). Fasting blood samples were taken prior to morning practices at the end of six training phases over a 25 week period (week 0, 4, 10, 14, 22 and 25). Blood samples were analyzed for: 1.) lymphocyte proliferation induced by pokeweed mitogen (PWM) and phytohemagglutinin (PHA). Proliferation was measured by the incorporation of [^{3}H-methyl]-thymidine into the DNA of 5×10^5 peripheral blood mononuclear cells and reported as counts per minute (cpm); 2.) cell surface phenotypes were determined by flow cytometry for the following lymphocyte sub-populations: total T cells (CD2), total B cells (CD19), T-helper/inducer (CD4) and T-suppressor/cytotoxic cells (CD8); and 3.) plasma levels of immunoglobulin A (IgA) were measured by radial diffusion assay (RID). Data were analyzed using two-way ANOVA with one repeated measure with Tukey *post hoc* procedures. No significant differences were revealed between any of the groups' baseline (week 0) measurements. Also, no significant differences were revealed between the groups' retrospective self-reported symptoms and frequency of infection questionnaires. The cumulative mean and standard deviation for each treatment during the 25 week period revealed no significant effect between the groups' response to PHA [(S) 41086 ± 40836, (C) 50671 ± 38582 cpm], PWM [(S) 39799 ± 15198, (C) 39272 ± 13065 cpm]; total T cells [(S) 69.3 ± 13.0, (C) 75.3 ± 9.5 %], total B cells [(S) 8.7 ± 2.7, (C) 7.9 ± 2.7 %], T-helper/inducer [(S) 32.6 ± 9.6, (C) 36.9 ± 10.9 %], T-suppressor/cytotoxic [(S) 15.7 ± 7.2, (C) 17.3 ± 7.9 %], T-helper/suppressor ratio [(S) 2.48 ± 1.27, (C) 2.61 ± 1.42 %]; and plasma IgA [(S) 132.5 ± 56.3, (C) 124.6 ± 54.9 mg·dl^{-1}]. A treatment effect ($p = 0.02$) within the PWM, T-suppressor/cytotoxic and T-helper/suppressor ratio groups was explained by fluctuations in responses throughout the study. An interaction effect ($p = 0.001$) was evident between the groups for plasma IgA at week 14 [(S) 150.1 ± 65.6, (C) 109.8 ± 51.9 mg·dl^{-1}] and week 22 [(S) 139.6 ± 63.9, (C) 94.7 ± 34.5 mg·dl^{-1}]. The increase in plasma IgA in the (S) group was not associated with increased percentages of circulating B cells and indicates a heightened state of antibody production in the (S) group. Overall, there was no evidence to suggest that 25 weeks of high-volume swim training of systematically increasing intensity suppressed the immune function; in contrast, some components of humoral immunity were enhanced in competitive swimmers.

Supported by *Advance Sport Nutrition* of Mundelein, Illinois through ODURF Grant #723041

SEROTONERGIC AGONISTS AND ANTAGONISTS AFFECT ENDURANCE PERFORMANCE IN THE RAT

S.P. Bailey, J.M. Davis, & E.N. Ahlborn. Exercise Science Department, University of South Carolina, Columbia, SC 29208

The purpose of this experiment was to examine the effects of administration of serotonergic (5-HT) agonists and antagonists on run time to exhaustion (RUN-EXH) in male and female rats. RUN-EXH was reduced ($p<0.05$) in a dose related manner by increasing dosages of quipazine dimaleate (QD: general 5-HT agonist) (0-5 $mg \cdot kg^{-1}$ i.p.) administered immediately prior to exercise (treadmill running at 20 $m \cdot min^{-1}$ & 5% grade). Conversely, RUN-EXH was increased ($p<0.05$) by the greatest dosage of LY 53,857 (LY: $5\text{-}HT_{1C}$ and $5\text{-}HT_2$ antagonist) (1.5 $mg \cdot kg^{-1}$ i.p.). Changes in RUN-EX, due to alteration in 5-HT activity, were similar in male and female rats. The negative effects of QD administration on RUN-EXH were not attenuated by administration of the peripherally restricted antagonist, xylamidine tosylate (up to 200 $ug \cdot kg^{-1}$ i.p.). The results of this investigation indicated that fatigue during prolonged exercise can be influenced by direct pharmacological manipulation of 5-HT activity and that the mechanisms underlying these effects are likely to be central (brain) in nature.

Supported by the ACSM Foundation.

27

CARDIOVASCULAR AND PLASMA CATECHOLAMINE RESPONSES TO STATIC EXERCISE IN NORMOTENSIVE BLACKS AND WHITES

W.J. Duey, D.R. Bassett, Jr., A.J. Walker, E.T. Howley, D. Ely, M.O. Pease, D.J. Torok, P. Mancuso. Department of Human Performance and Sports Studies and Department of Internal Medicine, The University of Tennessee, Knoxville, TN 37996

Racial differences in blood pressure response to stress and alpha adrenergic sensitivity may contribute to the greater prevalence of essential hypertension in black Americans. In this study, cardiovascular and catecholamine responses to isometric handgrip exercise (3 min, 30% MVC) were measured in 15 normotensive blacks and whites. Blood pressure in the blacks increased from 115/67 to 160/120 mmHg during isometric exercise; in the whites it increased from 113/67 to 153/110 mmHg. Blacks exhibited greater diastolic and mean arterial blood pressure responses to isometric exercise, as evidenced by significant Race x Time interactions ($P < 0.05$). Heart rate responses were not significantly different between the two groups. Plasma levels of norepinephrine were similar at rest, but were 25% lower in blacks than in whites following isometric exercise ($P < 0.01$). Blacks also demonstrated a greater responsiveness to intravenous injections of phenylephrine (an alpha-specific agonist) at rest ($P < 0.05$). Thus, the diminished plasma norepinephrine response of the blacks during isometric exercise appeared to have been offset by an enhanced sensitivity to norepinephrine. The results suggest that norepinephrine is not solely responsible for the increased blood pressure response to isometric exercise in blacks.

Supported by Grant TN-90-572 from the American Heart Association-Tennessee Affiliate

28

29

RECURRENT STINGER - FOOTBALL

David N.M. Caborn, M.D., Brent Johnson, M.D.
University of Kentucky Sports Medicine Center
Lexington, KY

HISTORY: A 15 year old football player presents one week after tackling a player and having persistent pain in the posterior aspect of his neck. He states that following a similar tackle two years ago he has had recurrent history of stingers in his right upper extremity. With this recent episode he is having only neck pain.

PHYSICAL EXAM: He demonstrates tight muscle spasm along the right paravertebral area of his neck. Point tenderness over C6 and C7. No palpable widening. He does resist though any active flexion or extension of his neck because of posterior pain. He shows full range of motion of his upper sensation in the entire aspect of the upper and lower extremities. Strength is 5/5 in all major muscle groups in the upper and lower extremities.

30

BACK PAIN -- SOCCER

David L Jackson, MD, Brett C Hynninen, MD, and
David N M Caborn, MD, University of Kentucky,
Lexington, KY.

HISTORY -- 12-year-old male soccer player presents with and 8-week history of right low back pain that is described as aching in nature and worse with activity or after a prolonged soccer game. He now complains of sharp pain when he kicks the ball or bends backwards.

PHYSICAL EXAM -- He has diffuse muscle tightness and guarding in the right lumbar region with tenderness most localized at the L-5 level on the right. Motion is limited in all directions with most pain occurring with hyperextension and lateralization to the right. Neurologic exam is normal, but he has bilateral hamstring and hip flexor tightness (+ Thomas Test).

ELBOW AND SHOULDER PAIN -- BASEBALL PITCHER

Benjamin H Reuter, ATC, CSCS, and W. Ben Kibler, MD,
Lexington Clinic Sports Medicine Center, Lexington, KY.

HISTORY -- 19 year old baseball pitcher with complaints of right shoulder and elbow pain. The shoulder pain has been intermittent since the subject started pitching at the age of seven. The elbow pain has been present intermittently since the patient was 15. Patient was diagnosed with bone spurs in the right elbow at age 16. Attempts to strengthen shoulder and elbow musculature by the patient in the past have proven unsuccessful in regards to relieving pain. Patient felt a sudden sharp flash of pain in he right elbow when pitching in a game about 1 month ago. This sharp pain caused the subject to seek medical help.

PHYSICAL EXAM -- Patient is well built young man, with significantly larger muscle bulk in the right upper extremity and shoulder girdle. He has constant pain, which he states is not relieved with Aspirin or other NSAID's or pain killers. Neurovascularly the patient is normal. There is a positive relocation test of the right shoulder, and upon stressing, the ulnar side of the elbow opens up easily, with pain.

31

ANTERIOR KNEE PAIN -- RUNNER

David L Jackson, MD, Brett C Hynninen, MD, and
David N M Caborn, MD, University of Kentucky,
Lexington, KY.

HISTORY -- 49 year old avid runner with a 2 year history of right anterior knee pain had decreased his running from 60 miles/wk. two years ago to 15 miles/wk. has increasing aching pain and mild swelling now despite decreasing his running further.

PHYSICAL EXAM -- reveals muscle tightness with a positive Ober's test and Ely test bilaterally, Q-angle of 9 deg. on right and 8 deg. on left with knee @ 90 deg. flexion, passive patellar tilt of 15 deg. on the left and 10 deg. on the right, and a negative lateral apprehension sign. The remainder of the knee exam was normal.

32

33

EYE INJURY -- ICE HOCKEY

George C Wortley, MD, Lynchburg Family Practice Residency, Lynchburg, VA.

HISTORY -- 23-year-old ice hockey player was struck in the left eye by a hockey puck. Pre-season vision screening had shown 20/15 vision in both eyes. He was not wearing eye protection at the time of injury. There was immediate pain and photo-phobia in the eye. Within 30 minutes nausea developed.

PHYSICAL EXAM -- There was a 3 cm laceration beneath the left eyebrow with profuse bleeding. Once hemostasis was obtained the orbit was examined. A hyphema was present. Fundoscopic exam was prevented by blood in the anterior chamber. Extra ocular movement was full. There was no external evidence of a ruptured globe. Fifteen minutes after the injury visual acuity was "count fingers". One hour past injury he would barely perceive light in the injured eye.

34

OUTCOME AND COMPLIANCE IN THE TREATMENT OF CHRONIC OVERUSE SPORTS INJURIES: A RETROSPECTIVE STUDY

L.C. Almekinders and S.V. Almekinders. University of North Carolina, Chapel Hill, NC 27599, North Carolina State University, Raleigh, NC

Overuse injuries due to repetitive motion are common injuries in both recreational and elite athletes. Some overuse injuries resolve quickly after activity modifications but others can persist which often prompts the patient to seek medical attention. Treatment generally consists of continued activity modifications often in combination with physical therapy and non-steroidal anti-inflammatory medication (NSAID's). Studies on treatment efficacy often are short term follow-up studies in which a mild beneficial effect of the treatment is seen, but the ultimate outcome is not clear. This study reviewed retrospectively the long term outcome and compliance in the treatment of these chronic overuse sports injuries.

One hundred and twenty seven, consecutive patients with previously untreated overuse injuries were identified retrospectively. Treatment consisted of activity modification only or activity modification and physical therapy and/or NSAID's. Patients with abnormal radiographs, joint instability and back injuries were excluded. One hundred and two patients were contacted by telephone at an average of 27 months following their initial visit for their chronic overuse injuries. A questionnaire regarding the treatment compliance and outcome was completed. Of this group 38 (37%) claimed to be completely better, 28 (28%) were improved but 36 (35%) were no better or worse. Anterior knee pain had a significantly worse outcome than any other injury ($p<0.005$). Neither activity modification nor combination treatment with non-steroidal anti-inflammatory drugs (NSAID's) and physical therapy was associated with a better result. Non-compliance rates were 9% for NSAID therapy and 13% for physical therapy. The improvement rate in non-compliant patients was similar to compliant patients. These results indicate that chronic overuse injuries are not always self-limiting, but can result in prolonged symptoms. Treatment with PT and/or NSAID'S was not associated with any improved results compared to activity modification only.

EFFECTS OF SHORT-TERM EXERCISE CESSATION ON MUSCLE STRENGTH AND SIZE IN POWER ATHLETES

T. Hortobágyi, J.A. Houmard, R.A. Johns and R.G. Israel. Human Performance Lab., East Carolina University, Greenville, NC 27858

Twelve power athletes (age 24.4 y, mass 88.6 kg, stature 1.81 m, weight lifting history 8.1 y) were tested during normal training and after 14 days of exercise cessation for free weight bench press (BP) and parallel squat (SQ), isometric (90° knee angle) and isokinetic concentric and eccentric knee extension/flexion force at three speeds (50, 150, 250 $°\cdot s^{-1}$), and muscle biopsies of the vastus lateralis. Percutaneous electromyographic (EMG) activity was also monitored during the isometric and isokinetic testing. Following detraining, the average decrease in BP and SQ was only 2 kg (1.2%, $P > .05$). Isometric knee extension and concentric force at 3 speeds decreased non-significantly by 72 N (7%) and 15 N (2.3%). No changes occurred in knee flexion forces or EMG activity. The percentages of ST (49.5), FTa (48.6), and FTb (1.9) fibers and the mean area of the ST fibers (5841 μm^2) also remained unaltered (all $P > .05$). In contrast, isokinetic eccentric knee extension force decreased at all 3 speeds in every subject (mean decrease 114 N, 12%) and the mean FT fiber area from 7043 to 6593 μm^2 (6.4%) ($P < .05$). A control group of 11 untrained men tested for strength only, showed no changes ($P > .05$). These data suggest that eccentric forces and FT muscle fibers may especially be susceptible to the absence of overload stimuli. However, the concerns of power athletes with the negative effects of detraining may be unfounded as detraining did not impair BP and SQ performance.

35

IS OXYGEN CONSUMPTION ELEVATED FOLLOWING AN ACUTE BOUT OF HIGH INTENSITY RESISTANCE TRAINING

K. Mitchell, and C. Broeder. Dept. of Physical Education, Exercise and Sport Sciences, East Tennessee State University, Johnson City, TN 37614

Nine resistance trained males between 21 and 31 years of age participated in this study to determine if an acute bout of high intensity resistance training could sustain excess post exercise oxygen consumption (EPOC) values following exercise. Each subject had his resting metabolic rate (RMR) measured prior to exercise under strict standardized conditions (e.g., 12-fast and 24-hrs without prior exercise). Following the RMR measurements, each subject exercised for approximately 80 mins utilizing free-weights and Nautilus type machines through a series of 12 resistance movements involving all major muscle groups (Mean Total Weight Lifted = 11,750 kg). Immediately following exercise, oxygen consumption was measured continuously for 60 mins. All metabolic measurements were made in an enviromental chamber in which room temperature and humidity were held constant (22°C, 55% Humidity). The results of this study indicated that resistance training did significantly increase EPOC values by 20.8%, for the entire 0-60 measurement when compare to the RMR values (RMR = 0.294, EPOC = 0.355, liters • min^{-1}). When the total 60 min EPOC measurement was divided into four 15-min segments, EPOC values were significantly elevated for each individual period when compared to the baseline RMR value. Also, there was a significant correlation between the amount of weight each subject lifted and the post exercise thermogenic response observed ($r = 0.74$, SEE = 0.03, $P < .02$). This study suggests that high-intensity resistance training can significantly elevated RMR for at least 60 minutes following exercise. However, additional research is needed to determine what role total resistance training load and lifting intensity has on EPOC's over-all response and oxygen consumption's subsequent return to resting baseline values.

Supported by a grant from The Quality Of Life Wellness Center, ETSU

36

37

THE EFFECT OF ISOLATED LUMBAR EXTENSOR STRENGTH TRAINING ON MAXIMUM DYNAMIC LIFTING CAPACITY

T.F. Lackney and J.W. Yates, FACSM. Exercise Physiology Laboratory, University of Louisville, Louisville, KY 40292

The purpose of this investigation was to determine the effect of a 10 week training program on the MedX lumbar extension machine on lumbar isometric strength, sagittal plane dynamic lifting capacity, isometric lifting strength, and on isokinetic and isometric strength as measured on the Kin-Com. The intent was to determine if increased lumber extension strength resulted in an improved ability to manually lift loads. Ten subjects (5 males - 5 females) trained once a week for 10 weeks on the MedX (Exp), while 11 subjects (6 males - 5 females) served as controls (Cntr). Each subject completed a 7 angle isometric test on the MedX, 3 static lifting tests, an isometric and isokinetic (30 °/sec) trunk-extension test on the Kin-Com, and a maximum dynamic lifting test. The dynamic lifting test required the subject to lift a weight -loaded, wooden box with cut-out handles from the floor to a height of 28 cm. Trial and error were used to determine the maximum weight lifted. The Exp group increase isolated, isometric lumbar extensor torque significantly more than did the Cntrl group, as measured on the MedX, at all angles except 72 degrees of lumbar flexion. The Exp group improved their dynamic lifting strength by 14.0% (87.9 to 100.2 kg) while the Cntr group increased by only 6.3% (88.8 to 94.4 kg); a statistically significant difference. There were no significant differences between groups for the 3 static lifting tasks or for the isometric and isokinetic exertions performed on the Kin-Com. These data suggest that isolated lumbar extensor training improves the ability to perform a dynamic, sagittal plane lift in addition to isolated lumbar extensor strength.

38

THE EFFECTS OF LOW LEVEL WEIGHT TRAINING ON STRENGTH, FLEXIBILITY, AND BODY COMPOSITION IN AN ELDERLY POPULATION.

B.M. Boulet, A.M. Swank, P. Douglas-Gillette, and S. Roberts-Bradley. Exercise Physiolog Laboratory, Physical Therapy Department, University of Louisville, Louisville, KY 40292, Baptist Hospital East, Louisville, KY

The purpose of this investigation was to examine the effects of low level weight training on strength, flexibility, and body composition in elderly subjects (55-74 years) following participation in a 9-week exercise program. The "weighted" exercise group (EW, n=15) trained with light hand-held weights (1-3 lbs.) and ankle weights (2 lbs.), while a "nonweighted" exercise group (EN, n=12) served as controls. Subjects exercised one hour per session, three days per week, with the "weighted" exercises comprising 30 minutes of each session. Isometric strength was measured by hand-held dynamometry (Nicholas Manual Muscle Tester) for five muscle actions: shoulder flexion, hip flexion, knee extension, ankle plantar flexion, and finger flexion (handgrip). Range of motion was evaluated at the neck, shoulder, hip, knee, and ankle joints using standard goniometry. Body composition was determined via skinfold measurements. Two-way ANOVA with repeated measures indicated significant increases in strength and flexibility for both the EW and EN groups. The EN group experienced greater improvement than the EW group for the following strength (S) and flexibility (F) variables: S-knee extension (2.4%), S-hip flexion (1.4%), F-hip flexion (4.0%), F-knee flexion (1.3%), and F-ankle plantar flexion (11.0%). However, the EW group had additional improvement beyond that achieved by the EN group for the following strength (S), flexibility (F), and body composition (BC) variables: S-shoulder flexion (3.3%), S-ankle plantar flexion (4.3%), F-right cervical rotation (4.6%), F-left cervical rotation (0.4%), F-hamstring (2.0%), F-knee extension (19.2%), F-shoulder flexion (0.1%), F-Thomas test (64.4%), F-hip extension (1.7%), and BC-percent fat (6.5%). These findings suggest that adding light resistance training to a flexibility-based exercise program can improve strength, flexibility, and body composition profiles in the elderly. Additionally, the significant improvements observed for the S-ankle plantar flexion, F-knee extension and F-Thomas test for hip flexibility may serve a critical role in the maintenance of normal gait patterns in this population.

Supported by a research grant from the University of Louisville Research Foundation, Inc.

METHODS OF LACTATE THRESHOLD DETECTION: WHOLE BLOOD VERSUS PLASMA

E.W. Smith, D.D. Pascoe, M. Skelton, D. Kremer, and L.B. Gladden
Department of Health and Human Performance, Auburn University, Auburn, AL 36830

This investigation examined differences among four methodologies of lactate threshold (LT) detection using whole blood or plasma lactate concentrations ([La]). Ten college-aged males performed progressive incremental tests on a cycle ergometer to determine peak oxygen uptake (VO_2peak). Blood samples, taken at each work load, were analyzed for whole blood [La] and plasma [La] by enzymatic techniques. These [La]s were then applied to the following four methodologies of LT determination: 1) Visual inspection of [La] versus time, 2) computerized linear regression analysis (NLIN) of two-segment model plot of log [La] versus log VO_2, 3) a fixed [La] of 2 mM, and 4) a fixed [La] of 4 mM. The LT results (± SE) are shown in the table below.

Method	Whole Blood		Plasma	
n=10	VO_2(ml·kg^{-1}·min^{-1})	%VO_2peak	VO_2(ml·kg^{-1}·min^{-1})	%VO_2peak
Visual	25.5 ± 5.8 ^{a}	60.3	25.6 ± 5.8 ^{acd}	60.7
Log-Log	25.7 ± 6.5 ^{a}	59.9	26.8 ± 6.9 ^{ac}	62.4
2 mM	25.3 ± 5.7 ^{a}	60.4	18.2 ± 6.1 ^{d}	44.2
4 mM	33.6 ± 5.6 ^{b}	70.8	30.0 ± 5.3 ^{e}	71.2

Values not sharing the same superscript are significantly different ($p < .05$)

We conclude, given the incremental exercise protocol used here, the visual and Log-Log methods of LT detection appear interchangable with either whole blood or plasma [La]. Although a fixed whole blood [La] produced LTs in agreement with LTs by the visual and Log-Log methods, we do not recommend the 2 mM method be used with plasma [La]. The the VO_2 at the fixed [La] of 4 mM, although easily determined, is clearly higher than the LT.

39

PEAK LACTATE DETERMINATION AND LACTATE DIFFERENCES BETWEEN WHOLE, LYSED, VENOUS, AND ARTERIAL BLOOD FOLLOWING MAXIMAL EXERCISE

M. Murphy, P. Bishop, J. Smith, and R. Godsen. Human Performance Laboratory, University of Alabama, Tuscaloosa, AL 35486

Blood samples were taken from sixteen healthy college students via the antiqubital vein after standing for at least 20 minutes. Duplicate samples, with one containing a lysing solution, were taken before a continuous incremental maximal treadmill test, immediately after the test, and at four, six, eight, and ten minutes post exercise. Pre-warmed fingertip samples were taken pre exercise and at six minutes post exercise. Whole blood samples were analyzed immediately and lysed samples were analyzed following completion of the testing. All lactate analysis was done with the Model 23L Lactate Analyzer (YSI Co.) which was calibrated every six samples. There were no significant differences between venous whole and lysed blood or capillary whole and lysed blood at any time pre or post test ($p \leq 0.01$). Peak lactate times from whole blood samples showed high intersubject variability (4.63,sd=3.37). There was no difference between venous and capillary blood at any time ($p \leq 0.01$). The results suggest that lysing blood for later analysis does not alter lactate concentration. Peak lactate levels in subjects with varying degrees of fitness showed large intersubject variability and lactate concentrations did not differ between venous and capillary blood following a short term maximal exercise test.

40

41

COMPARISON OF CAPILLARY AND VENOUS BLOOD LACTATE AND GLUCOSE VALUES

C.J. Womack and J.A. Flohr. The University of Virginia, Charlottesville, VA. 22903. James Madison University, Harrisonburg, VA. 22807.

The present study was designed to compare blood lactate and glucose values obtained from capillary and venous samples. Eight young (22-26 yrs.), healthy subjects (6 male, 2 female) completed a graded exercise test using a Monark cycle ergometer. Simultaneous blood samples were collected during the last minute of each 3 minute stage from both an indwelling venous catheter and via finger puncture. The site of initial site of blood sampling for each stage was alternated. All samples were analyzed for glucose and lactate using the YSI 2300L analyzer (Yellow Springs Instruments, Yellow Springs OH). Metabolic parameters were determined using open circuit spirometry with a metabolic cart (MMC Horizon, Sensormedics, Yorba Linda, CA). A two-way ANOVA was used to compare blood glucose and lactate values obtained from the two sampling sites. Mean values (± SEE) of blood lactate and glucose are given below in tables 1 and 2. No significant differences were found between the venous and capillary values of lactate and glucose at any intensity. We conclude that either method of sampling will yield similar lactate and glucose values during graded exercise testing.

Table 1 **Hla (mmol/L)**

	rest	50 watts	100 watts	150 watts	Max
Venous	0.69 ± 0.08	0.99 ± 0.13	1.25 ± 0.12	2.34 ± 0.32	5.16 ± 0.80
Capillary	0.76 ± 0.07	0.90 ± 0.05	1.55 ± 0.22	2.75 ± 0.61	4.45 ± 0.87

Table 2 **Glucose (mg/dl)**

	rest	50 watts	100 watts	150 watts	Max
Venous	74.34 ± 11.53	69.75 ± 4.52	64.13 ± 5.18	62.13 ± 3.93	65.75 ± 3.35
Capillary	77.13 ± 8.85	70.25 ± 6.72	61.25 ± 6.80	54.25 ± 6.54	53.75 ± 7.40

42

DETERMINING LACTATE UPTAKE BY CLASSICAL PAIRED TRACER METHOD CAN PRODUCE LARGE ERRORS.

P.D. Watson, M.I. Lindinger, M.T. Hamilton, and D.S. Ward. Depts. of Physiology & Exercise Science, USC, Columbia, SC 29208, and School of Human Biology, Univ. of Guelph, Ontario, Canada.

Lactate metabolism in skeletal muscle is frequently studied by the paired tracer method in which radiolabeled lactate and mannitol are injected intraarterially and the unidirectional lactate uptake, v, is calculated from the maximum value of ratio of the tracer venous concentrations, U_{max}, i.e. $v = -Q.C_a.\ln(1-U_{max})$, where Q is the blood flow rate and C_a is the arterial lactate concentration. This approach assumes that the capillary permeability (PS) of the two tracers is identical. However, the measured PS of lactate is approximately twice that of mannitol (lactate is smaller than mannitol) so that lactate will always tend to leave the circulation faster than mannitol even when cell uptake is zero. The error incurred by the assumption of equal PS values was investigated by mathematical modelling of plasma-interstitial solute movement including a term for cell tracer uptake, and tracer (^{3}H-mannitol and ^{14}C-lactate) uptake studies in the isolated, perfused cat calf muscle preparation. We found that a) the magnitude and direction of the error in v depends upon the actual rate of cell uptake, with the calculated v ranging from half to twice the true value, b) the U_{max} ratio has no simple interpretation when the tracer PS values are significantly different, c) the addition of an intravascular marker to the paired tracer injections allows the calculation of the true cell uptake, and d) the paired tracer method is inherently poor for calculating cell uptake rates when the uptake rate is high.

Supported by NIH Grant HL 24314

EFFECT OF TIMING OF CARBOHYDRATE INGESTION BETWEEN REPEATED EXERCISE BOUTS DESIGNED TO SIMULATE A SOCCER OR RUGBY EFFORT

Tipton, K., L.A. Weinreb, C.J. Wetzstein, S.J. Hewlings, N.R. Green and E.M. Haymes. Department of Nutrition, Food and Movement Sciences, Florida State University, Tallahassee, FL 32306.

The effect of timing of carbohydrate ingestion on the physiological responses to repeated intermittent exercise bouts similar to soccer or rugby competition was investigated in male athletes from university soccer (n=4) and rugby (n=4) teams. Athletes participated in two intermittent treadmill exercise bouts designed to simulate match effort separated by a 2.5 h rest. Each bout consisted of two 30 min halves of 12 x 2.5 min cycles of 50% (90 sec) and 90% VO_2max (20 sec) and 20 sec each of acceleration and deceleration. A performance run (PR) to exhaustion (90% VO_2max) was performed five min following each bout. Athletes consumed a 20% carbohydrate (CHO) solution between the exercise bouts in each of two treatments, either 2.5 h (T1) or 1 h (T2) prior to the second bout. T2 lactate values (2.3 mmol/L) were less ($p<0.05$) than T1 values (3.0 mmol/L) for the second exercise session. Halftime lactate was higher in B1 than B2 (3.7 vs. 3.2 mmol/L). Pre-exercise plasma lactate values were significantly less than halftime and post-exercise values in both bouts. PR times were not different between treatments. Pre-exercise plasma glucose values during B2 were significantly higher for T2 than T1 (120.0 vs. 97.3 mg/dl), but were similar between treatments post-exercise. RER during PR for B2 (0.96) was less than B1 (1.06) for T1. PR RER was less for T1 (0.96) than T2 (1.007) for B2. Although performance did not seem to differ between treatments, gastric distress was often reported, especially during T2 and when large volumes of CHO were ingested. Therefore it is recommended that each individual should determine comfortable volumes and timing of CHO ingestion during training.

Supported by Quaker Oats

43

ARE THE METABOLIC RESPONSES FOLLOWING A 720-KCAL MEAL REPRODUCIBLE IN ACTIVE COLLEGE AGE FEMALES

C. Broeder, L. Kennedy-Honeycutt, K. Mitchell, and M. Marks. Dept. of Physical Education, Exercise and Sport Sciences, East Tennessee State University, Johnson City, TN 37614

Seven females between 18 and 25 years old participated in this study to determine if the metabolic responses following the feeding of a 720-kcal liquid meal (55% = carbodydrate (CHO), 30% = fat, 15% = protein) were reproducible. Each subject completed two aerobic capacity trials (MAX), two resting metabolic rate (RMR) and thermogenic responses to feeding (TEF) trials, a series of anthropometric measurements, hydrostatic weighing with the measurement of residual volume (oxygen dilution), a dual-photon absorption bone density and mineral content scan , and a 3-day dietary-activity recall. The means ± SEM of the group for age, weight, height, relative body fat, and MAX were 21 ± 1.0 yrs, 60.3 ± 3.0 kg, 164.1 ± 2.3 cm, 26.3 ± 2.0 %, and 44.6 ± 2.4 $ml \cdot kg \cdot min^{-1}$, respectively. This study's result indicated that both the RMR and TEF for the entire 180 min post-absorptive trials were reproducible. However, despite similar group mean kcal RMR expenditure and substrate utilization values, post-feeding substrate utilization values were not reproducible (r=0.46, NS). In addition, the R^2 values indicated that one trial accounted for 86% of the thermogenic responses for the first 2-hrs following feeding while only 46% of the remaining 60 min thermogenic responses could be accounted for using one trial.

Variable	RMR_1	RMR_2	Sig.	TEF^*180_1	TEF^* 180_2	Sig.
RMR ($kcal \cdot hr^{-3}$)	159	161	NS	202	196	NS
r-value, SEE	0.98, 0.02		$p < 0.0001$	0.90, 0.05		$p < 0.005$
% kcal (fat)	51.5	52.4	NS	22.6	29.2	NS
% kcal (CHO)	48.5	47.6	NS	77.4	70.8	NS

Sig.= Between trial significance

Supported by a grant from ROSS Laboratories

44

45

EFFECTS OF AMINO ACID & CARNITINE SUPPLEMENTATION ON MARKERS OF PROTEIN CATABOLISM AND BODY COMPOSITION DURING 25 WEEKS OF SWIM TRAINING

R. Kreider, FACSM, V. Miriel, E. Bertun, T. Somma, & S. Sechrist. Wellness Institute & Research Center, Department of HPERES, Old Dominion University, Norfolk, VA 23529-0196.

Branched-chain amino acid supplementation with carbohydrate has been reported to suppress protein degradation during exercise *(Carli et al., E.J.A.P. 64:272-277, 1992; Blomstrand et al., E.J.A.P. 63:83-88, 1991)* and hasten the rate of muscle recovery *(Cade et al., E.J.A.P. 63:83-88, 1991)* in comparison to carbohydrate supplementation alone. This study examined the effects of amino acid & carnitine supplementation on markers of catabolism, anabolism and body composition during 25 weeks of swim training. 10 intercollegiate swimmers (5 males, 5 females) were matched to 10 swim team counterparts based on gender, training volume (18 ± 0.4 hr·wk^{-1}), and event specificity. During weeks 1-10 of training, match-paired subjects were randomly and blindly assigned to ingest either 2.175 gm of a commercially available supplement (AAC) containing leucine (850 mg), isoleucine (625 mg), valine (625 mg), glutamine (50 mg) and carnitine (25 mg) or 2.175 gm of a lactose placebo (LP) prior to and following each strength and swim workout (9/wk). AAC and LP supplements were ingested with 250 ml of water containing 22.5 gm of maltodextrin. During weeks 11-25 of training, subjects ingested 2.9 gms of the AAC supplement or LP with the maltodextrin drink prior to and following each workout as well as supplemented their diet with 3.2 gm of an amino acid complex supplement containing 20 amino acids (AACX) or 3.2 gm of the LP four times daily (12.8 gm·d^{-1}). Hydrostatically determined body composition, 3-d dietary records, and fasting blood samples were obtained prior to the initiation of training (week 0) and at the end of each training phase (weeks 4, 10, 14, 15, 22, & 25). Data were analyzed by two-way SPANOVA with Tukey post-hoc analysis. No significant differences were observed among PL and AAC group week 0 body composition, caloric intake, serum ammonia (NH_3), cortisol (C), testosterone (T), or the ratio of cortisol to testosterone (C/T) values. No significant group, treatment or interaction effects were observed among total caloric intake (LP mean $2,957 \pm 921$; AAC mean $3,169 \pm 960$). Mean group protein intake was greater ($p < 0.05$) in the AAC group (LP 1.16 ± 0.3; AAC 1.61 ± 0.5 gm·kg^{-1}). Serum analysis revealed significant group and/or interaction effects among C, C/T, and NH_3 values with group mean AAC values 23%, 58%, and 16% lower than LP values, respectively. No $p < 0.05$ differences were observed among LP and AAC serum T values. Body composition analysis revealed no significant differences among LP (75.0 ± 13 to 74.3 ± 14 kg) and AAC (70.1 ± 11 to 68.7 ± 12 kg) total body weight for weeks 0-25, respectively. Significant group and/or interaction effects were observed among LP and AAC lean body weight (LBW), fat weight (FW), and percent body fat (%BF) values. Post-hoc analysis revealed that LP group LBW (59.5 ± 11 to 59.4 ± 12 kg), FW (15.5 ± 3.2 to 14.9 ± 3.4 kg), and %BF (20.8 ± 3.6 to 20.3 ± 4.2 %) values were not significantly altered. AAC group LBW increased (57.6 ± 10 to 59.6 ± 10 kg) while FW (12.7 ± 4.9 to 9.2 ± 5.5 kg) and %BF (18.0 ± 5.5 to 13.1 ± 6.7 %) values decreased during weeks 0-25, respectively. Results suggest that within the limitations of the experimental protocol employed, AAC & AACX supplementation may affect body composition alterations during high volume swim training possibly by hormonally suppressing protein degradation and/or catabolism.

Supported by *Advance Sport Nutrition* of Mundelein, Illinois through ODURF Grant #723041.

46

THE EFFECT OF EXERCISE INTENSITY ON FOOD INTAKE, HUNGER, MOOD, AND NONEXERCISE ACTIVITY LEVEL IN UNTRAINED, OVERFAT WOMEN

R.A. Shern. Nutrition and Exercise Science Departments, Georgia State University, Atlanta, GA 30303

Exercise is beneficial in the treatment of human obesity. The potential effects of exercise are to influence (a)energy expenditure, (b)energy intake, (c)hunger, and (d)mood. These factors can effect the outcome of a weight management regimen. This study investigated the effect of exercise intensity on food intake, hunger at mealtimes, mood at mealtimes, and nonexercise activity for 24 hour periods. Hunger was defined using a 4-point Likert scale ranging from "not hungry" to "extremely hungry". Mood was defined using a 7-point Likert scale ranging from "extremely bad" to "extremely good". Nonexercise activity was defined with a 5-point scale ranging from "resting" to "heavy work". All data was self-reported for 4 day periods at the beginning, midpoint, and end of the study. Total subject pool consisted of 12 untrained and overfat women. Seven were randomly selected into the high intensity group (HIG) and 5 into the low intensity group (LIG). The HIG walked on a treadmill at 80% of their VO2 max and the LIG walked on a treadmill at 50% of their VO2 max. Both intensity groups exercised a total of 48 times (approximately 4 times per week for 12 weeks) expending 300 calories each time. Food intake was not affected at either intensity level. No statistically significant changes were found for hunger or mood. However, small trends were seen for hunger and mood to increase for both intensity groups over the study period. Nonexercise activity increased slightly for both groups over the study period. The HIG showed a statistically significant higher activity level at the end of the study than the LIG. Body fat losses averaged 1.5% for both intensity groups over the study period, as determined by hydrostatic weighing.

CARDIOVASCULAR RESPONSES OF ELDERLY FAINTERS AND NONFAINTERS TO HEAD-UP TILT (HUT) BEFORE AND AFTER EXERCISE TRAINING

J. Carroll, Mississippi State Univ., Mississippi State, MS 39762; C. Wood, M. Pollock, and J. Graves, Univ. of Florida, Gainesville, FL, 32611; V. Convertino, Kennedy Space Center, Florida, 32899

Fainting during HUT may be related to low resting cardiac output (Q), impaired cardioacceleration capacity, or inadequate peripheral resistance (TPR) responses. Whether these responses can be modified by training in the elderly has not been studied. The purpose of this investigation was to compare cardiovascular responses of 60-82 year old men and women who fainted (FAINT, n=7) with responses of nonfainters (NOFAINT, n=35) during HUT before (T1) and after (T2) 6 months of endurance training. HUT at T1 and T2 consisted of 30 min. of supine rest and 15 min. of 70° HUT. FAINT consisted of subjects exhibiting syncope or presyncope during T1 HUT; all FAINT completed T2 HUT. During HUT, HR, stroke volume (SV) and blood pressure were measured; Q was calculated from HR X SV and TPR was calculated from the ratio of mean arterial pressure and Q. Training consisted of treadmill walking or stairclimbing exercise, 70-85% maximal heart rate (HR) reserve, 45 min/day, 3 X/wk. Mean responses of FAINT and NOFAINT at T1 and T2 were compared using analysis of covariance.

	T1		T2	
	Rest	Tilt	Rest	Tilt
FAINT (n=7)				
HR ($b \cdot min^{-1}$)	60.1±6.9	73.2±8.1	57.3± 5.4	71.8±10.7*
SV ($ml \cdot b^{-1}$)	46.4±8.5	33.2±5.7	53.6±10.3	37.9± 4.4
Q ($L \cdot min^{-1}$)	2.75±0.41	2.40±0.44	3.06±0.58	2.73±0.62
TPR ($dyne \cdot sec\ cm^{-5}$)	2710±734	3176±635	2442±517	2905±793
NOFAINT (n=35)				
HR ($b \cdot min^{-1}$)	65.0± 9.8	73.1±11.4	63.1± 9.1	70.9±11.3
SV ($ml \cdot b^{-1}$)	46.7±10.0	35.5± 8.3	50.7±10.2	37.4± 8.6
Q ($L \cdot min^{-1}$)	3.02±0.72	2.56±0.54	3.18±0.76	2.62±0.54
TPR ($dyne \cdot sec\ cm^{-5}$)	2645±666	3190±683	2532±620	3140±709

Values are mean±SD; *p≤0.05, greater than NOFAINT at T2.

Results indicated that only the tilt HR differed between groups at T2. However, tilt Q increased 13.8% and 2.3% in FAINT and NOFAINT, respectively, while decreases in tilt TPR averaged 8.5% and 1.6%, respectively. The ability of FAINT to complete HUT at T2 may be related to improved Q and improved venous return, and decreased reliance on TPR to maintain MAP.

47

TIME COURSE OF RECTAL TEMPERATURE RESPONSES TO WORK IN ENCAPSULATING PROTECTIVE CLOTHING- A PILOT STUDY.

P. Reneau, P. Bishop and J. Smith. Human Performance Laboratory, University of Alabama, Tuscaloosa, AL 35487

Predicting individual responses to work and rest in encapsulating protective clothing (EPC) is difficult. The purpose of this study was to examine the time course of individual rectal temperature (Tre) response to work and rest in EPC to determine if the rate of change could be a useful variable to predict heat storage responses. Tre was measured each min during work and rest (n=7), and during multiple rest periods (n=7) in EPC in a pilot study. Subjects [24 (±7.1) years of age, 178 (±6.6) cm tall, weighing 74.3 (±8.7) Kg] walked on a treadmill for 15 min followed by 5 min of biceps curls at a grade and pace to elicit a time-weighted metabolic rate of 450W. Subjects continued walking/arm curls until Tre reached 39°C, or unwilling to continue. After 48 min of rest in EPC, walk/arm curl was resumed. Tre was monitored each min during work and rest. The mean rate of Tre increase during work (0.13°/min) had a coefficient of variation (CV) of .48 (n=7), whereas the CV for rest for these subjects was .32 (mean rate=0.25°/min). Within-subjects CV of the rate of Tre decrease in rest was .17 for multiple rest periods. The bi-phasic nature of the Tre rate of increase apparent in some subjects, and the difference in variability between work and rest suggests that mechanics and biophysics may contribute substantially to the physiological variability in the Tre response to work in EPC. These preliminary data suggest that rate of Tre decline is more consistent and easily predicted than rate of Tre increase and that response prediction may require innovative incorporation of mechanics and biophysics.

This study was supported by USAF Office of Scientific Research, Bolling AFB, DC F49620-85-C-0013/SB5851-0360.

48

THE EFFECTS OF VARYING DOSES OF EXERCISE ON ACUTE STRESS REACTIVITY

M. L. Hobson and W. J. Rejeski. Department of Health and Sport Science, Wake Forest University, Winston-Salem, NC 27109

49

This investigation examined the role that different doses of acute aerobic exercise (AE) have on psychophysiological responses to mental stress. Eighty women participated in one of four experimental conditions: (a) attention control, (b) 10-min of exercise, (c) 25-min of exercise, or (d) 40-min of exercise. All exercise sessions were performed at 70% of subjects' heart rate reserve. Following each condition, subjects rested for 20 min and then completed a modified Stroop test. Systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were monitored at rest and during the stressor. Positive and negative affect were assessed upon entry to the laboratory, post-exercise (after the 20 min rest), prior to the stressor, and after a 5 min recovery period. *A priori* comparisons of the 40-min exercise condition versus the attention control manipulation revealed that a demanding bout of acute AE lowered DBP and MAP reactivity to the Stroop; however, there were no significant linear trends between the dose of exercise and the extent of BP reactivity. Analysis of the positive and negative affect data revealed no differences between any of the four treatment groups either prior to performing the Stroop task or following a 5-min period of recovery.

ACUTE EXERCISE AND CARDIOVASCULAR RESPONSES TO STRESS IN RATS

G.A. Anderson and J.M. Overton. Ex. Physiol. Lab, Univ. of Louisville, Louisville, KY 40292; and Dept. of Nutr., Food, and Movement Sci., Fla. State Univ., Tallahassee, FL 32306.

50

Acute exercise (EX) produces multiple alterations in cardiovascular function which are evident after cessation of activity. The purpose of this study was to determine if acute EX reduces the cardiovascular response to air jet stress (AJS) in rats. Male Sprague-Dawley rats (n=11) were instrumented with Doppler flow probes and a carotid arterial catheter to determine mean arterial pressure (MAP), heart rate (HR), mesenteric blood flow (MBF), and iliac blood flow (IBF). Rats were exposed to treadmill running and the holding device utilized to administer AJS prior to participating in two trials (random order, separated by 48 hours): 1) Control (CON) consisted of 90 min of rest on the treadmill followed by AJS, and 2) EX consisted of 60 min of rest on the treadmill, 30 min of EX at 20 m/min, and AJS. AJS was produced by directing a stream of air (100 mmHg pressure) at the forehead of the rat 20 min after cessation of rest or EX for 20 min in duration. Results indicate change between pre exercise and the peak response within the initial 5 min of AJS and are expressed as mean ± SE; (#) indicates N for that variable; * p< .05 versus CON.

	(7) MAP (mmHg)	(10) HR (bpm)	(7) MBF (%)	(9) IBF (%)
CON	23±3	125±6	-29±8	56±9
EX	12±3*	77±14*	-12±7	29±16

Thus, acute EX blunted the pressor and HR responses and tended to reduce MBF and IBF changes during AJS. In conclusion, the results suggest that acute EX reduces the cardiovascular responses to AJS.

51

PREDICTIONS OF LEAN BODY WEIGHT OF HIGH SCHOOL WRESTLERS.

Love, P. G.[1] and Johnson, B. F.[2] NutriSport[1] and Department of HPRD[2], Georgia State University, Atlanta, GA

It is common practice for high school wrestlers to lose 10% or more of total body weight (BWt) over a period of 3 -5 days with an average BWt loss of 5 - 9 lbs every week. Assessment of body composition (BC) through measurement of skinfolds (SF), BWt, and height (HT) are used for both screening and monitoring changes in lean body weight (LBWt) and fat body weight (FBWt). BC screenings are held many weeks before the competitive season to provide athletes with realistic WT class goals for competition. Body fat (BF) levels of 7% are considered minimum safe BF% for adolescent males. The purpose of this study was to assess BC of 749 high school wrestlers, ages 13 - 19 yrs (mean=15.7 yrs) to determine the % of high school wrestlers with BF levels below the recommended minimal safe BF% for males and to determine a wrestling-specific method of calculating desired LBWt from these data. BF percentages ranged from 1.6% - 35.9% (mean=8.9%). Multiple regression analysis of the data revealed that abdominal (ABD) SF was the best predictor of BF% (r=0.95). BWt ranged from 80 - 288 lbs (mean=143.8 lbs). BWt was the best predictor of LBWt (r=0.93). ANOVA revealed statistical differences ($p<0.05$) between several age groups (by year) for BWt, LBWt, and HT. The following equation was determined to measure LBWt with 98.7% confidence:

$$LBWt = BWt\ (.8634) - ABD\ SF\ (.9244) + 18.1346$$

A 7% of BWt value must be added to the LBWt estimation to determine the lowest safe goal BWt for wrestlers. Of the entire study group, 49.5% of the wrestlers had BF% below 7%. These results emphasize the importance of having BC screenings performed on all high school wrestlers.

52

CARDIORESPIRATORY RESPONSES TO POSTPRANDIAL EXERCISE

T. Boone and D. Diboll. Laboratory of Applied Physiology, The University of Southern Mississippi, Hattiesburg, MS 39406

The present study was designed to investigate the effect of eating a 1000 kcal meal just prior to 10 minutes of submaximal steady-state treadmill exercise on ventilatory and circulatory responses in 14 normally active young males (mean age, 23.6 yrs). Each subject served as his own control in that he exercised twice, once with the meal and once without the meal. The order of the two sessions was randomly determined. Analysis of variance with repeated measures was used to analyze differences between means. The results indicated that cardiac output (18.2 to 19.3 L/min), heart rate (145 to 153 beats/min), systolic blood pressure (154 to 160 mm Hg), double product (223 to 245), expired ventilation (60.3 to 64.3 L/min), tidal volume (1924 to 2099 ml), oxygen consumption (2.40 to 2.52 L/min), and the volume of carbon dioxide produced (2.19 to 2.36 L/min) were significantly increased ($p<.05$) during the postprandial exercise session. Further, the data indicate that the significant increase in oxygen consumption was due to the effect of the meal on the subjects' central adjustment. The significant increase in cardiac output was due to the significant increase in heart rate.

53

EFFECT OF EXERCISE DURATION UPON EXCESS POST-EXERCISE OXYGEN CONSUMPTION (EPOC) DURING ARM ERGOMETRY

B. Tinnin, B. R. Abadie, B. Wax, R. Tollison, D. O'Nan, and J. Lamberth, Mississippi State University, Mississippi State, MS 39762

The purpose of this study was to evaluate the effect of exercise duration on EPOC during arm ergometry. Eight male subjects 20-24 yrs of age randomly performed three arm ergometry testing sessions at 60% of VO_{2max} for durations of 10, 20, and 30 min. Baseline VO_2 was determined by averaging the VO_2 over the last 10 minutes of a 30 min seated rest. Duration (DUR) of EPOC lasted until the average VO_2 over five consecutive min was ≤ baseline VO_2. Magnitude (MAG) of EPOC was assessed by summing the net energy expenditure over DUR. VO_2 was converted to energy expenditure (kcal) by using the caloric equivalent of a liter of O_2 based on the non-protein respiratory exchange ratio. The effect of exercise duration on MAG and DUR of EPOC was analyzed with repeated measures ANOVA. Results indicated a non-significant effect of exercise duration on either MAG (p=.332) or DUR (p=.356) of EPOC. Means ± SD for MAG and DUR of EPOC for the three exercise conditions are presented below.

	10 min	20 min	30 min
DUR (min)	18.12 ± 6.68	12.00 ± 6.82	13.25 ± 8.79
MAG (kcal)	13.39 ± 5.06	10.88 ± 4.11	10.21 ± 2.20

Within the limits of the experiment, these results suggest that the duration of arm ergometry exercise does not affect either MAG or DUR of EPOC. These findings are in conflict with results reported for leg ergometry exercise. It is possible that there was not enough of a work differential between the three exercise durations to affect MAG and DUR of EPOC.

54

ACUTE BLOOD CHOLESTEROL VARIATIONS ARE NOT EXPLAINED BY CHANGES IN PERCEIVED STRESS OR BY CHANGES IN DIET AND EXERCISE HABITS.

R.N. Godsen, S. Balinsky and J. Hamilton, Dept. of PEHD, College of Charleston, SC 29424

It has been reported by a number of researchers that blood cholesterol values may demonstrate considerable short-term variation. The causes of this variability have not been clearly delineated, but it has been hypothesized that these variations may be the result of dietary changes, stress responses, and changes in exercise habits. This study was conducted to test that hypothesis. Twenty-four college-affiliated adults volunteered to participate in the study via informed consent. Plasma blood cholesterol was estimated from three venous blood samples taken at approximately one-month intervals over the course of a college semester. Dietary habit, stress disposition, and exercise habit were estimated from self report. A cholesterol variation of at least 20 mg/dl (from previous value) was defined as a real change. Statistical significance was determined by the application of a chi-square analysis. The data summary is included below.

	Collection Means±SEM			% with	Chi
VARIABLE	First	Second	Third	change	Square
Cholesterol	170±5	177±6	171±6	29.8	
Diet				31.9	4.15
Stress				40.4	6.36
Exercise				72.3	4.72

None of the calculated chi-square values approached significance ($P_{0.05}$=9.49 for 4 df); thus, we conclude that acute blood cholesterol variations are not explained by changes in perceived stress levels or by changes in diet and exercise habits.

AN EVALUATION OF EXISTING METHODS OF ESTIMATING BODY FAT IN BLACK FEMALES

L. Jerome Brandon, Georgia State Univ., Atlanta, GA 30303
Vernon Bond, Lousiana State Univ., Baton Rouge LA

The purpose of this study was to compare body fat assessments in 16 black females ($\bar{X}$ age 29.7 yr; WT 73.1 kg) measured by hydrostatic weighing (HW) with Futrex 5000 (FTX) an infrared interactance device, bioelectrical impedance system (RJL), Sloan et al. (SB) and the 3 (J3) and 7 (J7) sites Jackson et al. skinfold equations.

Equat	%FAT $\bar{X}$	S	E^b	SEE	r
HW	36.7	9.8			
FTX	29.7*a	5.4	2.5	2.9	0.68
RJL	32.9*	5.6	1.8	1.9	0.81
SB	24.3*a	7.1	3.5	3.0	0.76
J3	28.1*a	14.3	2.9	4.0	0.85
J7	37.6	19.5	3.2	7.3	0.79

*P<.05; aP<.01; $E^b=\sqrt{(HW-X)^2/N}$

The subjects were an overfat heterogeneous sample as indicated by the S for %fat. The J3 and J7 equations were adversely affected (large S & SEE) by a number of overfat subjects. Based on r values, the FTX and SB, were poor predictors of body fat in this sample. The relatively high r value and the low E^b and SEE suggest that RJL, when compared with HW, was the most effective. The E^b and SEE values were within ± 3% of HW %fat. Based on these data, RJL is the method of choice when measuring a group of overfat heterogeneous black females.

55

SUBCUTANEOUS FAT THICKNESS AND PERCENT FAT MEASUREMENTS IN CHILDREN USING MAGNETIC RESONANCE IMAGING, CALIPERS AND UNDERWATER WEIGHING: A CASE STUDY

L.C. Colvin & J. Sylvester. Laboratory of Applied Physiology, The University of Southern Mississippi, Hattiesburg, MS 39406-5142 and Department of Magnetic Resonance Imaging, Glenwood Regional Medical Center, West Monroe, LA 71290.

The simple addition of a number of skinfold caliper measurements is frequently used to provide an index of subcutaneous body fat. Although practical and frequently utilized, there are disadvantages in using calipers, as they compress the fatty tissue, and there is a limit to the size of the skinfold they can pinch. The purpose of this study was to compare the fat thicknesses measured from magnetic resonance imaging (MRI) with the thicknesses estimated from skinfold calipers (SF) and percent fat from SF, MRI and underwater weighing (UWW). A 10 year old male volunteered to participate in the pilot study. Twelve skinfold sites were chosen on the basis of their frequent use for both determining body density and for anthropometric classification at selected sites (B=biceps, T=triceps, FL=lateral forearm, SU=subscapular, ST=supra-ilium, MA=mid-axillary, JN=anterior chest, SS=sternum, JU=juxta-umbilicus, AT=anterior thigh, LT=lateral thigh and CP=posterior calf). The chosen arrangement represented a good spread of sites over the body surface area. Cross-sectional MRIs were made at positions on the body corresponding to the 12 sites. Skin and fat thickness was measured together using an electronic rule (Table). UWW was also performed and residual volume was measured using a nitrogen washout technique. Percent fat was calculated using the sites best correlated between caliper readings and MRI. Those sites were B, T, SU and ST. *In vivo* numerical values were placed in a skinfold percent fat equation as reported by Durnin and Womersley (1974) as well as caliper values. Values for scores were: Sum of 4 MRI sites =7.8 mm, Sum of 4 caliper site =7.7 mm, % fat SF = 7.8%, % fat MRI = 6.6 %, and % fat UWW = 6.6%. Statistical analysis indicates there is a significant relationship ($p < .01$ level) between % fat derived from UWW and MRI and between the 4 sites in the MRI measurements utilizing the skinfold equation.

Table : Fat thicknesses for MRI and calipers (SF) sites (* significant at p <.01)

	B	T	FL	SU	ST	MA	JN	SS	JU	AT	LT	CP
MRI	1.4*	3.3*	2.7	2.4*	2.7	3.1	6.1	5.5*	8.8	7.8	8.2	6.8
SF	1.3	3.5	6.0	2.8	5.4	6.2	4.6	5.4	8.4	14.8	17.0	8.2

Magnetic resonance imaging is now providing a new dimension in body composition analysis and will be an exciting and useful tool in the *in vivo* assessment of body composition. Precise reformulation of skinfold equations in children may be possible using this new technique.

56

57

ESTIMATION OF ENERGY EXPENDITURE DURING HANDBALL SINGLES MATCH PLAY

M. Loftin, P. Anderson, L. Lytton, P. Pittman and B. Warren,
Human Performance and Health Promotion, University of New Orleans, New Orleans, LA 70148

Limited information is available concerning caloric expenditure (kcal) of handball players during competition (Fox, et al., 1972). Since the measurement of VO2 is not practical during handball match play, caloric expenditure is typically estimated from the heart rate (HR)-VO2 relationship for such activities. The purpose of this study was to estimate kcal during handball match play from the HR response. Twelve experienced handball players volunteered and exhibited the following physical characteristics (mean): age 47.2 yrs; Ht 1.8 m; BW 78.0 kg; % fat 18.9; Peak VO2 (ml/min/kg BW) 48.0. Relative fat was determined from hydrodensiometry with treadmill walking / running employed to assess submaximal and peak exercise responses. The participants completed 3 submaximal workloads which were 4 minutes in duration with the last minute of each workload used to ascertain the HR-VO2 relationship. Initial workload ranged from 94 to 161 m/min with each additional workload increased by 26.8 m/min. A Polar Vantage XL heartwatch monitor was used to measure and record HR activity during singles match play. Data were collected every 5 seconds. Based on each participant's regression of HR on VO2 during the submaximal test, caloric output was estimated during match play. VO2 was converted to kcal using the procedures outlined in McArdle, et al., (1991). The regression of predicted VO2 (l/min) on actual VO2 (l/min) was: $y = 0.971 + 0.055$ (l/min), $r = 0.98$. Match play averaged 67.0 ± 20.2 min with a mean HR of 155.6 ± 13.0 bpm (85 % of peak HR). Estimated average caloric expenditure corrected for 30 and 60 minutes was 452 and 904 kcal. These data indicate that handball match play for experienced players is vigorous with respect to HR and estimated caloric expenditure. Further, this activity meets the ACSM (1990) criteria as an exercise modality to control BW and relative fat.

58

PHYSIOLOGICAL RESPONSE TO ARM EXERCISE DURING MODERATE INTENSITY LEG ERGOMETRY

B. R. Abadie, Mississippi State University, Mississippi State, MS 39762

The purpose of this study was to determine if arm exercise performed in conjunction with leg ergometry produced increases in energy expenditure over leg ergometry alone. Twelve males, 18-25 yrs of age, underwent a symptom limited maximal exercise test on a leg ergometer prior to performing two randomly ordered 20 min submaximal exercise sessions. One session was performed without arm (NW) exercise at workloads eliciting 75% VO_2max. The other session was performed at the same leg workload with the addition of alternating arm curls with 1.82 kg wrist weights (WW). Oxygen consumption (VO_2) was monitored during min intervals. Heart rate (HR), ratings of perceived exertion (RPE), and systolic (SBP) and diastolic (DBP) blood pressures were determined during the last 30 seconds of exercise. Multivariate analysis of variance (ANOVA) indicated an overall effect [$F(5,7)=5.50$, $p=0.02$] between WW and NW. Univariate ANOVA indicated that the WW condition created a higher VO_2, HR, SBP, and RPE. DBP did not differ between NW and WW.

	NW	WW
HR ($b \cdot min^{-1}$)	167.5 ± 12.5	178.8 ± 8.0*
VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$)	34.6 ± 5.2	38.3 ± 5.7*
SBP (mmHg)	167.8 ± 17.8	179.1 ± 11.5*
DBP (mmHg)	77.3 ± 6.5	77.5 ± 7.1
RPE	13.8 ± 2.6	16.1 ± 1.5*

Values are means±SD; *$p \leq 0.05$

VO_2 and RPE were increased 10.7% and 16.7%, respectively, by WW. This suggests that although curling 1.82 kg WW is effective in increasing VO_2 at the same level of leg work, the perception of effort is increased disproportionately.

THE EFFECTS OF IMMEDIATE VISUAL FEEDBACK ON RUNNING ECONOMY AND SELECTED HEMODYNAMIC VARIABLES IN MALE SUBJECTS

D. Diboll, T. Boone, and R. Lindsey
Laboratory of Applied Physiology
The University of Southern Mississippi
Hattiesburg, MS 39406-5142

The purpose of this study was to determine if immediate visual feedback alters running economy and selected hemodynamic variables during submaximal treadmill running in 20 male subjects with no extensive running experience. The treatment group (T) performed 11 minutes of running at 8 $km \cdot hr^{-1}$ and 2% grade with each subject observing his running mechanics in a full-length mirror. The control group (C) followed the same protocol with the exception that no mirror was used to provide visual feedback. Both groups were given basic instructions on running mechanics prior to testing. Heart rate (HR) was determined by electrocardiography. Oxygen consumption ($\dot{V}O_2$) was determined by measuring exspired gases using a SensorMedics Metabolic Measurement Cart (MMC). Cardiac Index (CI) and stroke volume index (SVI) were determined by way of the MMC and the CO_2 rebreathing procedure (Collier plateau method). There was no significant difference ($p>.05$) between T and C $\dot{V}O_2$ (32.02 ±3.81 vs 34.00 ±2.48 $ml \cdot kg^{-1} \cdot min^{-1}$). This is indicative of no difference in running economy between T and C. There was no significant difference in T and C CI as well. However, T HR was significantly lower ($p<.05$) than C HR (156.90 ±15.37 vs 172.90 ±12.62 $bts \cdot min^{-1}$). Also, T SVI was significantly higher than C SVI (61.20 ±8.05 vs 52.67 ±8.63 $ml \cdot M^{-2}$). These findings are indicative of an increase in central hemodynamic efficiency within the T group.

59

THE EFFECT OF CAFFEINE CONSUMPTION ON HEART RATE AND RATE OF PERCEIVED EXERTION DURING MAXIMAL EXERCISE TESTING

C. Ashley, P. Ochoa, M. Ritta and P. Bishop. Human Performance Laboratory, University of Alabama, Tuscaloosa, AL 35487

Caffeine consumption is believed to exert a significant influence on exercise heart rate in healthy humans and is routinely prohibited. However, few studies have examined the effects of caffeine consumption on heart rate (HR) and rate of perceived exertion (RPE) during a maximal exercise test. The primary purpose of our investigation was to assess the effect of ingestion of caffeine on HR and RPE during a maximal exercise test. A secondary aim was to determine any differences in the effect between habitual caffeine users and non-users. Male volunteers (N=20) performed two maximal treadmill runs within one week. One test was performed 15 min. after ingestion of 400 mg of caffeine (C), and the other after ingestion of a placebo (NC) in a counter-balanced order. Resting heart rate (RHR) was assessed prior to the exercise test, and HR and RPE were recorded during the exercise session. Subjects were also questioned about their usual caffeine consumption to determine habitual caffeine use. A repeated measures ANOVA identified no significant difference ($p>.05$) in RHR after ingestion of C versus NC (RHR=65.4 and 71.3 bpm, respectively). Further, there was no significant difference ($p>.05$) in maximum HR between C and NC (HR=196 and 195.15 bpm, respectively). The RPE at maximum HR was not significantly different ($p>.05$) between the treatment groups (RPE=18.65 for C and 18.7 for NC). Further, there were no significant differences in submaximal and maximal HRs between habitual caffeine users and non-users. Although caffeine may have an impact on certain parameters of heart function, the results of this study suggest that ingestion of 400 mg of caffeine does not have a significant influence on HR and RPE of healthy males during a maximal treadmill run.

60

61

THE EFFECTS OF A MENTAL AND PHYSICAL TRAINING PROGRAM ON VENTILATORY RESPONSES DURING REST: A PHYSIOLOGICAL EVALUATION

Y.A. Lim, T. Boone, R. Kazelskis, and W.R.Thompson. Life College, Marietta, GA 30060, and Laboratory of Applied Physiology, The University of Southern Mississippi, Hattiesburg, MS 39406-5142

Self-synchronized cardiorespiratory regulation (SSCR), a mental training technique which uses the subject's respiratory frequency (F_b) to cue a particular heart rate response, was incorporated in a physical training program to determine the ventilatory responses during rest. Nine college-age male students (27.89 $\pm$ 5.37 yrs) were mentally and physically trained for twelve alternate days before the testing of the treatment effect. The testing protocol followed a Control$_1$-Treatment-Control$_2$ (C_1-T-C_2) design in which the subjects were to initiate the SSCR procedure during the treatment period. Each period was 10-min in duration and thus each testing session consisted of 30-min. Results indicated that there were statistically significant decreases ($p<.05$) in expired ventilation (V_e), frequency of breath, ventilatory efficiency for oxygen uptake (V_e/VO_2), and ventilatory efficiency for carbon dioxide produced between T and the two controlled periods. A significant increase was found in tidal volume (T_v) {1177.80 [T] vs 844.07 [C_1] and 824.58 ml·breath^{-1} [C_2]}. This suggests that the SSCR procedure could be an active form of relaxation shown by a significant increase in T_v of an average of 29%. In addition, the incorporation of the mental training of SSCR procedure into a physical training program may have useful practical and therapeutic value, especially given an average of 19.72% and 24.25% improvement in V_e/VO_2 and V_e/VCO_2, respectively.

62

$\dot{V}O_2$max IMPROVEMENT INDEPENDENT OF TRAINING INTENSITY WHEN CALORIC COST IS SIMILAR.

I.S. Kallish and J.C. Rupp. Applied Physiology Laboratory, Georgia State University, Atlanta, GA 30303

The purpose of this investigation was to determine the effects of high-intensity, short-duration (HS) vs low-intensity, long duration (LL) training with similar caloric costs on $\dot{V}O_2$max. Twelve untrained ($\bar{x}$ $\dot{V}O_2$max=31 ml·kg^{-1}·min^{-1}), female volunteers ages 24-40 yr were randomly assigned to either HS (N=6) or LL (N=6). Subjects trained on a treadmill 4 d·wk^{-1} for 15 weeks. Duration was adjusted to elicit a caloric cost of 300 Kcal·session^{-1}. Training intensity (HS=80% and LL=50% $\dot{V}O_2$max) was verified at the beginning and midpoint of the investigation by indirect calorimetry. A mixed two factor within subjects ANOVA showed significant ($P<0.05$) improvement in $\dot{V}O_2$max for both groups. No significant differences for improvement in $\dot{V}O_2$max was found between the groups. Within the limitations of this investigation it was concluded that when caloric costs are similar, training at either 50% or 80% elicits similar changes in $\dot{V}O_2$max.

$\dot{V}O_2$ (ml·min^{-1}) HS			$\dot{V}O_2$ (ml·min^{-1}) LL		
PRE	POST	% CHANGE	PRE	POST	% CHANGE
2159 (437)	2368 (362)	9.7	2153 (319)	2388 (264)	10.9

63

VALIDITY OF RATINGS OF PERCEIVED EXERTION IN OLDER ADULTS

M. K. Chance, B. R. Abadie, R. Boling, and J. Lamberth,
Mississippi State University, Mississippi State, MS 39762

The use of ratings of perceived exertion (RPE) to monitor exercise intensity is currently being recommended by many fitness experts. However, the majority of the studies demonstrating the value of RPE for monitoring exercise intensity have been conducted on young or middle aged adults (Stamford, 1976; Skinner et al., 1973). The purpose of this study was to determine the ability of RPE to track VO_2 in an older adult population. Six conditioned older adult males and six conditioned older adult females, 50-65 years of age, participated in two submaximal exercise conditions to determine their ability to track oxygen consumption (VO_2) with RPE. A preliminary session was used to train subjects on the utilization of the RPE scale. One exercise session required subjects to perform four stages of progressively increasing intensity on a stationary cycle ergometer. The other session required subjects to perform the same exercise intensities in random order. The order of the exercise sessions was counterbalanced. Correlations were determined between VO_2 and RPE with regression analysis. The analysis of the data indicated a moderately high regression correlation between RPE and VO_2 during the progressive presentation of workloads ($r=.725$). However, during the random presentation of workloads, the regression correlation dropped substantially ($r=.421$). These data suggest that older adults are not able to monitor exercise intensity with the RPE scale without being cued by a progressive presentation of workloads.

64

LIPID AND LIPOPROTEIN PROFILES OF DIABETIC WOMEN AND MEN WITH CORONARY ARTERY DISEASE.

Paul G. Davis, William A. Webster, Dawn W. Blackhurst, Pamela K. McCarter, and J. Larry Durstine. Greenville Hospital Systems, HeartLife Program, Greenville, SC 29605 and the Department of Exercise Science, University of South Carolina, Columbia, SC 29208

A sample of 509 women (n=69) and men (n=440) with known coronary artery disease (CAD) was used to evaluate differences between lipid and lipoprotein profiles from nondiabetic and diabetic patients. This sample represents 10% of all cardiac patients enrolled into cardiac rehabilitation between the years 1979 and 1989. Of these patients, 417 were nondiabetic (51 women and 365 men) and 92 were diabetic (17 women and 75 men). Blood glucose levels were higher in diabetics than in nondiabetics in both women (151 and 101 $mg \cdot dl^{-1}$, $p<0.01$) and men (144 and 105 $mg \cdot dl^{-1}$, $p<0.0001$). Triglyceride concentrations did not differ (209 and 209 $mg \cdot dl^{-1}$) between nondiabetic women and men respectively, but they did differ (170 and 264 $mg \cdot dl^{-1}$, $p<0.006$) between diabetic women and men. Total cholesterol was different (236 and 213 $mg \cdot dl^{-1}$, $p<0.002$) between nondiabetic women and men. Although not significant (232 and 208 $mg \cdot dl^{-1}$, $p=0.09$), a similar trend was noted between diabetic women and men. When compared to men, high density lipoprotein cholesterol (HDL-C) was higher in nondiabetic (44 and 35 $mg \cdot dl^{-1}$, $p<0.002$) and diabetic women (41 and 33 $mg \cdot dl^{-1}$, $p<0.05$). Low density lipoprotein cholesterol (LDL-C) did not differ between nondiabetic women and men (149 and 140 $mg \cdot dl^{-1}$), but did differ between diabetic women and men (167 and 132 $mg \cdot dl^{-1}$, $p<0.01$). The ratio of total cholesterol/HDL-C was different (5.7 and 6.4, $p<0.008$) between nondiabetic women and men, but was not different (6.4 and 7.0) between diabetic women and men. When lipid and lipoprotein levels were compared between diabetics and nondiabetics, no differences existed within women or men. These results support previous findings that some lipid differences exist between women and men, and most of these differences persist with diabetes.

65

EXAMINATION OF ST SEGMENT DEPRESSION DURING GRADED EXERCISE TESTS AS AN INDICATOR OF MYOCARDIAL PERFUSION DEFECTS

J.A. Stewart, J.C. Rupp, Exercise Science Department, Georgia State University, Atlanta, GA 30303

The purpose of this study was to evaluate ST depression during graded exercise tests (GXT) as an indicator of myocardial perfusion abnormalities. The records of 350 patients, covering a period of 10 years, were examined at Georgia Baptist Medical Center. Of these, 127 were identified as having maximal GXT results which were considered positive for myocardial ischemia. As a result these patients underwent Treadmill Stress Thallium (TSS) tests for evaluation of myocardial perfusion. Of particular interest during their original GXT was the presence or absence of angina pectoris, the degree of ST segment depression and the rapidity with which the ST segment resolved following cessation of exercise. Only one asymptomatic subject (3%) with ST depression ≤ 2mm resolving within 1 minute post exercise showed a perfusion abnormality. Two asymptomatic (6%) subjects with ST ≤ 2mm had perfusion abnormalities when ST depression resolved within 2 minutes. This amounts to a false positive occurrence, under these conditions, in excess of 90%. Symptomatic (angina pectoris) subjects had positive TSS tests in 76% of cases regardless of both the degree of ST segment depression and the time of resolution. Asymptomatic subjects whose ST segment depression, regardless of degree, resolved within two minutes had only an 8.5% incidence of perfusion defects as indicated by the TSS. However, asymptomatic subjects whose ST segment depression resolved only after five minutes or failed to resolve at all had positive TSS tests in 46% of cases. These data suggest that angina pectoris and ST resolution time may be better indicators of myocardial perfusion defects than ST changes during graded exercise tests.

66

UPPER EXTREMITY EXERCISE FOLLOWING MEDIAN STERNOTOMY

Kelly J. Shields, Donald K. Shaw, Henry S. Jennings and Chela D. Cound. Cardiac Rehabilitation Departments, Riverview Hospital Association, Wisconsin Rapids, WI, and Saint Thomas Hospital, Nashville, TN.

Surgeons often proscribe upper extremity exercise (UEE) for several months following median sternotomy (MS). Such proscriptions appear to be largely based on anecdotal evidence and not on objective findings. Data related to UEE and MS are extremely limited. We retrospectively administered a 10-item questionnaire to 77 Phase II MS pts (61 males, 63.1±9.7 yrs, and 16 females, 65.8±9.3 yrs) specific to sternal healing and UEE. Mean time from hospital discharge to program entry was 38.4±20.8 days with 78% completing 36 Phase II sessions. Most pts (73) had undergone CABG surgery. Initial and final arm ergometer and rower workloads were 7.5±4.6/22.4±11.4 watts and 16.9±3.7/37.4±14.2 watts, respectively. Workloads were adjusted based on heart rate (HR) and rating of perceived exertion (RPE) rsponses per exercise prescription. Post MS complaints were grouped by type: 1) musculoskeletal, 2) incisional, 3) general. Nine pts (12%) registered post MS complaints: musculoskeletal (3), incisional (3), general (3). When asked if the MS complaints were related to UEE, there were no "yes" responses, five "unsure" responses and four "no" responses. We conclude that UEE can be safely prescribed prior to sternal healing when workloads begin low and are progressively increased based on HR and RPE criteria. In addition, we speculate that increased blood flow to the chest during UEE actually facilitates MS healing.

AN EMG ANALYSIS OF THE TENNIS SERVE: ESTABLISHMENT OF A BIOMECHANICAL DATA BASE.

R. Shapiro+, FACSM, R.L. Stine+, T.S. Horn+, T.J. Chandler*, FACSM and W.B. Kibler*, FACSM. +University of Kentucky; *Lexington Clinic, Lexington, KY 40506

In order to appropriately determine the correct course for performance or injury assessment and injury repair or rehabilitation, the intervention should be determined by existing knowledge of the role of the musculature surrounding the shoulder. When evaluating the muscle activity associated with the shoulder during the tennis serve, a data set for comparison is not readily available. The purpose of this investigation was to establish baseline data for injury and performance assessment for the tennis serve. Electromyographic data were collected from 13 male and 3 female highly skilled players during the serve. Surface electrodes were placed over the mid-belly of the following muscles: (1) upper trapezius; (2) lower trapezius; (3) posterior deltoid; (4) anterior deltoid; and (5) serratus anterior. Four subjects also had an electrode placed over the middle trapezius. Fine wire electrodes were inserted into the mid-belly of the supraspinatus and the infraspinatus. Subjects were instrumented unilaterally according to their serving arm. Signals were sampled at a frequency of 2000 Hz. Subjects were videotaped simultaneously using 4 high-speed (200 Hz) video cameras to establish a frame of reference for the EMG data. Standard three-dimensional analysis techniques utilizing the DLT were employed to extract coordinate data via the Expertvison software package. Onset times were determined for each muscle relative to racquet/ball impact. A negative value indicates that the onset was prior to impact. Average mean onset time (AMOT) for the upper trapezius was -56 $\pm$ 54 msec for males and -56 $\pm$ 28 msec for females. AMOT for the lower trapezius was -75 $\pm$ 57 msec for males and -43 $\pm$ 42 msec for females. AMOT for the posterior deltoid was -134 $\pm$ 45 msec for males and -137$\pm$ 54 msec for females. AMOT for the anterior deltoid was -311 $\pm$ 106 msec for males. AMOT for the serratus anterior was -6 $\pm$ 56 msec for males. AMOT for the middle trapezius was -80 $\pm$ 28 msec for males. AMOT for the supraspinatus was -80 $\pm$ 70 for males. AMOT for the infraspinatus was -36 $\pm$ 40 for males. AMOT were not available for the supraspinatus, infraspinatus, anterior deltoid, serratus anterior, and middle trapezius for the females. These data provide a useful data base for subsequent assessment of tennis athletes.

67

THE EFFECTS OF EXERCISE ON STANDING BALANCE, PAIN AND COPING RESOURCES FOR OLDER PEOPLE WITH ARTHRITIS: COMPARISON OF LAND AND WATER EXERCISE

Johnston, K. D., Johnson, B. F., Rupp, J.C. and Brandon, L. J. Biomechanics and Ergonomics Laboratory, Dept. of HPRD, Georgia State University, Atlanta, GA 30303

The purpose of this study was to determine the difference in standing balance, pain levels and coping resources following 8-weeks of exercise classes for older people with arthritis and to compare the effects of water exercise and chair exercise classes. Ten participants in ongoing exercise classes for people with arthritis volunteered to participate. Six were involved with water-based (mean age: 82$\pm$6.3 years) and four with chair-based (mean age: 62.5$\pm$5.1 years) exercise classes. All participated in two classes per week. Standing balance while blindfolded was measured for 60 seconds using an AMTI force platform and mean sway path area and length were calculated. Pain levels were measured from self-scored questionnaires, while coping resources were measured by the CRIS (Coping Resources Inventory for Stress). All subjects were pre- and post-tested and a repeated measures ANOVA ($p < 0.05$) was performed to determine differences between the variables as well as the groups. Analysis of the results determined that no significant differences existed between the variables or the groups over the 8-week period. The measurements did not increase or decrease significantly over the 8-week period, thereby implying a maintenance of function while performing either mode of exercise. Given the limitations of this study's sample size and training time, it was concluded that participation by this group of elderly subjects in an exercise class as part of disease management for arthritis appeared to aid in the maintenance of standing balance, pain levels and coping resources for stress.

68

69

THE EFFECT OF NUTRITIONAL KNOWLEDGE AND EXERCISE ON DIETARY HABITS OF THE ELDERLY

J.L. Moul, B.J. Warren, and R.M. Hohl. Department of Health, Leisure, and Exercise Science, Appalachian State University, Boone, NC 28608

The elderly have been associated with a relatively high incidence of suboptimal nutrition. The purpose of this study was to determine if nutritional knowledge and regular physical exercise effected the dietary habits of older adults. Eleven men and women ($\bar{x}$ age=68.67±1.01, BMI=25.5±0.7 $kg \cdot m^{-2}$) volunteered to engage in weight training and walk exercise training 5 $d \cdot wk^{-1}$ for 16 wk. Following exercise training the subjects completed a nutritional knowledge questionnaire and 7 d dietary recall. Thirteen sedentary men and women who were similar in age and body composition ($\bar{x}$ age=70.54±0.83, BMI=26.8±0.6 $kg \cdot m^{-2}$) to the exercise group completed the same questionnaire and 7 d dietary recall. Results indicated no significant difference between the groups in nutritional knowledge and that nutritional knowledge was not significantly correlated to dietary habits in either group ($p>0.05$). However, when sorted by gender, exercising females demonstrated a higher caloric intake (2019.8±281.5 vs 1494.9±115.3 kcal, $p=0.029$) and more adequately met the RDA for selected nutrients than the sedentary females (5 vs 11 of 14 selected nutrients significantly different from RDA, $p<0.05$). These results indicate that although nutritional knowledge does not appear to alter dietary habits in older adults, regular exercise training encourages a greater caloric intake in females and may serve as an impetus for enhanced nutrient intake.

70

POSITION OF BLOOD PRESSURE MEASUREMENT AND THE ANTIHYPERTENSIVE EFFECTS OF AEROBIC EXERCISE: A META-ANALYSIS

George A. Kelley, Department of HPE, Johnson C. Smith University, Charlotte, NC 28216

Previous meta-analytic research (Kelley, 1992) has shown that lower extremity aerobic exercise reduces resting systolic and diastolic blood pressure in hypertensive adults by approximately 12 and nine mmHg, respectively. The purpose of this study was to examine the effects of position of blood pressure measurement (sitting and/or supine) on post-training changes in resting blood pressure. Human longitudinal training studies (N=19, systolic, N=17, diastolic) published in English and conducted over the past 26 years (1966-1991) were retrieved via Medline computer searches. In addition, extensive cross-referencing and hand searches were performed. Studies were limited to those published in journals which included hypertensive adults (resting systolic and/or diastolic blood pressure >139/89 mmHg) measured by ausculatory cuff method in the sitting (SIT) and/or supine (SUP) position. Using the meta-analytic technique, effect sizes (ES) were calculated, corrected for bias, and analyzed. Across all categories and positions, large (>.70) sample weighted ES signficantly different from zero ($p<0.05$) were noted (0.81 + 0.94, 1.69 + 2.07, systolic SIT and SUP, 1.08 + 0.95, 2.03 + 2.44, diastolic SIT and SUP). ES corresponded with absolute decreases of approximately 12 (SIT) and 16 (SUP) mmHg for resting systolic blood pressure, and nine (SIT) and 12 (SUP) mmHg for resting diastolic pressure. Comparison of SIT and SUP ES results revealed no signiflcant differences for either resting systolic or diastolic blood pressure. It was concluded that ausculatory cuff blood pressure measurement in either the SIT or SUP position will yield similiar post-training ES results on resting systolic and diastolic blood pressure in hypertensive adults.

RELATIONSHIP OF TOTAL CHOLESTEROL TO PHYSIOLOGICAL AND BEHAVIORAL VARIABLES IN WHITE AND HISPANIC CHILDREN

J. Rodean, C.G.R. Jackson, Z.V. Tran, D. Shaw, and S.C. Baird,
School of Kinesiology and Physical Education, University of Northern Colorado, Greeley, Colorado 80639

The relationship of total cholesterol to physiological and behavioral variables was investigated in 27 third grade children: 7 white girls (WG), 4 white boys (WB), 6 Hispanic girls (HG), and 10 Hispanic boys (HB). Measures included height (HT), weight (WT), triceps (TS) and subscapular (SS) skinfolds, systolic (SBP) and diastolic (DBP) blood pressures, total cholesterol (TC), family history of cardiovascular disease (FH), socioeconomic status (SES), Type A behavior (TAB), dietary consumption of cholesterol and saturated fat (CSF), activity ratings (AR) and motor ability (MA). Body mass index (BMI), ponderal index (PI), centrality index (CI) and percent fat (PF) were calculated. Hispanics had significantly lower mean TAB and classroom teacher AR and higher mean CSF was compared to white children ($p < .05$). Means for HB were significantly higher than those for WB for DBP, SS, SS+TS, PF and CSF. Results show that TC was significantly correlated to PF for all children combined. There were no significant relationships with TC for girls. For boys, TC was significantly related to BMI, SS, PF, PI, DBP, TS and WT. For white children, TC was significantly correlated to WT, PI, PF and BMI. For Hispanic children, TC was significantly related to classroom teacher AR. Three of the seven children who had TC >200 mg/dl, including the child with the highest TC, had a negative or unknown FH. Further exploration of pediatric cholesterol screening strategies other than FH was recommended. Focusing on physiological measures and those relating to activity level as well as gender and ethnic differences was suggested.

71

WHAT ARE THE DIETARY PRACTICES OF 8-12 YEAR-OLD BLACK FEMALES AND WHAT DO THEY KNOW ABOUT FAT, FIBER, AND CHOLESTEROL?

Myers-Oakes, Barbee and Karen Saxer. Department of Health and Sport Science, Wake Forest University, Winston-Salem, NC 27109.

Knowledge and attitude regarding fat, fiber, sugar, and cholesterol were assessed by questionnaire among 57 black females (BF) aged 8-12 years. A 24-hour food recall was also analyzed. The mean value of each variable was: age = 10.2 years, weight = 104.2 lbs., height = 59 inches , body mass index (wt/ht^2) = 20.5, blood pressure = 107/58 mmHg, total of 7 skinfolds = 138 mm (biceps, triceps, subscapular, abdomen, suprailiac, thigh, calf). The average Waist-to-Hip ratio = .83 and 61% BF had the Male Pattern of obesity, linked to diseases. Dietary practices based on the 24-hour recall revealed that the BF had poor dietary practices. The mean Kcal intake per day = 2798 (134% RDA). The mean Protein intake was 244% RDA; Fat intake was 148% RDA; Carbohydrate intake was 153% RDA. The mean Cholesterol intake was 290.6 mg/day (97%). Vitamin A intake was 109% the RDA; however, 60% of BF had less than 100% RDA. Vitamin C intake was 354% RDA, reflecting major imbalances in Vitamin intakes. Sodium intake was 3625 gm/day (171% RDA). Dietary fiber intake was 11.3 gm (44% RDA).

"Please check which of the following describe each food." (Percent responding "Yes")

Food	Hi Sugar	Hi Fat	Hi Cholesterol	Hi Fiber
Whole Milk	19	47	37	60
Skim Milk	16	16	32	49
Butter	14	70	84	33
Margarine	21	51	61	37
Apples	21	10	18	56
Mayonnaise	26	75	74	28

CONCLUSIONS: Although BF were generally aware that that fat, fiber, and cholesterol affect their risk of heart disease and cancer, there is limited knowledge of the sugar, cholesterol, and fiber content of specific foods. These data suggest that BF were lacking essential information needed to make positive nutritional choices, which is reflected in their 24-hour dietary recalls.

72

73

PREVALENCE OF CARDIOVASCULAR RISK FACTORS IN A GROUP OF AFRICAN AMERICAN AND WHITE HIGH SCHOOL STUDENTS

S.R. Vickers, C.B. Berry, B.E. Ainsworth and N.R. Oakley. Wellness Laboratory, Winston-Salem State University, Winston-Salem, NC 27110.

A mixed racial sample of 60 high school students (mean age = 16 ±.91 years) participated in a study to determine prevalence of selected risk factors for cardiovascular disease. Measurements were taken of serum lipids, resting blood pressure and anthropometric sites. Physical activity habits were assessed by the Lipid Research Clinic (LRC) questionnaire. When classified by their gender specific percent body fat (%BF), 18% were obese and another 30% were overfat (between optimal and obese). The means for the body composition variables of body mass index, triceps skinfold and subscapular skinfold for the gender/race groups all were above the 50th percentile of the NHANES II reference data. Multiple linear regression analysis was used to look at associations between the risk variables. Race was found not to contribute to the association between any of the variables. There was a significant relationship between SBP ($r=0.51$, $p=0.002$) and physical activity after controlling for sex and %BF. Cholesterol and %BF were associated ($r=0.40$. $p=0.036$) after controlling for sex as were DBP and %BF ($r=0.40$, $p=0.04$). Sixty percent of the subjects were sedentary. There were significant differences ($p<0.05$) in heart rate between the groups of low active and active and in %BF between the groups of very low active and active and between the groups of low active and active. It appears that for this group of students, the most significant risk may be sedentary behavior which may influence body fat and possibly blood pressure.

Supported by NIH grant # S206 RR008040-19

74

BLOOD PRESSURE AND THE JHAC SCALE IN EMPLOYEED AFRICAN AMERICAN MEN

T.J. Hodge, C.B. Berry and V.N. Schnyder, Wellness Laboratory, Winston-Salem State University, 27110

The purpose of this investigation was to examine the relationship between the John Henryism Active Coping (JHAC) score and blood pressure (BP) in a group of 76 employed male African Americans (mean age = 36.8 years). The JHAC questionnaire was developed to help in understanding the inverse relationship between socio-economic status (SES) and hypertension. A few studies have shown a relationship between high JHAC score and hypertension in African American subjects of low SES. Analysis of covariance was used to test the interaction of SES and JHAC with mean BP as the dependent variable. Independent variables were dichotomized at the median score and included education (ED) (LOWED: ≤ high school graduate; HIGHED: > high school graduate), JHAC (HIGHJ: ≥ 22; LOWJ: ≤ 21) and SES X JHAC. Covariates were age and percent body fat (%BF). Analysis revealed no effect ($p>0.05$) for either JHAC or ED. The BP and JHAC relationship was examined within the HIGHJ and LOWJ. After controlling for age, smoking status and %BF, no significant relationship was found for either diastolic (DBP) or systolic (SBP) BP. Subjects were also divided into occupation groups by blue collar (BC) and white collar (WC) jobs. No relationship was found between either SBP or DBP and JHAC within either of these groups. Based on the data presented , it is concluded that the JHAC score provides very little information about BP in employed African American men.

Supported by NIH grant # SO6 RR08040-19.

ADVANCED MECHANICAL TECHNOLOGY, INC.
151 CALIFORNIA STREET, NEWTON, MASSACHUSETTS 02158
TEL (617) 964-2042 TWX 710-335-0406 FAX (617) 964-6234

Have a Safe Trip Home!

See You in Greensboro in 1994!