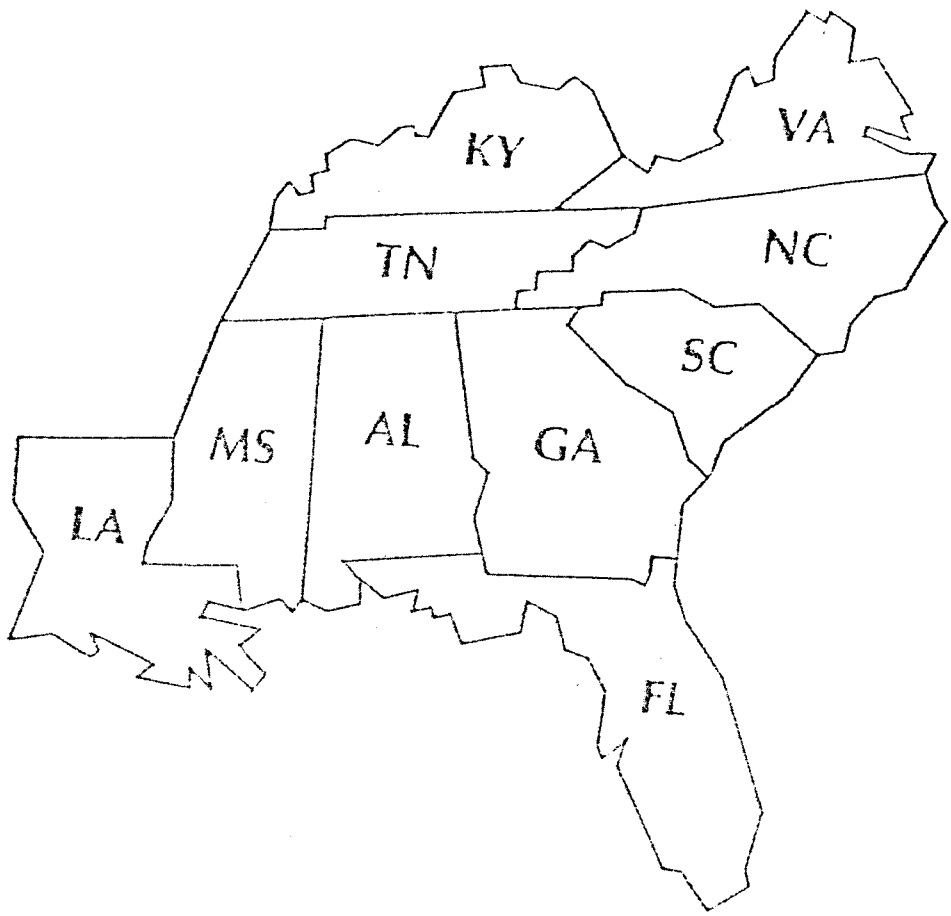
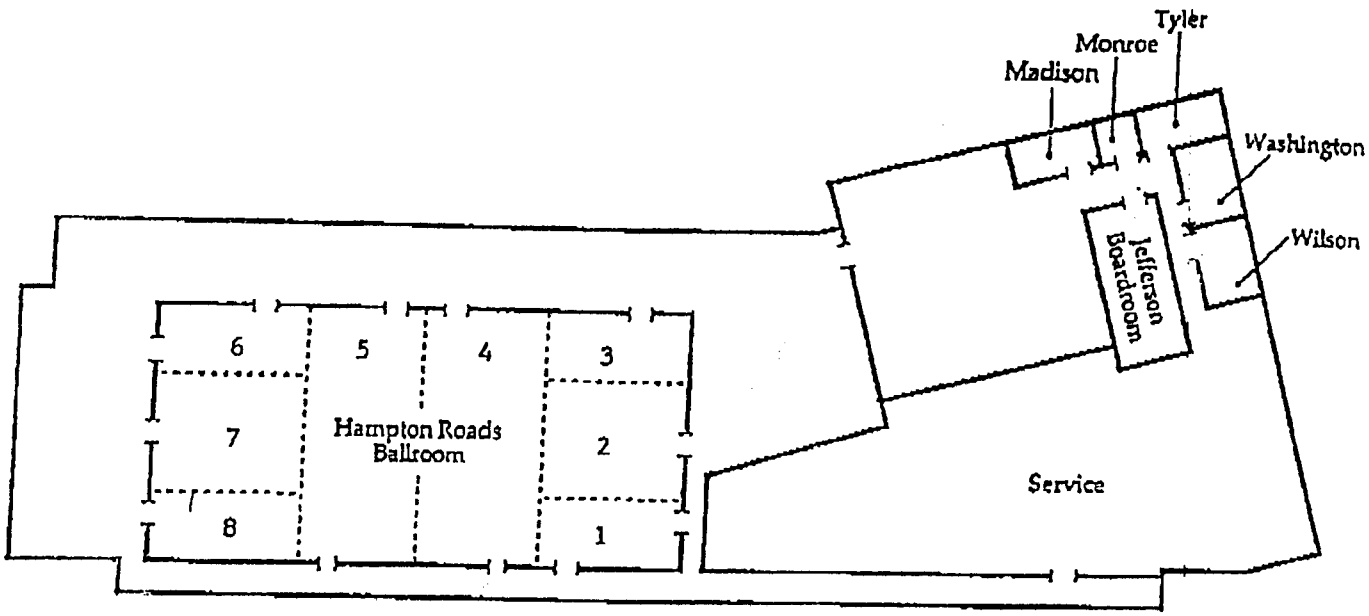
AMERICAN COLLEGE of SPORTS MEDICINE

SOUTHEAST REGIONAL CHAPTER

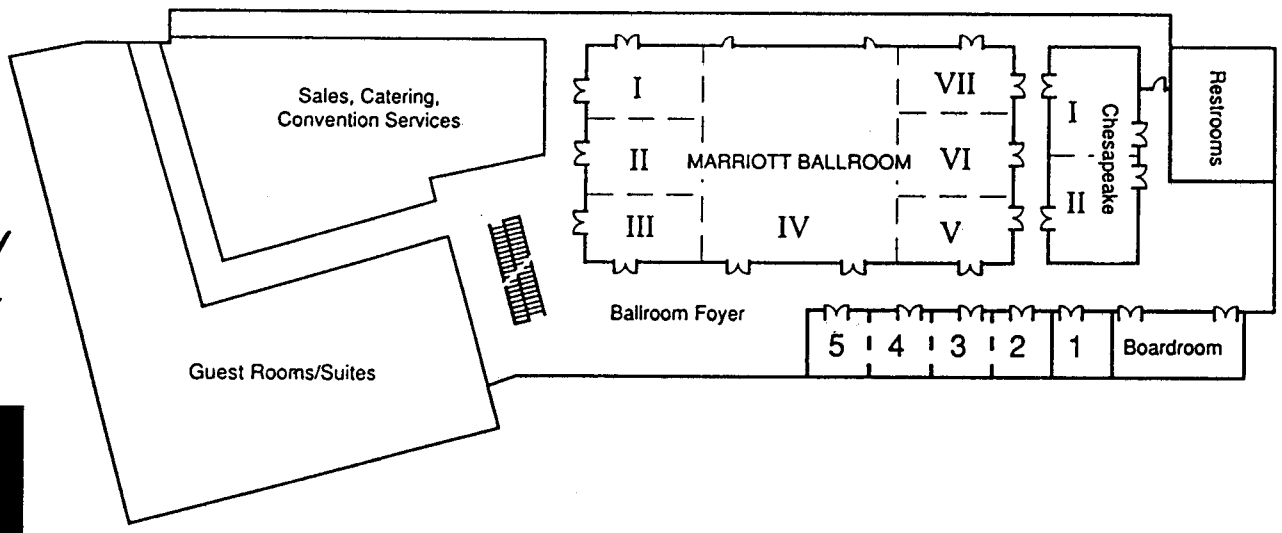
February 4-6, 1999
27th Annual Meeting
Norfolk Waterside Marriott, Norfolk, Virginia

ABSTRACTS





Third Floor



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Fourth Floor

Twenty-Seventh Annual Meeting

SOUTHEAST REGIONAL CHAPTER AMERICAN COLLEGE OF SPORTS MEDICINE

Norfolk Waterside Marriott
Norfolk, Virginia

February 4-6, 1999

Officers

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

Past President:
Bob Moffatt, Florida State University

President-Elect:
Jeff Rupp, Georgia State University

Executive Board:
Mark Davis, University of South Carolina (National Rep.)
Steve Dodd, University of Florida
Bonita Marks, University of North Carolina, Chapel Hill
Mike Overton, Florida State University
Dixie Thompson, University of Tennessee
Melicia Whitt, University of South Carolina (Student Rep.)
George Wortley, Lynchburg Family Practice Residency (Clinical Rep.)

Executive Secretary:
Vaughn Christian, Appalachian State University

Meeting Host:
Old Dominion University
Liz Dowling and Larry Durstine

Publisher and Editor:
Don Torok, Florida Atlantic University

Meeting Objective

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

Planning Committee

Jeff Rupp, Chair	Liz Dowling, Host	Dianne Ward	Bob Moffatt	Larry Durstine
Vaughn Christian	Mark Davis	Steve Dodd	Bonita Marks	Mike Overton
Dixie Thompson	Melicia Whitt	George Wortley		

SEACSM List of Reviewers

Bob McMurray	Janet Walberg-Rankin	Kirk Cureton	Larry Durstine	Scott Powers
Emily Haymes	Steve Messier	Mindy Millard-Stafford		Bonita Marks
Bruce Gladden	Barbara Ainsworth	Theodore Angelopoulos		Andy Doyle

SEACSM Meetings & Officers

	Date/Place	Pres./PastPres./PresElect	Executive Board
1st	Fall 1973 Gatlinburg, TN	Andrew Kozar	
2nd	Fall 1974 Atlanta, GA	Clyde Partin	
3rd	Fall 1975 Charlottesville, VA	Dan Copeland	
4th	Fall 1976 Murfreesboro, TN	Rankin Cooter	
5th	Fall 1977	Ed Howley	Steve Blair Ron Byrd Joe Smith
6th	Fall 1978 Columbia, SC	Russ Pate	
7th	Feb. 16-17, 1979 Atlanta, GA	Dennis Wilson Ed Howley Ron Byrd	Earl Allen Thad Crews Art Weltman
8th	Feb. 8-9, 1980 Charlotte, NC	Ron Byrd Dennis Wilson Paul Ribisl	Bruce Gladden Jay Kearney Russ Pate
9th	Feb. 6-7, 1981 Charleston, SC	Paul Ribisl Ron Byrd Bill Herbert	Joe Chandler Tom Cronan Kirk Cureton
10th	Feb. 5-6, 1982 Blacksburg, VA	Bill Herbert Paul Ribisl Russ Pate	Harvey Murphy (ES) Jon MacBeth (ES) Joe Chandler Tom Cronan Kirk Cureton Robert McMurray
11th	Feb. 4-5, 1983 Gainesville, FL	Russ Pate Bill Herbert Kirk Cureton	Jon MacBeth (ES) Earl Allen David Cundiff Scott Powers

	Date/Place	Pres./PastPres./PresElect	Executive Board
12th	Feb. 3-4, 1984 Auburn University	Kirk Cureton Russ Pate Chris Zauner	Ron Bos (ES) Emily Haymes Phil Sparling Mike Stone
13th	Jan. 31-Feb. 2, 1985 Boone, NC	Chris Zauner Kirk Cureton Robert McMurray	Ron Bos (ES) John Billings Harry DuVal Diane Spitler J. W. Yates
14th	Jan. 23-25, 1986 Athens, GA	Robert McMurray Chris Zauner Scott Powers	Ron Bos (ES) Terry Bazarre John Billings J. Larry Durstine Russ Pate (N) Diane Spitler
15th	Jan. 29-31, 1987 Charleston, SC	Scott Powers Robert McMurray Diane Spitler	Ron Bos (ES) Terry Bazarre J. Larry Durstine Steve Messier Allen Moore (S) Russ Pate (N) Janet Walberg
16th	Jan. 28-30, 1988 Winston-Salem, NC	Diane Spitler Scott Powers Phil Sparling	Ron Bos (ES) Dalynn Badenhop Gay Israel Steve Messier Russ Pate (N) Janet Walberg Rankin Mark Senn (S)
17th	Jan. 19-20, 1989 Atlanta, GA	Phil Sparling Diane Spitler Emily Haymes	Ron Bos (ES) Dalynn Badenhop Kirk Cureton (N) Mark Davis Gay Israel Ben Kibler (MD) David Peltzer (S) Art Weltman
18th	Feb. 1-3, 1990 Columbia, SC	Emily Haymes Phil Sparling Harry DuVal	Ron Bos (ES) Jerry Brandon Maria Burgess (S) Kirk Cureton (N) Mark Davis Ben Kibler (MD) Dianne Ward Art Weltman

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

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

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

SEACSM Award Winners

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

AMERICAN COLLEGE of SPORTS MEDICINESM

1999 SEACSM Meeting Schedule

Waterside Marriott Hotel and Convention Center
Norfolk, Virginia

THURSDAY, FEBRUARY 4

12:00 - 6:00 **3rd Floor**	REGISTRATION
12:00 - 2:00 **Jefferson**	SEACSM BOARD MEETING
4:00 - 5:30 **Hampton 2**	**SYMPOSIUM** Exercise, Radicals, and Health: Role of Radicals in Atherosclerosis, Muscle Atrophy, and Muscle Fatigue.
4:00 - 5:30 **Hampton 3** **Hampton 6** **Hampton 7**	**TUTORIALS** The Significance of Exercise Through the Ages: Childhood Through Senescence. Development of Youth Sport Talent Identification Program Specific to the USA. Considerations in Calibration and Validation of Portable Metabolic Units.
4:00 - 6:00 **Marriott 4**	EXHIBITORS
4:00 - 6:00 **Marriott 1-2** **Marriott 5-6**	**FREE COMMUNICATIONS** **Psychology/Psychiatry** **Exercise Evaluation**
4:00 - 6:00 **Marriott 4**	**POSTER PRESENTATIONS** **Body Composition** **Energy Balance & Weight Control** **Nutrition and Sports Science**
7:30 - 9:00 **Hampton 4-5**	BUSINESS MEETING AND KEYNOTE ADDRESS Presiding: Dianne Ward, University of North Carolina Introduction of Speaker: Larry Durstine, University of South Carolina **"Exercise Comes of Age: Mainstreaming the Exercise Prescription for the Older Adult"** Maria Fiatarone Singh, MD Tufts University
9:00 - 11:00 **Hampton 1-3**	SEACSM SOCIAL

FRIDAY, FEBRUARY 5

8:00 AM - 6:00 **3rd Floor**	REGISTRATION
8:00 AM - 6:00 **Marriott 4**	EXHIBITS
7:45 - 9:00 **Marriott 4**	**POSTER PRESENTATIONS** Cardiovascular, Environmental and Occupational Physiology Fitness
7:45 - 9:00 **Hampton 2** **Hampton 1**	**SYMPOSIA** The Cytokine Theory of Overtraining: A Proposed Hypothesis. Winning Non-Competitive Research Grants.

7:45 - 9:00	**TUTORIALS**
Hampton 3	Thin Thighs or Thin Wallet? The Facts About Aminophylline-Based Thigh Reducing Creams.
Hampton 6	A Scientific Approach to Alternative (Unconventional) Medicine.
8:00 - 9:00	**FREE COMMUNICATIONS**
Marriott 1-2	**Sports Nutrition**
Marriott 5-6	**Connective Tissue, Endocrinology, Immunology**
9:15 - 10:15	**ACSM PRESIDENTIAL ADDRESS**
Hampton 4-5	**"Resistance and Upper Body Training in Cardiac Rehabilitation"** Barry Franklin, Ph..D., William Beaumont Hospital
10:30 -12:00	**FREE COMMUNICATIONS**
Marriott 1-2	**Body Composition**
Marriott 5-6	**Chronic Disease/Disability/Injuries**
Hampton 8	**Biomechanics**
10:45 - 12:00	**TUTORIALS**
Hampton 2	Anatomic and Physiological Considerations in Prescribing Exercise for Spinal Cord Injured Adults.
Hampton 3	The Meaning of VO_{2max} and Its Relationship to Endurance Performance.
Hampton 1	The Exercise-Health Connection.
12:00 - 1:00	**LUNCH**
1:00 - 1:55	**HENRY J. MONTOYE SCHOLAR LECTURE**
Hampton 4-5	**"Rehabilitation of Older Adults with Osteoarthritis: The Contributions of Exercise Science"** Steve Messier, Ph.D., Wake Forest University
2:00 - 3:15	**SYMPOSIA**
Hampton 1	To Supplement or Not? Ethical and Legal Considerations of Nutritional Supplementation in Sport.
Hampton 8	Credentials for Exercise Professionals: ACSM Certifications and the Clinical Exercise Physiology Registry.
2:00 - 4:00	**POSTER PRESENTATIONS:**
Marriott 4	**Psychology, Psychiatry, Education** **Competitive Athletes** **Disease/Therapy/Miscellaneous Clinical**
2:00 - 4:00	**FREE COMMUNICATIONS**
Marriott 5-6	**Skeletal Muscle**
Marriott 1-2	**Exercise Evaluation**
2:15 - 3:30	**TUTORIALS**
Hampton 3	Neural Activation During Eccentric Contraction: A Strange World.
Hampton 6	Exercise Science: Career Opportunities.
Hampton 7	Academic Teaching - The Art, the Science (and Some of) the Tricks.
3:45 - 4:45	**SEACSM BASIC SCIENCE LECTURE**
Hampton 4-5	**"Post Exercise Muscle Glycogen Synthesis: Role of GLUT4 Expression"** Speaker: John Ivy, Ph.D., University of Texas, Austin
5:00-6:00	CASE AND CLINICAL ABSTRACTS
Hampton 1	Stress Fracture -Tibia - Football. Foot Pain - Running.

5:00 - 6:00 **STUDENT SYMPOSIA**
Hampton 4-5 **"Interviewing for That First Clinical Job and Getting It"**
Barry Franklin, Ph.D., William Beaumont Hospital

"Health Management: Vast Challenges at the Work Site for the Multi-Skilled Exercise Professional"
Mark Landgreen, The Coca-Cola Company

6:00 - 7:15 **SEACSM STUDENT FAIR**
Marriott 1-3

SATURDAY, FEBRUARY 6

6:30-7:30 AM **PAST PRESIDENT'S BREAKFAST**
Hampton 3

7:45 - 9:00 **CLINICAL SYMPOSIUM**
Hampton 8 Foot and Lower-Extremity Injuries: Utilization of In-Shoe Pressure and Force Measurements to Assess Treatment Interventions.

7:45 - 9:00 **TUTORIALS**
Hampton 7 Preparing Undergraduate Students in Exercise Science for Future Career Endeavors.
Hampton 6 A Tutorial Review of Isometric Exercise.

7:45 - 9:00 **SYMPOSIA**
Hampton 1 Student Biomechanics Symposium: Biomechanics and Exercise Associated with Aging, Illness, and Injury.
Hampton 2 The Ultra Endurance Athlete.

9:15 - 10:15 **SPECIAL TOPICS LECTURE**
Hampton 4-5 **"Skeletal Muscle: Physiological and Biomechanical Adaptations to Microgravity"**
Robert Fitts, Ph.D., Marquette University

10:45 -12:00 **SYMPOSIA**
Hampton 1 Explosive Exercise: Theoretical and Practical Aspects.
Hampton 2 Effects of Exercise on Elevated Blood Pressure, Diabetes, and Excess Body Fat in African Americans.

10:45 -12:00 **TUTORIALS**
Hampton 7 Eccentric Contraction-Induced Strength Loss: Contributing Factors and Their Relative Importance.
Hampton 6 The Bibliographically Challenged Scientist's Guide to References and Citations: Automated Referencing and the Internet.

10:45 -12:00 **STUDENT AWARD WINNERS-PRESENTATIONS**
Hampton 3
10:45-11:00 Third Place (Jennifer Hootman, University of South Carolina) Predictors of Lower Extremity Injury Among Recreationally Active Men and Women.

11:00-11:15 Second Place (Jason Allen, Louisiana State University) Relationship Between Blood-Flow Velocity and Brachial Artery Flow-Mediated Dilation.

11:15-11:30 First Place (Christopher Hewitt, University of South Carolina) Effects of Exercise on Corticotropin-Releasing Factor (CRF) in the Rat Brain.

12:00 - 2:00 **SEACSM LUNCHEON LECTURE**
Marriott 1-7 **"The Evolution of Sports Physiology"**
David Costill, Ph.D., Indiana University

2:30-?? **SEACSM BUSINESS MEETING**
Jefferson Executive Committee

THURSDAY, FEBRUARY 4

12:00 - 6:00 PM REGISTRATION
(3rd Floor)

4:00 - 6:00 PM EXHIBITORS
(Marriott 4)

12:00 - 7:30 PM SPEAKER READY ROOM
(Madison)

12:00 - 2:00 PM SEACSM BOARD MEETING
(Jefferson)

4:00 - 5:30 **SYMPOSIUM**

[S1] Exercise, Radicals, and Health: Role of Radicals in Atherosclerosis, Muscle Atrophy, and Muscle Fatigue. Scott K. Powers, Ed.D., University of Florida
Chair: Mark Davis, University of South Carolina
(Hampton 2)

4:00 - 5:30 **TUTORIALS**

[T1] The Significance of Exercise Through the Ages: Childhood Through Senescence. Robert G. McMurray. Ph.D., University of North Carolina, Chapel Hill
Chair: Jerry Brandon, Georgia State University
(Hampton 3)

[T2] Development of Youth Sport Talent Identification Program Specific to the USA. Mitchell W. Craib, Ph.D., Appalachian State University
Chair: Don Torok, Florida Atlantic University
(Hampton 6)

[T3] Considerations in Calibration and Validation of Portable Metabolic Units. George A. King, University of Tennessee
Chair: Ted Angelopoulos, University of Central Florida
(Hampton 7)

4:00 - 6:00 **FREE COMMUNICATIONS**

Psychology/Psychiatry
Chair: Charlie Jackson, Old Dominion University
(Marriott 1-2)

(4:00-4:15) [O1] Physical Activity Barriers Among Low Income, Under-Served Women: The North Carolina Wisewoman Project. K.R. Evenson, K.W. Tawney, K.J. Hunt, A.S. Ammerman, J.L. Holliday, W.D. Rosamond. University of North Carolina, Chapel Hill

(4:15-4:30) [O2] Psychophysiological Responses of Men and Women to Anaerobic Power Tests. M.A. Fischer, S. N. Pearman, III. Furman University

(4:30-4:45) [O3] Physical Fitness and Perceived Quality of Life Among Rural and Urban Louisiana Senior Women. R. Reyes, E. Hirschey, A. Gray, M. Alomari, D. Bao, M. Frisard, M. Welsch, R. Wood. Louisiana State University

(4:45-5:00) [O4] Utility of the Theories of Reasoned Action and Planned Behavior for Predicting Objectively Measured Physical Activity in Youth. S.G. Trost, R.R. Pate, D.S. Ward, R. Sanders, W. Riner. Auburn University and University of South Carolina

(5:15-5:30) [O5] Adherence to Southeast ACSM Curricular Guidelines by Undergraduate Exercise Science Schools in South Carolina. A. Wheat , K. Wood Woeber. University of South Carolina

Exercise Evaluation
Chair: Craig Broeder, East Tennessee State University
(Marriott 5-6)

(4:00-4:15) [O7] Interrater Objectivity and Test-Retest Reliability of the Robertson Modified Curl-up Test. J.R. Barrett, M.C.W. Lauderback, D.E. Cornelius, L. A. Downie, D. A. Rowe. Middle Tennessee State University

(4:15-4:30) [O8] Functional Capacity in Patients Early After Coronary Artery Graft Surgery. K. Biris, K. Wood Woeber. University of South Carolina

(4:30-4:45) [O9] Effects of Static and Hold-Relax Stretching on Hamstring Range of Motion Using the Flexibility LE1000. P.A. Gribble, K.M. Guskiewicz, W.E. Prentice, E.W. Shields. University of North Carolina, Chapel Hill

(4:45-5:00) [O10] The Effect of Walking, Jogging, and Exerstriding on Heart Rate, Systolic Blood Pressure, and Perceived Exertion. J.D. Hawkins, S.M. Hawkins, G.E. Boyd. Lander University

(5:15-5:30) [O11] The Effects of Helmet and No Helmet Use on Thermoregulatory Responses to Cycling Outdoors. M.P. Hogan. Old Dominion University

(5:30-5:45) [O12] Lactate and Ventilatory Thresholds Occur at the Same Relative Oxygen Consumption. I.S. Kallish, C. Papadopoulos, J.C. Rupp. Georgia State University

(5:45-6:00) [O13] Vagal Modulation of the Heart and Central Hemodynamics During Handgrip Exercise. H. Kluess, R. Wood, M. Frissard, A. Gray, M. Lee, R. Prisby, K. Russo, M. Welsch. Louisiana State University

4:00 - 6:00 **POSTER PRESENTATIONS**
(Marriott 4)
Authors Present from 5:00 - 6:00 PM
Chair: Tim Masias, Old Dominion University

Body Composition

[P1] Body Composition Measurement in Females with Leg-to-Leg Bioelectrical Impedance Analysis Compared to Dexa. M.A. Austin, S.B. Heymsfield, D.C. Nieman. Appalachian State University; St. Luke's/Roosevelt Hospital, Columbia University

[P2] The Validity of Leg-to-Leg Bioelectrical Impedance Measurement in Males. A.F. Cable, D.C. Nieman, M.A. Austin, E.C. Hogan, A.C. Utter. Appalachian State University

[P3] Relationship Between Percent Body Fat and Body Mass Index for Morbidly Obese Adults. J. Goodman, K. O'Brien, M. McCammon. East Carolina University

[P4] Left Ventricular Geometry and Function in Obese Children: Effects of Physical Training and Detraining. M.C. Humphries, B. Gutin, P. Barbeau, S. Vemulapalli, S. Owens. Medical College of Georgia

[P5] Relationship Between Body Composition and Decrements in Quadriceps Strength Following Downhill Running. P.M. Mehta, P.L. Byrd, P. DeVita, R.C. Hickner. East Carolina University

Nutrition and Sports Science

[P10] Effect of Oxygenated Water on Heart Rate Responses During Submaximal Exercise. J.L. Atkin, A.W. Hamilton, C.S. Overstreet, D.E. Kremer. Lander University

[P11] Lactate Influx into Red Blood Cells of Trained and Untrained Greyhounds. R.K. Evans, J.J. Hamann, L.B. Gladden. Auburn University

[P12] Effect of Fasting and Carbohydrate Ingestion on Fat Utilization During Submaximal Exercise. L.A. Smith, T.L. Asti, G.E. Boyd, D.E. Kremer. Lander University

Energy Balance & Weight Control

[P7] BMI and Energy Expenditures Trends Between Mothers and Daughters. T.J. Masias, J.D. Branch. Old Dominion University

[P8] Effect of Accelerometer Position on Estimated Energy Expenditure. C. McMahon. University of Tennessee,

[P9] Effects of Intense Swim Training on Plasma Leptin Concentration in Male and Female Athletes. R.C. Noland, J.T. Baker, S.R. Boudreau, C.J. Tanner, M.R. McCammon, R.C. Hickner, J.A. Houmard. East Carolina University

7:30 - 9:00 **BUSINESS MEETING AND KEYNOTE ADDRESS**
(Hampton 4-5)
Presiding: Dianne Ward, University of North Carolina
Introduction of Speaker: Larry Durstine, University of South Carolina

"Exercise Comes of Age: Mainstreaming the Exercise Prescription for the Older Adult"
Maria Fiatarone Singh, MD
Tufts University

9:00 - 11:00 **SEACSM SOCIAL**
(Hampton 1-3)

FRIDAY, FEBRUARY 5

8:00 AM - 6:00 PM REGISTRATION
(3rd Floor)

8:00 AM - 6:00 PM EXHIBITS
(Marriott 4)

7:00 AM - 6:00 PM SPEAKER READY ROOM
(Madison)

7:45 - 9:00 AM **POSTER PRESENTATIONS**
(Marriott 4) Authors Present from 8:00 - 9:00 AM
Chair: Tim Masias, Old Dominion University

Fitness

[P19] A Comparison of One Repetition Maximums on Seated Leg Press and Seated Leg Extension in College Women. M.H. Bean, M.A. Hart. Mississippi University for Women

[P20] Comparisons of Metabolic and Subjective Response of Three Modalities in College-Age Subjects. A. Crommett, L. Kravitz, J. Wongsathikun, T. Kemerly. University of Mississippi

[P21] Scaling of Maximal Power in Boys and Men 8 to 22 Years of Age. J.C. Martin , W.W. Spirduso. University of South Carolina and University of Texas, Austin

[P22] Relationship of Plasma Leptin with Cardiovascular Fitness. G.D. Miller, R. Frost, J. Olive. Wake Forest University

[P23] Effectiveness of a 20-m Shuttle Run Test as a Predictor of Maximal Oxygen Uptake in Adults. I.H. Muir, J.F. Smith. University of Alabama

[P24] Do Children Rate Perceived Exertion Differently During Game Playing as Compared to Machine Exercise? S.G. Owens, M. Litaker, M. Harber, M. Ferguson, B. Gutin. Medical College of Georgia

[P25] Effect of Static Stretching and PNF in the Posterior Pelvic Tilt Position on Hamstring Flexibility. J. Swain, S. Guyer, M. Skelton. Stetson University

Cardiovascular, Environmental and Occupational Physiology

[P13] Effects of Repeated Bouts of Downhill Running on Blood Lactate Response and O_2 Cost of Running. P.L. Byrd, P.M. Mehta, R.C. Hickner. East Carolina University

[P14] The Effects of Environmental Tobacco Smoke and Physical Activity Status on Fibrinogen Levels in Healthy Adults. D.P. Crowe, B.L. Marks, R.G. McMurray, M. Sweeney. University of North Carolina, Chapel Hill

[P15] Heart Rate and RPE During Indoor Rock Climbing. J. Phillips, W.K. Guion. Georgia Southern University

[P16] Oxygen Uptake and RPE During Treadmill and Stairstep Exercises at a Given Percent of Heart Rate Reserve. T.A. Cates, E. Genelus, J.A. Kelly, J. Plant, T.N. Richardson, R. Seepersad, C.M. Mier. Barry University

[P17] Cross Validation of Three Non-Exercise VO_{2max} Prediction Equations in Healthy Young Men. J.L.P. Roy, M.T. Richardson, J.F. Smith, R.T. Lomax. Judson College and University of Alabama

[P18] Changes in Muscle Use, Oxygen Uptake, and RPE During Constant-Load Cycling. M.J. Saunders, E.M. Evans, S.A. Arngrimsson, J.D. Allison, K.J. Cureton, University of Georgia

7:45 - 9:00 **SYMPOSIA**

[S2] The Cytokine Theory of Overtraining: A Proposed Hypothesis.
Lucille Lakier-Smith, Ph.D., Appalachian State University
Chair: Dixie Thompson, University of Tennessee
(Hampton 2)

[S3] Winning Non-Competitive Research Grants.
Phillip A. Bishop, University of Alabama
Chair: Linda Chitwood, University of Mississippi
(Hampton 1)

7:45 - 9:00 **TUTORIALS**

[T4] Thin Thighs or Thin Wallet? The Facts About Aminophylline-Based Thigh Reducing Creams. Bonita L. Marks, Ph.D., University of North Carolina, Chapel Hill
Chair: Michelle Skelton , Stetson University
(Hampton 3)

[T5] A Scientific Approach to Alternative (Unconventional) Medicine. Amanda Timberlake, Life University
Chair: Carolynn Berry, Winston-Salem State University
(Hampton 6)

8:00 - 9:00 **FREE COMMUNICATIONS**

Sports Nutrition
Chair: Andy Doyle, Georgia State University
(Marriott 1-2)

(8:00-8:15) [O14] The Effects of Creatine Loading on Repeated Upper and Lower Body Wingate Performance. M. Green, J.R. McLester Jr., J.F. Smith, E.R. Mansfield. University of Alabama

(8:15-8:30) [O15] Relationship Between Creatine Supplementation History and Markers of Clinical Status in College Football Players. R.B. Kreider, C. Rasmussen, J. Ransom, C. Melton, J. Hunt, A.L. Almada, R. Tutko, P. Milnor, III. University of Memphis

(8:30-8:45) [O16] Creatine Monohydrate and Cycle Ergometry: Effects on Body Mass and Power Output. P. McDonough, K.D. Biggerstaff, S.N. Cheuvront, S.E. Bearden, J. Bergen, R.J. Moffatt. Florida State University

Connective Tissue, Endocrinology, Immunology
Chair: Robert McMurray, University of North Carolina
(Marriott 5-6)

(8:00-8:15) [018] Immune Function in Female Elite Rowers and Nonathletes. J.M.E. Hjertman, D.C. Nieman, S.L. Nehlsen-Cannarella, O.R. Fagoaga, D.A. Henson, M. Shannon, Marc R. Bolton, M.D. Austin, B.K. Schilling. Appalachian State University

(8:15-8:30) [019] Changes in Blood Leptin Levels After a Bout of Eccentric Exercise? E. Hogen, J. Mercer, C. Rananto, K. Person, D. Henson, R. Johnson, L. Smith. Appalachian State University

(8:30-8:45) [020] Immune Response to Rowing in Elite Female Rowers. D.C. Nieman, S.L. Nehlsen-Cannarella, O.R. Fagoaga, D.A. Henson, M. Shannon, M.D. Austin, M.R. Bolton, J.M.E. Hjertman, B.K. Schilling. Appalachian State University

9:15 - 10:15 **ACSM PRESIDENTIAL ADDRESS**

"Resistance and Upper Body Training in Cardiac Rehabilitation"
Barry Franklin, Ph.D., William Beaumont Hospital
Chair: Walter Thompson, Georgia State University
(Hampton 4-5)

10:30 -12:00 **FREE COMMUNICATIONS**

Body Composition
Chair: Mindy Millard-Stafford, Georgia Institute of Technology
(Marriott 1-2)

(10:30-10:45) [021] Day-to-Day Reliability of Spine, Hip, and Whole Body Dexa Scans in College Men and Women. A.L. Almada, R.B. Kreider, J. Ransom, C. Rasmussen, R. Tutko, P. Milnor, III. University of Memphis

(10:45-11:00) [022] Changes in Aerobic Capacity, Body Composition, Physical Activity, and Leptin Consequent to Aerobic Training in Obese Children. M.T. Mahar, K.A. Mullery, M.R. McCammon, A.S. Curtis, R.P. Rawl. East Carolina University

(11:00-11:15) [023] Comparison of Body Composition and Nutrition Patterns Between Adolescents in Public and Private High Schools. S.N. Pearman, III, W.G. Thatcher, R.F Valois, J. W. Drane. Furman University and University of South Carolina

(11:15-11:30) [024] The Effects of a Six-Month Dry Land Resistance Training Program on the Bone Mineral Density of Competitive Adolescent Female Swimmers. T.L. Robinson, J.W. Barber, R.L. Glazner. University of South Alabama

(11:30-11:45) [O25] Resting Energy Expenditure and Fat Oxidation After One 40-Min and Two 20-Min Aerobic Exercise Bouts. C.L. Sipe, G.A. Gaesser. University of Virginia

Chronic Disease/Disability/Injuries
Chair: Mike Turner, University of North Carolina-Charlotte
(Marriott 5-6)

(10:30-10:45) [O26] Prospective Study of Knee Injuries in High School Female Athletes. W.R. Barfield, J.R. DeMarco, K.D. Merrill. College of Charleston, Medical University of South Carolina

(10:45-11:00) [O27] Autonomic Control Is Not Different in Healthy Young African-Americans. C.L. Fulton, K. DeBate, B.L. Marks, J.T. Lightfoot. University of North Carolina, Charlotte, University of North Carolina, Chapel Hill

(11:00-11:15) [O28] Clotting Activity Changes After Exercise in Males. S.S. Hegde, A.H. Goldfarb. University of North Carolina, Greensboro

(11:15-11:30) [O30] Effect of Seven Days of Endurance Training on Insulin Action in Middle-Aged Men. C.J. Tanner, M.R. Moreland, J.P. Baker, P.M. Mehta, J.A. Houmard. East Carolina University

Biomechanics
Chair: Tony Marsh, Wake Forest University
(Hampton 8)

(10:30-10:45) [O31] Altered Gait Kinetics in Obesity. K. Gummow, P. DeVita, A. Hyatt, M. Spencer, D. Tunnel, T. Hortobágyi. East Carolina University

(10:45-11:00) [O32] Biomechanical Analysis of the Squat and Deadlift: Comparison of Segmental Lengths Between Competitive Weight Groups. M. Hales, B. Johnson, L. Tis, E. Higbie. Georgia State University

(11:00-11:15) [O33] Kinematic Comparison of the Tennis Service of 1996 Atlanta Olympic Competitors by Service Type and Gender. R. Imamura, V. Ramsey, V. Wang, J. Johnson, B. Johnson. Georgia State University

(11:15-11:30) [O34] The Impact of Biofeedback Device on Controlling Forward Trunk Flexion During Lifting Task: Implications for Low Back Injury Prevention . J. Johnson, B. Johnson, S. Porter, L. Horvath, G. Moore. Georgia State University

(11:30-11:45) [O35] A Biomechanical Case Study of Pre-and Post-Operative Knee Replacement Gait Characteristics. V. Ramsey, B. Johnson. Georgia State University

10:45 - 12:00 **TUTORIALS**

[T6] Anatomic and Physiological Considerations in Prescribing Exercise for Spinal Cord Injured Adults. David R. Gater Jr., M.D., Ph.D., University of Kentucky, Lexington
Chair: Mitch Collins, Kennesaw State University
(Hampton 2)

[T7] The Meaning of VO_{2max} and Its Relationship to Endurance Performance. David R. Bassett Jr. Ph.D., Edward T. Howley, Ph.D., University of Tennessee, Knoxville
Chair: Art Weltman, University of Virginia
(Hampton 3)

[T8] The Exercise-Health Connection. David C. Nieman Ph.D., Appalachian State University
Chair: William Herbert, Virginia Tech
(Hampton 1)

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

1:00 - 1:55 **HENRY J. MONTOYE SCHOLAR LECTURE**
"Rehabilitation of Older Adults with Osteoarthritis: The Contributions of Exercise Science"
Steve Messier, Ph.D., Wake Forest University
Chair: Scott Powers, University of Florida
(Hampton 4-5)

2:00 - 3:15 **SYMPOSIA**

[S5] To Supplement or Not? Ethical and Legal Considerations of Nutritional Supplementation in Sport. Richard Kreider, Ph.D., FACSM, University of Memphis
Chair: Robert Moffatt, Florida State University
(Hampton 1)

[S6] Credentials for Exercise Professionals: ACSM Certifications and the Clinical Exercise Physiology Registry. William Herbert, Ph.D., FACSM, Virginia Tech University, Walt Thompson, Ph.D., FACSM, Georgia State University
Chair: Ed Howley, University of Tennessee
(Hampton 8)

2:00 - 4:00 **FREE COMMUNICATIONS**

Skeletal Muscle : **(Marriott 5-6)**
Chair: Alan Goldfarb, University of North Carolina, Greensboro

(2:00-2:15) [O44] The Effect of Voluntary Fatigue on the Involuntary Muscle Activity of Selected Arm Muscles. S.E. Berk, S.J. Kinzey, L. Kravitz, J.L. Cole. University of Mississippi

(2:15-2:30) [O45] Exercise Increases Capillarity, but Not bFGF Content in Occluded Muscle. M.R. Deschenes, R.W. Ogilvie. College of William and Mary

(2:30-2:45) [O46] Effects of Cryotherapy on Ground Reaction Forces and Muscle Activity During a Functional Movement. K.G. Gallen, S.J. Kinzey, J.B. Moore, M.L. Cordova, S.P. Brown, J.L. Cole. University of Mississippi, Indiana State University

(2:45-3:00) [O47] Delayed Onset Muscle Soreness is Associated with Impaired Maximal Muscle Tension, but Not Electrical Activation. D.A. Judelson, R.E. Brewer, R.W. McCoy, M.R. Deschenes. College of William and Mary

(3:00-3:15) [O48] Monitoring the Effects of Vasoactive Compounds on Skeletal Muscle Nutritive Flow Using Microdialysis. T.R. Koves, R.C. Hickner. East Carolina University

(3:15-3:30) [O49] The Effects of Glycolytic Metabolites on Sacroplasmic Reticulum Ca^{2+} Handling. E.E. Spangenburg, C.W. Ward, H. Metz, R. Nelson, J.H. Williams. Virginia Polytechnic Institute and State University

Exercise Evaluation
Chair: Steve Dodd, University of Florida
(Marriott 1-2)

(2:00-2:15) [O36] Changes in Vagal Modulation of the Heart and Central Hemodynamics During Neck Flexion. M. Lee, M. Frisard, A. Gray, H. Kluess, K. Russo, M. Welsch, R. Wood. Louisiana State University

(2:15-2:30) [O37] Association Between Changes in Mean Arterial Pressure and Heart Rate Variability During Upright Tilt. R. Prisby, H. Kluess, M. Lee, M. Frisard, A. Gray, K. Russo, R. Wood. Louisiana State University

(2:30-2:45) [O38] Validation of a Prediction Equation for Maximal Heart Rate of Deep Water Running. P. Reneau, J. Dierking. Tennessee Wesleyan College

(2:45-3:00) [O39] Investigation of a Practice Effect and Intertrial Consistency for the Wingate Anaerobic Test. P.D. Sells, J.P. Barfield, D.A. Rowe, K.S. Hannigan-Downs, C. Floyd. Middle Tennessee State University

(3:00-3:15) [O40] Predictive Ability of the YMCA Cadence Bench Press and the Self-Determined Bench Press Test. D.J. The, D.A. Rowe, T.L. Franchitto, M.J. Wilson, T. Harville. Middle Tennessee State University

(3:15-3:30) [O41] Effect of Carbohydrate Energy Substrate and Hormonal Regulation on Ratings of Perceived Exertion During Prolonged Running and Cycling. A.C. Utter, J. Kang, D.C. Nieman, F. Williams, R.J. Robertson, D.A. Henson, J.M. Davis, D.E. Butterworth. Appalachian State University

(3:30-3:45) [O42] Testing an Urban Legend - Does Ankle Circumference Predict Jump Height? G. Waggener, W. Barfield, E. Sessoms. College of Charleston

(3:45-4:00) [O43] Relationship Between Blood Lipids and Brachial Artery Flow-Mediated Dilation in Normocholesterolemics. M. Welsch, J.D. Allen, K. Landry, S.R. Smith, M. Lefevre. Louisiana State University

2:00 - 4:00 **POSTER PRESENTATIONS:**
Tim Masias, Old Dominion University
Authors Present from 3:00 - 4:00 PM
(Marriott 4)

Psychology, Psychiatry, Education

[P26] The Effects of Physical Activity on the Mood States of Hemodialysis Patients. M.A. Versprille, E.A. Dowling, C.W. Jackson. Old Dominion University

Competitive Athletes

[P27] The Effect of Aerodynamic Posture on Work of Breathing in Competitive Cyclists. S.C. Hilbert, J.A. O'Kroy, D. Torok, K. Campbell. Florida Atlantic University

Visit the **SEACSM Web site**:
www.fau.edu/divdept/exsci/seacsm/sehomepage.htm

2:00 - 4:00 **POSTER PRESENTATIONS:**
Tim Masias, Old Dominion University
Authors Present from 3:00 - 4:00 PM
(Marriott 4)

Disease/Therapy/Miscellaneous Clinical

[P6] Validation of Aerosport Kb1-C Portable Metabolic System. G.A. King, J.E. McLaughlin, E.T. Howley, D.R. Basset Jr., B.E. Ainsworth. University of Tennessee

[P28] Relationship Between Aerobic Capacity and Fasting Plasma Glucose as an Indicator of Type 2 Diabetes. J.T. Baker, M.T. Mahar, M.A. Brunson, J.A. Houmard, R.C. Hickner. East Carolina University

[P29] Progression of Multiple Sclerosis and Measures of Balance. D. Bao, R. Wood, L. Li. Louisiana State University

[P30] Effects of an External Nasal Dilator on the Work of Breathing During Exercise. T.R. James, J.A. O'Kroy, D. Torok, K. Campbell. Florida Atlantic University

[P31] Peak Metabolic Rate in Canine Gastrocnemius Muscle: Intact Arterial Vs. Contralateral Shunt Perfusion. K.M. Kelley, W.G. Aschenbach, J.J. Hamann, R.K. Evans, R.E. Patillo, L.B. Gladden. Auburn University

[P32] Medication Effectiveness in the Gait Mechanics of Parkinson's Disease Individuals. R.W. McCoy, C.C. Taylor, B.L. Dunn, M.Moran. College of William and Mary

[P33] Changes in Circulating Levels of Cell Adhesion Molecules (CAMs) in Response to One Bout of High Intensity Eccentric Exercise. C. Rananto, A. Anwar, R. Johnson, D. Holbert, L. Smith. Appalachian State University, Northeastern Illinois University, East Carolina University

[P34] Changes in Serum Interleukin-6 (IL-6) and Creatine Kinase (CK), in Response to Three Muscle Biopsies: A Preliminary Investigation. H. Stevens*, M. Smith*, K. Person, E. Hogan, D. Henson, J. Walberg Rankin*, L. Smith. *Virginia Tech and Appalachian State University

2:15 - 3:30 **TUTORIALS**

[T9] Neural Activation During Eccentric Contraction: A Strange World. Tibor Hortobágyi, Ph.D., East Carolina University
Chair: Greg Hand, University of South Carolina
(Hampton 3)

[T10] Exercise Science: Career Opportunities. Len Kravitz, Ph.D., University of Mississippi
Chair: Dianne Ward, University of North Carolina, Chapel Hill
(Hampton 6)

[T11] Academic Teaching - The Art, the Science (and Some of) the Tricks. Neal W. Pollack, Ph.D., Georgia Southern University
Chair: Danny Blessing, Auburn University
(Hampton 7)

3:45 - 4:45 **SEACSM BASIC SCIENCE LECTURE**
"Post Exercise Muscle Glycogen Synthesis: Role of GLUT4 Expression"
Speaker: John Ivy, Ph.D., University of Texas, Austin
Chair: Bruce Gladden, Auburn University
(Hampton 4-5)

5:00-6:00 CASE AND CLINICAL ABSTRACTS
Chair: George Wortley, Lynchburg Family Practice Residence
(Hampton 1)

[C1] Stress Fracture -Tibia - Football. Angus M. McBride, M.D., Medical University of South Carolina

[C2] Foot Pain - Running. Donald H. Sussman, Ph. D., Old Dominion University

5:00 - 6:00 **STUDENT SYMPOSIA** **(Hampton 4-5)**
Chair: Melicia Whitt, University of South Carolina

"Interviewing for That First Clinical Job and Getting It"
Barry Franklin, Ph.D., William Beaumont Hospital

"Health Management: Vast Challenges at the Work Site for the Multi-Skilled Exercise Professional"
Mark Landgreen, The Coca-Cola Company

6:00 - 7:15 **SEACSM STUDENT FAIR** **(Marriott 1-3)**

SATURDAY, FEBRUARY 6

6:30-7:30 AM **PAST PRESIDENT'S BREAKFAST (Hampton 3)**

7:45 - 9:00 **CLINICAL SYMPOSIUM**
[S7] Foot and Lower-Extremity Injuries: Utilization of In-Shoe Pressure and Force Measurements to Assess Treatment Interventions. Elizabeth J. Higbie, Ph.D., PT, ATC, Georgia State University
Chair: Jeff Chandler, Lexington Sports Medicine Center
(Hampton 8)

7:45 - 9:00 **TUTORIALS**

[T12] Preparing Undergraduate Students in Exercise Science for Future Career Endeavors. LaGary Carter, DA, Valdosta State University
Chair: Neal Pollock, Georgia Southern University
(Hampton 7)

[T13] A Tutorial Review of Isometric Exercise. Don Torok, Ph.D., Florida Atlantic University
Chair: Gordon Warren, Georgia State University
(Hampton 6)

7:45 - 9:00 **SYMPOSIA**
[S8] Student Biomechanics Symposium: Biomechanics and Exercise Associated with Aging, Illness, and Injury. Benjamin F. Johnson Ed.D., Georgia State University
Chair: Benjamin F. Johnson, Georgia State University
(Hampton 1)

[S9] The Ultra Endurance Athlete. George C. Wortley, M.D., Lynchburg Family Practice Residence, and David Horton, Ed.D., Liberty University
Chair: David Nieman, Appalachian State University
(Hampton 2)

9:15 - 10:15 **SPECIAL TOPICS LECTURE**
"Skeletal Muscle: Physiological and Biomechanical Adaptations to Microgravity"
Robert Fitts, Ph.D., Marquette University
Chair: Dave Bassett, University of Tennessee-Knoxville
(Hampton 4-5)

10:45 -12:00 **SYMPOSIA**

[S10] Explosive Exercise: Theoretical and Practical Aspects. Michael H. Stone, Ph.D., Appalachian State University.
Chair: Craig Broeder, East Tennessee State University
(Hampton 1)

[S4] Effects of Exercise on Elevated Blood Pressure, Diabetes, and Excess Body Fat in African Americans. L.J. Brandon Ph.D., FACSM, Georgia State University
Chair: Beverly Warren, Lander University
(Hampton 2)

10:45 -12:00 **TUTORIALS**

[T14] Eccentric Contraction-Induced Strength Loss: Contributing Factors and Their Relative Importance. Gordon L. Warren, Georgia State University
Chair: Kathy Campbell, Florida Atlantic University
(Hampton 7)

[T15] The Bibliographically Challenged Scientist's Guide to References and Citations: Automated Referencing and the Internet. Michael J. Berry, Ph.D., Wake Forest University
Chair: Tim Lightfoot, University of North Carolina-Charlotte
(Hampton 6)

10:45 -12:00 **STUDENT AWARD WINNERS-PRESENTATIONS**
Chair: Bob Moffatt, Florida State University
(Hampton 3)

(10:45-11:00) [O29]Third Place (Jennifer Hootman, University of South Carolina) Predictors of Lower Extremity Injury Among Recreationally Active Men and Women. J.M. Hootman, C.A. Macera, K. Jackson, B.A. Ainsworth, S.N. Blair. University of South Carolina

(11:00-11:15) [O6] Second Place (Jason Allen, Louisiana State University) Relationship Between Blood-Flow Velocity and Brachial Artery Flow-Mediated Dilation. J.D. Allen, M. Welsch, K. Landry, S.R. Smith, M. Lefevre. Louisiana State University

(11:15-11:30) [O17] First Place (Christopher Hewitt, University of South Carolina) Effects of Exercise on Corticotropin-Releasing Factor (CRF) in the Rat Brain. C.D. Hewitt, G. Kemeny, J. Buggy, D.A. Essig, J.M. Davis, G.A. Hand. University of South Carolina

12:00 - 2:00 **SEACSM LUNCHEON LECTURE**
"The Evolution of Sports Physiology"
David Costill, Ph.D., Indiana University
(Marriott 1-7)

2:30 **SEACSM BUSINESS MEETING**
Executive Committee
(Jefferson)

See You in Charlotte, NC 2000!

T1

THE SIGNIFICANCE OF EXERCISE THROUGH THE AGES: CHILDHOOD THROUGH SENESCENCE

R.G. McMurray & B.L. Marks, Dept. of Exercise & Sport Science, University of North Carolina, Chapel Hill, NC

Modern medicine and technology have increased the life span of humans. However in many cases the quality of life, or life satisfaction, has not kept pace with the quantity of life. Exercise has a key role in maintaining quality of life, contributing to the emotional, social, and physical well-being of the person. This presentation will focus on four issues that contribute to the decline in quality of life and how exercise can have a positive impact on these issues: 1) osteoporosis, 2) heart disease, 3)obesity, and 4) motor control and coordination. Bone mass accumulates up to about age 25-30. After age 45 there is a loss of bone mass that can reach critical limits resulting in fractures and immobility. Exercise early in life contributes to the development of bone mass. Exercise throughout the ages, particularly weight bearing, contributes to the maintenance of bone mass and slows the demineralization process. Exercise has a role in the prevention of atherosclerosis. Evidence suggests that aerobic exercise in childhood can reduce cholesterol levels, reduce blood pressure, improve insulin sensitivity and reduce weight gain; all of which contribute to the atherosclerotic process. The maintenance of exercise throughout the life span has a significant impact on these risk factors. A consistent exercise program will contribute to weight control, maintain lean body mass, and has the potential to reduce obesity. Even in obese individuals exercise can improve glucose tolerance, reduce cardiovascular disease, reduce symptoms of osteoarthritis. Finally, exercise in childhood improves motor control, coordination and strength. Maintenance of these capacities throughout the life span can impact an older individual by reducing the amount and severity of falls. Therefore, exercise throughout the life span improves the quality of life.

Target Audience: Those working in fitness and wellness industry, those working with children and aged, and undergraduate student of exercise and sport science.

T2

DEVELOPMENT OF A YOUTH SPORT TALENT IDENTIFICATION PROGRAM SPECIFIC TO THE U.S.A.

M.W. Craib. Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC 28608

The U.S. relies on random discovery of sport talent for success in international competition. Because of our large population this method appears to work fairly well. However, when the number of world class performances by U.S. citizens is normalized to population size and compared to those of other countries, our talent discovery "system" is clearly ineffective. For example, at the Atlanta Olympics, Australians won 5.5 medals to every single medal American's obtained relative to population size. This situation suggests that our youth are not identifying their athletic strengths and therefore are not receiving the guidance necessary to achieve their athletic potential. This circumstance can be altered by gaining voluntary participation of most U.S. youth in a battery of talent tests and then directing interested and "talented" children to able coaches. This tutorial will focus on the pros and cons of various talent identification methods and will propose a system applicable to U.S. needs and culture. The content will be relevant to those interested in helping youth discover and develop their athletic abilities.

T3

CONSIDERATIONS IN CALIBRATION AND VALIDATION OF PORTABLE METABOLIC UNITS

George A. King, The University of Tennessee, Knoxville

The purpose of this tutorial is to discuss the various factors to be considered in the validation of portable metabolic systems. The discussion will revolve around the procedures followed during the validation of two systems: the Aerosport KB1-C and the Cosmed K4b2. A tutorial outline follows:

A. George King: General introduction discussion validation procedures for metabolic systems.

B. George King: Calibration of Aerosport KB1-C

C. Jim Mc Laughlin: Calibration of the Cosmed K4b2

Items of discussion:
1. Douglas Bag as the Gold Standard
2. Range of oxygen uptakes over which instrument was calibrated
3. Procedures for simultaneous/ between-day measurement of gas exchange with portable unit and Douglas Bag
4. Results
5. Conclusions

D. Questions

The target audience includes faculty and students interested in portable metabolic systems for both laboratory and field studies. Our experience might be helpful to those considering similar validation studies or the purchase of similar types of equipment.

T4

THIN THIGHS OR A THIN WALLET? THE FACTS ABOUT AMINOPHYLLINE-BASED THIGH REDUCING CREAMS

Bonita L. Marks, Ph.D., FACSM

PURPOSE

Overall weight loss in a decreased percent body fat is not reflective of regional changes in body fat distribution. In comparison to the abdominal region, the femoral region has been shown to be less metabolically active, and hence more resistant to fat reduction. Additionally, women tend to have femoral fat patterning. Consequently, women have been targeted by the cosmetic industry with specialized creams purportedly formulated to dissolve thigh fat. Aminophylline, a common bronchorelaxant used in the treatment of asthma, has become a popular additive in many thigh reducing cream preparations. However, relatively little known about these cosmetic thigh reducing products. The purpose of the tutorial is to provide a theoretical basis for these creams as well as to discuss the safety and efficacy of the creams as demonstrated in scientific clinical trials.

CONTENT

A. Pharmacology, Mechanism, and Marketing: A review of how these creams might do what they claim to do- and how the cosmetic industry profits.
B. Blood Metabolism and Cardio-Pulmonary Dose-Response Effects
C. The BIG Question: Do theses creams REALLY "work"?

TARGET AUDIENCE

Any individual involved with, or interested in, body fat management issues.

T5

A SCIENTIFIC APPROACH TO ALTERNATIVE (UNCONVENTIONAL) MEDICINE

A. Timberlake. Dept of Academic Wellness, Life University, Marietta, GA 30060

The purpose of this tutorial is to expose participants to a review of the scientific evidence for and against unconventional (alternative) medicine. Alternative medicine, defined as what is not normally required in medical school curriculums, is used by approximately 1/3 of all Americans. Consequently, a basic understudying of the different alternative therapies will be useful to all those working in the health care field or in education. Included in this tutorial will be a review of Chinese medicine and Ayurveda and their claims to restore balance and harmony to an individual. Included in this will be a discussion of the current research involving acupuncture. The pros and cons of Naturopathic and Homeopathic medicine will be mentioned. Similarities and differences between chiropractic care and massage therapy will be discussed. A scientific overview of biofeedback, yoga, meditation and the mind body connection will be presented. Finally the rationale behind spiritual healing and therapeutic touch will be explored. When applicable, relevance to sport health science will be covered for all therapies.

T6

ANATOMIC AND PHYSIOLOGICAL CONSIDERATIONS IN PRESCRIBING EXERCISE FOR SPINAL CORD INJURED ADULTS

David R. Gater, Jr., MD, Ph.D., Department of Physical Medicine & Rehabilitation, University of Kentucky, Lexington, KY 40536-0284

Although exercise intervention would appear beneficial to individuals with Spinal Cord Injury (SCI), there are currently no absolute guidelines available for its prescription in this unique population. Few clinicians are comfortable in prescribing exercise for SCI individuals because parameters for mode, intensity, frequency, duration, and progression have not been clearly defined. Inappropriately prescribed exercise may yield minimal or no benefit, and may, in fact, be dangerous- much the same as pharmaceutical therapeutics. The purpose of the tutorial is to identify the unique features of spinal cord injury which may preclude the use of standard techniques for exercise prescription, review the state of the literature regarding exercise and tetraplegia, offer suggestions for exercise prescription based on that review, and explore areas for future investigation in this special population. Clinicians, physical therapist and exercise physiologists interested in prescribing exercise for the SCI individual will benefit from this presentation.

T7

THE MEANING OF VO_{2MAX} AND IT'S RELATIONSHIP TO ENDURANCE PERFORMANCE

David R. Bassett, Jr. and Edward T. Howley, University of Tennessee

The purpose of the tutorial is to summarize the factors related to maximal oxygen uptake (VO2max), and to demonstrate the dependence of running speed in endurance races on oxygen delivery. An outline follows:

Part 1: Summary of the factors related to the variation in VO_{2max} in the population:

- A. Oxygen delivery
  - 1. Cardiac output
    - a. Normal individuals
    - b. Patient groups
  - 2. O_2 content of arterial blood
    - a. Hemoglobin content
    - b. Arterial PO2
      - 1. Desaturation
- B. Peripheral factors
  - 1. Muscle mass
  - 2. Skeletal muscle characteristics: capillary density and oxidative enzymes
- C. Homeostasis relative to mean arterial blood pressure

Part 2: Running speed over distance is dependent on aerobic ATP generation

- A. Percent of energy from aerobic vs. anaerobic sources over distance
- B. Relationship of VO_{2MAX} to running speed
- C. Running economy and distance running performance
- D. Percent of VO_{2MAX} used in distance races
  - 1. Lactate threshold as estimate of % VO_{2MAX}
- E. Impact of dietary and environmental factors

This tutorial may be of interest to faculty and students

T8

THE EXERCISE-HEALTH CONNECTION

David C. Nieman

The purpose of this tutorial is to summarize current scientific understanding regarding the relationship between physical activity and health. The target audience includes all exercise scientists and graduate students who have an interest in this important area of exercise science. This lecture is based on information summarized in my book, *The Exercise-Health Connection* (Champaign, IL: Human Kinetics, 1998). For some areas of health and disease, a large amount of research data are available to say with surety that regular exercise is beneficial or protective. In other areas, much more research is needed before firm conclusions can be reached. In this lecture, the various health benefits will be presented, with a rating given on just how sure scientists are that exercise is related. The highest "surety ratings" support that regular physical activity improves health in the following ways: 1) Reduces the risk of dying prematurely; 2) Reduces the risk of dying from coronary heart disease; 3) Reduces the risk of developing type 2 diabetes; 4) Helps prevent and treat high blood pressure; 5) Reduces the risk of developing colon cancer; 6) Reduces feelings of depression and anxiety, while improving mood state and self-esteem; 7) Helps control body weight; 8) Helps build and maintain healthy bones and muscles and improve heart and lung fitness; 9) Improves the life quality of older adults, patients with disease, and people of all ages. As will be summarized in this tutorial, there is little or no physical activity research data support for the treatment or prevention of type 1 diabetes, arthritis, asthma, and most types of cancer. Regular exercise has also not been shown to slow the progression of HIV-infection to AIDS. When change in dietary habits and weight loss is controlled, physical exercise has not been consistently linked to a decrease in LDL-cholesterol. More research is needed to confirm whether or not physical activity can promote regression of atherosclerosis, prevent stroke or hormone-dependent cancers such as breast and prostate cancer, treat osteoporosis, prevent and treat low back pain, improve diet quality, enhance success in quitting cigarette smoking, improve immunity, and protect against the common cold.

T9

NEURAL ACTIVATION DURING ECCENTRIC CONTRACTION: A STRANGE WORLD

T. Hortobágyi. Department of Exercise & Sport Science, East Carolina University, Greenville, NC 27858

Human movement is the result of sequences of eccentric and concentric contractions. Studies conducted many decades ago using rudimentary electromyography suggested differences in neural activation of muscle under eccentric and concentric contractions. Most recent studies employing single motor unit analyses in a variety of human muscles seem to indicate that the nervous system uses different strategies to activate skeletal muscle during eccentric compared to concentric or isometric contractions. The purpose of the tutorial is to systematically and integratively examine the hypothesis that neural control of eccentric muscle contraction is unusual compared to other contractions modes. Evidence will be considered for maximal voluntary contractions, at the single motor unit level, and relative to acute and chronic exercise adaptations. Interactive discussion will be induced by discussing the implications for designing exercise training paradigms in young and elderly populations. The presentation will contain useful information for individuals in both applied and basic exercise science.

Supported by ECU's Faculty Senate's Research and Creative Activity Grants and NICHD-30422 grant (T.H.)

T10

EXERCISE SCIENCE: CAREER OPPORTUNITIES

L. Kravitz, Department of Exercise Science and Leisure Management, University of Mississippi, University, MS 38677

Exercise science is an expanding multidisciplinary field that encompasses human movement, exercise performance, health, sport sciences, corporate and community fitness, rehabilitation and wellness. The traditional educational delivery system has prepared graduates for careers in teaching and human movement programs. Opportunities now exist in a number of related disciplines for the exercise science professional. The purpose of this tutorial is to present the growing community of exercise science professionals with some of the emerging career paths. Content will identify new and developing career tracks in health and fitness, sports sciences, exercise rehabilitation, fitness management, computer technology, lifestyle and exercise consulting, therapeutic sciences and human factors. The recent national ambitions to involve the mass population in low-intensity participation programs is opening up several new initiatives for the exercise scientist to become involved in the design, delivery and management of this process. With a solid grounding in the principles of exercise science, there are a number of professional pathways to explore for exercise science professionals entering the career domain.

T11

ACADEMIC TEACHING-THE ART, THE SCIENCE, (AND SOME OF) THE TRICKS

Neal W. Pollock, Ph.D., Georgia Southern University

Graduate student funding is frequently made available through teaching assistantships. While this represents an invaluable opportunity, there is generally little time to ease into the role when the classes to be taught begin a few days after the start of the graduate program. In addition to the abbreviated preparation time, the selection of teaching assignments may not always be chosen for the strengths of the student teacher. When these factors are added to the typical lack of previous teaching experience, they can make the first semester a long one. The purpose of this tutorial is to share techniques that can help in any teaching situation, to introduce the technology available to support teaching effectiveness. This tutorial will be appropriate for those new to teaching, those expecting to teach in the future, or those interested in sharing their experiences.

T12

PREPARING UNDERGRADUATE STUDENTS IN EXERCISE SCIENCE FOR FUTURE CAREER ENDEAVORS

Valdosta State University, Department of Health, Physical Education, and Athletics, Valdosta, GA

The purpose of this forum is to broaden student knowledge about curent trends in Exercise Science. The subject will focus on how students can better distinguish themselves form others in an increasingly competitive field. The audience will gain further insight into academic preparation, professional membership, certification, internship selection, "hands on" experience, and salary expectations. Students will gain an understanding of how to maximize the likelihood of obtaining future employment and/or furthering their education at the graduate level.

T13

A TUTORIAL REVIEW OF ISOMETRIC EXERCISE

D.J. Torok, Department of Health Sciences,
Florida Atlantic University, Davie, FL 33314

The purpose of this tutorial is to provide a historical examination of the nature and scope of isometric exercise. This review will highlight the similarities and differences in the responses elicited by this activity compared to other types of exercise. The review will then address the scope of responses associated with changes in the magnitude of the exercise intensity and the duration of the activity. Next the review will examine a variety of different settings where isometric exercise has been used and where the future may be leading. This tutorial should appeal to all individuals interested in the applications and responses associated with isometric exercise.

T14

ECCENTRIC CONTRACTION-INDUCED STRENGTH LOSS: CONTRIBUTING FACTORS AND THEIR RELATIVE IMPORTANCE

Gordon L. Warren

The strength loss resulting from performance of eccentric contractions is immediate and dramatic, with strength reductions of 50% or more immediately post-exercise not being uncommon. The time for strength recovery can take more than one month, well past the time required for resolution of soreness. The purpose of this tutorial is to provide the clinician, exercise physiologist, and athlete with an overview of the current state of knowledge of the factors that contribute to the eccentric contraction-induced strength loss. The factors responsible for the strength loss may be conceptualized as belonging to one of three categories, i.e., 1) damage to force-generating and/or -transmitting structures within the muscle, 2) failure to activate intact force-generating structures, and 3) frank loss of force-generating and/or transmitting structures. The three speakers in this tutorial will each discuss a category and describe the relative importance of those factors to the strength loss over the one month period following injury.

T15

THE BIBLIOGRAPHICALLY CHALLENGED SCIENTIST'S GUIDE TO REFERENCE AND CITATIONS: AUTOMATED REFERENCING AND THE INTERNET

Michael Berry

The purpose of this tutorial is to provide instructions on the use of software programs that eliminate the need to type citations and reference lists within grant proposals, manuscripts, papers and theses. The integration and use o the programs Reference manager, PubMed and Microsoft Word automates the creation and formatting of references and citations. Reference manager and Microsoft Word are commercially available programs that reside on one's personal computer. PubMed is a free search engine that can be used to search Medline, the National Library of Medicine database, and can be accessed using a commercially available network browser such as Netscape or Microsoft Internet Explorer. This tutorial will outline the use of these three programs. The sequence of steps outlined will take the audience through the steps of opening and accessing the programs, performing a Medline search and capturing and importing the findings of the search into a Reference Manager database. Instructions will be provided on composing a manuscript and creating automated citations and a references using the citation style of any of a hundred different journals. Once a document has been created, citation styles can be easily changed and references easily added.

S1

Title of Program: EXERCISE, RADICALS, AND HEALTH: ROLE OF RADICALS IN ATHEROSCLEROSIS, MUSCLE ATROPHY, AND MUSCLE FATIGUE

Name of Organizer: Scott K. Powers

EXERCISE, RADICALS, AND HEALTH: ROLE OF RADICALS IN ATHEROSCLEROSIS, MUSCLE ATROPHY, AND MUSCLE FATIGUE

Scott K. Powers, .Christiaan Leeuwenburgh, and Stephen Dodd.
Department of Exercise and Sport Sciences, Center for Exercise Science,
University of Florida, Gainesville, Florida 32611

Radicals are highly reactive molecules or fragments of molecules with an unpaired electron in their outer orbital. It is now clear that muscular exercise results in the production of radicals and other reactive oxygen species. Failure to remove radicals and other reactive oxygen species from cells can result in damage to cellular membranes, proteins, and DNA. Importantly, radical production has been linked to over 100 pathologies including major diseases such as heart disease and cancer. Further, recent evidence has linked radical production in skeletal muscles to disuse atrophy and contractile dysfunction. This symposium will provide an overview of recent experiments that examine the role of radicals in: 1) the development of atherosclerosis; 2) disuse atrophy of skeletal muscles; and 3) antioxidants and muscular performance. Potential mechanisms to explain the link between radicals and each of these issues will be discussed.

Target audience: Exercise physiologists, clinicians, graduate students

S2

CYTOKINE THEORY OF OVERTRAINING: A PROPOSED HYPOTHESIS

Lucille Lakier Smith. Department of Health Leisure and Exercise Science, Appalachian State University, Boone, NC 28608

Purpose: To present an hypothesis on the overtraining syndrome (OTS), that will attempt to explain, in part, certain signs and symptoms associated with OTS. The overall purpose of the presentation is to stimulate discussion on a novel perspective of mechanisms related to OTS. **Content:** It will be proposed that in certain instances, OTS, which occurs in response to excessive training, frequently associated with insufficient time for rest and recovery, may result in a sub-acute, overuse injury. This tissue injury may then activate a local inflammatory response, which may result in *de novo* synthesis of protein molecules, cytokines. These molecules are typically expressed locally in damaged tissue, in response to a variety of stimuli including injury and infection. It will be proposed that local production of cytokines will then "spill over" into the systemic circulation and that elevated systemic levels of certain cytokines may be central to aspects of the OTS, in the following manner: (A) Stimulate areas of the hypothalamus and hippocampus, resulting in the appearance of mood and behavioral changes, such as reduced appetite, weight loss, sleep disturbances, retarded motor behavior, and general apathy; (B) Alter concentrations of circulating levels of amino acids due, in part, to an increased uptake of amino acids by the liver, for synthesis of acute phase proteins. In addition, blood glutamine levels will decrease due to increased usage of glutamine by immune/inflammatory cells; (C) Alter immune function. All assertions will be based on research from the field of psycho-neuroimmunology, as well as from the area of injury/wound healing.
Target Audience: Graduate students and professionals in exercise science.

S3

WINNING NON-COMPETITIVE RESEARCH GRANTS

Phillip A. Bishop

The purpose of this symposium is to introduce the basics of writing non-competitive grant proposals. Competition for research grants money has never been tougher, but the benefits are great. It is extremely difficult for researchers to win competitive grants, but non-competitive grants offer much better possibilities, especially for new investigators. This symposium will introduce the rudiments of: establishing a line of research, identifying fundable research questions, seeing the process from the funding agency's perspective, preparing letter proposals, identifying potential funding agencies, writing full proposals, writing budgets, and sources for information. Strategies for maximizing success will be presented. Examples will be given of successful and unsuccessful proposals. Contrasts will be made between competitive and non-competitive grant proposals. Handouts will be provided. Questions will be encouraged throughout and the emphasis will be on the practical aspects. The symposium is aimed towards Doctoral students and junior faculty.

S4

EFFECTS OF EXERCISE ON ELEVATED BLOOD PRESSURE, DIABETES AND EXCESS BODY FAT IN AFRICAN AMERICANS

Vernon Bond[1], Sheila A. Ward[2] & L. Jerome Brandon[3], [1] Dept. of Kinesiology, Howard University, Washington, D.C., 20059; [2] Dept. of Health & Physical Education, Norfolk State University, Norfolk, VA, 23504; [3] Dept of Kinesiology & Health, Georgia State University, Atlanta, GA 30303.

The prevalence and severity of hypertension, diabetes and excess body fat are disproportionately high in African Americans (Surgeon General Report, 1996). While the cause of hypertension is not known, an exaggerated blood pressure response to conditions of stress has been shown to be a predictor and possible marker for the development of hypertension in normotensive individuals. This pressor hyper reactivity has been attributed to an elevated sympathetic neural activity (SNA) and regular aerobic exercise has been shown to decrease SNA. African Americans also suffer greatly form diabetes mellitus complications including disorders such as retinopathy, nephropathy, cardiovascular diseases and neuropathy. Exercise may offer protection against these diabetes mellitus disease processes. Finally, many African Americans are obese (especially females) and are prone to health complications because obesity is a co-morbidity to a number of diseases, include diabetes, cardiovascular disease and hypertension. Healthy lifestyle choices appears to positively impact hypertension, diabetes and obesity in African Americans. Therefore, the purpose of this presentation is to discuss research findings relative to the effects of exercise on high blood pressure, diabetes and excess body fat, and how the interactions among these three diseases are influenced by exercise in African Americans.

Audience - General

S5

TO SUPPLEMENT OR NOT? ETHICAL AND LEGAL CONSIDERATION OF NUTRITIONAL SUPPLEMENTATION IN SPORT

Richard B. Kreider, Ph.D., FACSM

Over the last several years, there has been significant amount of media attention regarding the safety and efficacy of various nutritional supplements that are popular among athletes (e.g., creatine, androstenedione, etc.). These concerns have caused organizations like the ACSM, AMA, and NSCA to publish opinion papers on the safety of nutritional supplementation as well as sport organizing bodies to consider whether some of these supplements should be banned for legal, safety, and/or ethical reasons. Additionally, a number of universities have announced discontinuation of providing various supplements to athletes citing legal liability concerns. The purpose of this symposia is to discuss some of the ethical and legal issues involved in nutritional supplementation in sport. This symposia will be moderated by Dr. Kreider and conducted by asking panel members to respond to a series of questions regarding the ethical and legal use of athletes taking nutritional supplements. This informative symposia should be of interest to anyone involved with training of athletes and/or nutrition research.

S6

CREDENTIALS FOR EXERCISE PROFESSIONALS: ACSM CERTIFICATIONS AND THE CLINICAL EXERCISE PHYSIOLOGY REGISTRY

William G. Herbert, Ph.D., FACSM

The Clinical Exercise Physiologist (CEP) works in the application of exercise and physical activity for those clinical and pathological situations where it has been shown to provide therapeutic or functional benefits. Patients for whom services are appropriate include, but not limited to hoses with cardiovascular, pulmonary, metabolic, immunologic, inflammatory, orthopedic, and neuromuscular diseases and conditions. This list is being further modified as indications and procedures of application are added, developed and matured. Furthermore, the CEP applies exercise principles to groups of geriatric, pediatric or obstetric populations, and to society as a whole in preventive activities. The CEP performs exercise evaluation, exercise prescription, exercise supervision, exercise education and exercise outcome evaluation. The practice of the CEP should be restricted to clients who are referred by and are under the continued care of a licensed physician. The purpose of this symposium will be to explore credentialing for the CEP and to develop a case for the registration of the CEP. This symposium will focus on the CEP's value to the public, the academic standards expected of the CEP, the clinical practice standards and experience necessary for the registry and the code of conduct (e.g., ethics) expected of the CEP. In addition, a case will be made answer questions relative to the differences between certification, registration, and licensure.

S7

FOOT AND LOWER-EXTREMITY INJURIES: UTILIZATION OF IN-SHOE PRESSURE AND FORCE MEASUREMENTS TO ASSESS TREATMENT INTERVENTIONS.

Elizabeth J. Higbie, Ph.D.

Foot and lower-extremity injuries are prevalent in an active society and are treated by a number of different practitioners. Force platforms are helpful in determining ground reaction forces that may be contributing to foot and lower-extremity injuries. However, the foot-shoe interface cannot be examined by force platforms. Determining plantar pressures and forces occurring at the foot inside the shoe may be helpful in assessing interventions designed to change this foot-shoe interaction (e.g., over-the-counter shoe insoles, custom-molded orthotics). The purpose of this symposium is to present current research regarding the use of an in-shoe pressure measurement system (EMED Pedar, Novel Electronics, Inc., St. Paul, MN) for determining plantar pressures and forces during walking, jogging and other activities of daily living with and without insole or orthotic intervention. The topics will include a brief overview of the theories of insole/orthotic use, different diagnoses and problems frequent requiring insole/orthotic use, information on the use and reliability of the Pedar system, and current findings on gender, racial and ethnic plantar pressure differences during ambulation. The expected audience would be physicians, podiatrists, physical therapists, athletic trainers, biomechanists and faculty and students in these areas.

S9

THE ULTRA ENDURANCE ATHLETE

David Horton, Ed.D., Sport Science Department, Liberty University, Lynchburg, VA 24501
George Wortley, M.D., Lynchburg Family Practice Residency, Lynchburg, VA

Purpose - This symposium will introduce the audience to training and medical issues affecting the ultra endurance athlete.

Content - Dr. Horton will discuss training methods, nutrition, psychological preparation and race strategies as they apply to ultra distance running. Dr. Wortley will discuss medical aspects of ultra endurance activity including electrolyte imbalance, heat illness and hydration. The challenge of providing medical coverage for multi-day events in remote locations will also be covered.

Target audience - Exercise physiologists, clinicians, and endurance athletes.

S10

EXPLOSIVE EXERCISE: THEORETICAL AND PRACTICAL ASPECTS

Michael H. Stone and Margaret E. Stone, Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC 28608

Explosive exercise can be defined as isometric or dynamic exercise with maximum rates of force development (RFD). Athletic performances (and daily activities) are dependent upon a variety of kinetic and kinematic factors. Beneficial alterations in theses factors can be only partially effected by typical heavy weight training. The use of explosive exercise, particularly dynamic explosive exercise, can alter a much wider range of force/power related variables. This presentation will discuss the efficacy of explosive exercise in beneficially altering these parameters. Discussion will include a description of various exercises, injury potential and safety issues, as well as appropriate programming of these exercises within the context of athletic training protocols.

The audience should include coaches, sports medicine personnel and sports scientists.

C1

STRESS FRACTURE - TIBIA - FOOTBALL

McBryde, A.M., M.D., FACS, Department of Orthopaedics
Medical University of South Carolina
Charleston, SC

HISTORY - A 17 year old high school football player presented with vague but significant pain at the mid tibia on the left aggravated by running and a slight move. There was minimal discomfort also on the left. Symptoms had begun during August early preseason practice with running. He was seen and examined on the field sidelines on an October Friday night by the trainers.

PHYSICAL EXAM - After the 3rd game of the season there was tenderness with a palpable soft tissue "bump". There was minimal tenderness on the right. The patient, his family and coaches were told that further running or practice was prohibited until x-rays were taken and definitive disposition made. X-rays were taken a day later showing a transverse luscent line at the left mid tibia anterior cortex. The coaches were again contacted and made sure no further repetitive stress occurred until allowed by the sports medicine team and orthopaedists. Unbeknownst to the coaches the player ran over the weekend with an acute injury the left tibia. Surgery was necessary. The tibia eventually united but with more time loss and morbidity than ideal. X-rays follow-up and generic discussion.

C2

FOOT PAIN — RUNNING

Sussman, D.H., PhD and Walker, M., PT, Old Dominion University
Norfolk, VA

HISTORY — 26 year old competitive marathon runner with a complaint of foot pain while running. The pain began as a result of the surgical removal of the distal phalanx of the left great toe. This occurred as a result of a complaint of an ingrown toenail 2 years previously while a member of the U.S. Navy. The ingrown toenail was not properly treated and 2 years later the phalanx was removed. The patient eventually returned to her running routine, but has been plagued by pain during running, but soon this pain permeated all forms of locomotion. Currently she cannot run for more than 15 minutes before the onset of pain, and therefore, does not run at all. There is no numbness in the foot or toe area; the surgical wounds appeared to have healed properly. The patient has seen several doctors; all of whom have said the pain will go away, but 2 years after surgery the pain is ever present.

PHYSICAL EXAM — An orthopedic evaluation of the lower extremity included a ROM screening for the ankle and first metatarsophalangeal joints of the right and left legs revealing normal ROM for both feet. A neurological evaluation was normal. The patient demonstrated some pain with moderate palpation under the head of metatarsal 1 and along the bases of metatarsals 2-5 on the left foot, and along the medial aspect of the left foot over the medial longitudinal arch. Biomechanical analysis using force plate and videography revealed no significant abnormalities in gait. The most clinically significant evaluation was revealed by the pressure plate analysis using the Pedobarograph Foot Pressure Plate. The right foot demonstrated a normal center of pressure profile, whereas the left foot demonstrated a significantly pathological center of pressure pattern. Normal center of pressure data shows great pressure on the big toe during tocoff, which was seen in the right foot, however the left foot demonstrated greatest pressure between metatarsals 2-5 during tocoff, thus "shielding" the injured left great toe completely.

P1

BODY COMPOSITION MEASUREMENT IN FEMALES WITH LEG-TO-LEG BIOELECTRICAL IMPEDANCE ANALYSIS COMPARED TO DEXA

M.A. Austin, S.B. Heymsfield, D.C. Nieman. Department of Health, Leisure, & Exercise Science, Appalachian State Univ., Boone, NC, 28608; Obesity Research Center, St. Luke's/Roosevelt Hospital, Columbia University, New York, NY 10025.

This study determined the validity of the leg-to-leg bioelectrical impedance analysis (BIA) system (Tanita Body Fat Analyzer, TBF 105, Tanita Corporation of America, Inc., Arlington Heights, IL) in estimating body composition in a heterogeneous group of females (N=255) [mean±SD, age, 42.9±15.6 yr (range, 18-88 yr); body mass, 74.8±16.7 kg (33.8-120.5 kg); height, 162±7 cm (144-179 cm); body mass index, 28.4±6.0 kg/m^2 (15.9-41.9 kg/m^2)]. Fat-free mass (FFM) and percent body fat (BF) were estimated using BIA and dual energy X-ray absorptiometry (DEXA) (Lunar DPX, Lunar Radiation Corp, Madison, WI). Prior to testing, subjects were required to adhere to standard BIA testing guidelines, and bioelectrical impedance was measured in subjects standing erect with bare feet on the analyzer's footpads, and wearing minimal clothing. FFM and BF from BIA were calculated using the prediction equation supplied by the manufacturer (which uses body mass, age, and an impedance index, height^2/impedance). A Bland-Altman plot of difference between FFM and BF measured by DEXA and BIA versus average FFM and BF by the two methods showed no significant systematic difference (mean difference, -1.2±3.0 kg, and 1.7±4.2%, respectively). FFM was estimated at 44.8±5.6 kg with DEXA, and 46.0±4.8 kg with BIA (r=0.84, P<0.001; SEE 3.0 kg). BF was estimated at 38.2±10.2% with DEXA, and 36.5±9.8% with BIA (r=0.91, P<0.001; SEE 4.2%). These data indicate that the leg-to-leg bioelectrical impedance system accurately assesses FFM and BF in females when compared to DEXA.

Supported by a grant from the Tanita Corporation of America, Inc.

P2

THE VALIDITY OF LEG-TO-LEG BIOELECTRICAL IMPEDANCE MEASUREMENT IN MALES

A.F. Cable, D.C. Nieman, M.A. Austin, E.C. Hogan, and A.C. Utter. Department of Health, Leisure, & Exercise Science, Appalachian State Univ., Boone, NC, 28608.

This study determined the validity of the leg-to-leg bioelectrical impedance analysis (BIA) system (Tanita Body Fat Analyzer, TBF 105, Tanita Corporation of America, Inc., Arlington Heights, IL) in estimating body composition in a heterogeneous group of males (N=192) [mean±SD, age, 39.0±16.8 yr (range, 18-74 yr); body mass, 81.9±14.3 kg (54.6-133.5 kg); height, 177±7 cm (156-193 cm); body mass index, 26.0±4.0 kg/m^2 (18.3-39.9 kg/m^2); percent body fat, 18.1±8.9% (1.3-39.0%]. Fat-free mass (FFM) was estimated using BIA and underwater weighing, with residual volume measured by the nitrogen washout technique using the Vmax 229-LV metabolic cart from the SensorMedics Corporation (Yorba Linda, CA). Prior to testing, subjects were required to adhere to standard BIA testing guidelines, and bioelectrical impedance was measured in subjects standing erect with bare feet on the analyzer's footpads, and wearing a swimsuit. FFM from BIA was calculated using the prediction equation supplied by the manufacturer (which uses weight, age, and an impedance index, height^2/impedance). A Bland-Altman plot of difference between FFM measured by underwater weighing and BIA versus average FFM by the two methods showed no systematic difference (mean difference, 0.07±3.5 kg). FFM was estimated at 66.3±8.6 kg with underwater weighing, and 66.2±7.7 kg with BIA (r=0.92, P<0.001; SEE 3.5 kg). These data indicate that the leg-to-leg bioelectrical impedance system accurately assesses FFM in a heterogenous group of males when compared to underwater weighing.

Supported by a grant from the Tanita Corporation of America, Inc.

P3

RELATIONSHIP BETWEEN PERCENT BODY FAT AND BODY MASS INDEX FOR MORBIDLY OBESE ADULTS

J. Goodman, *K. O'Brien and M. McCammon. Human Performance Laboratory and Biostatistics Department, East Carolina University, Greenville, NC 27858

There is a need to quantify body composition in the morbidly obese (BMI >40 $kg \cdot m^{-2}$) population. Unfortunately, methods for body composition assessment are not practical for this group of individuals due to their size. The purposes of this study were to determine if a relationship exists between hydrostatically determined percent fat and BMI ($kg \cdot m^{-2}$), and if BMI can be used as a method for predicting percent body fat in morbidly obese men and women. Subjects for the study were men (N=98) and women (N=357) that were undergoing elective gastric bypass surgery. Percent body fat was determined hydrostatically. Pearson product moment correlations between BMI and percent body fat (%BF) are listed below.

Group	BMI ±SD	%BF ±SD
Total (n=462)	51.9±10.0	50.9±5.7
Male (n=98)	53.0 ± 9.4	48.7 ± 6.8
Female (n=357)	51.6 ± 10.1	51.5 ± 5.2
Black (n=136)	54.8 ± 11.5	50.7 ± 5.4
White (n=308)	50.6 ± 9.0	51.1 ± 5.8
Black Female (n=117)	55.1 ± 11.9	51.1 ± 5.2
Black Male (n=19)	53.2 ± 8.6	48.0 ± 5.6
White Female (n=234)	50.0 ± 8.7	51.8 ± 5.1
White Male (n=74)	52.8 ± 9.7	48.9 ± 7.2

Although significant correlations were observed between BMI and percent body fat for all groups (P<0.05), BMI accounted for only 29% of the variance. Based on these data, BMI is not a sensitive indicator of percent body fat for morbidly obese men and women.

Supported by the North Carolina Institute of Nutrition

P4

LEFT VENTRICULAR GEOMETRY AND FUNCTION IN OBESE CHILDREN: EFFECTS OF PHYSICAL TRAINING AND DETRAINING

M.C. Humphries, B. Gutin, P. Barbeau, S. Vemulapalli, S. Owens. Georgia Prevention Institute, Medical College of Georgia, Augusta, GA, 30912

Previous studies have shown that high percent body fat (%fat) is associated with unfavorable left ventricular (LV) geometry and function. This study used physical training (PT) as a way to reduce body fatness to see if it also led to favorable changes in LV parameters. Obese children (n=78) ages 7-11 yr participated in 4-mo of PT and 4-mo of no PT; one group completed the PT during the first 4-mo period and the other group completed it during the second 4-mo period. The PT was offered for 40-min periods, 5 times/wk; the mean heart rate during PT was 157 bpm. No dietary intervention was involved. Left ventricular mass, left ventricular mass indexed to height to the 2.7 power, midwall fractional shortening, and relative wall thickness were measured at mo 0, 4, and 8 using M-mode echocardiography. To assess the effects of the PT and cessation of PT, we used mixed-model ANOVA, with subject as the random factor, and group and time as fixed factors. As hypothesized, %fat declined during 4-mo periods of PT compared to 4-mo periods of no-PT ($p<.001$) for the group by time interaction. However, no significant group by time interactions were found for the LV parameters (all $p's>.05$). This suggests that 4-mo of PT, without dietary intervention, does not induce a magnitude of change in %fat sufficient to produce significant changes in LV parameters. Studies involving a longer PT period, or combinations of exercise and diet, are needed.

Supported by the NIH (HL 49549)

P5

RELATIONSHIP BETWEEN BODY COMPOSITION AND DECREMENTS IN QUADRICEPS STRENGTH FOLLOWING DOWNHILL RUNNING

P.M. Mehta, P.L. Byrd, P. DeVita, and R.C. Hickner. Human Performance Lab., Dept. of Exercise and Sports Science, East Carolina University, Greenville, NC 27858

The purpose of this study was to determine if the added mechanical load of bearing body fat would result in greater muscle damage and decrements in leg strength following downhill running. The relationship between percentage body fat and strength decline caused by a bout of downhill running was investigated in 26 male runners (23.4±0.7 yr). Quadriceps strength was measured isokinetically one hour before and 48 hours after 30 minutes of downhill running (-11% grade). Quadriceps strength was reduced 3.8±0.5% after downhill running. Body fat was 13.4±2.1%, and was negatively correlated with the change in strength due to downhill running ($r= -0.64$, $P<0.001$). There was no relationship between body mass and the decrement in strength following downhill running. These data indicate that an increased ratio of fat mass to muscle mass places an increased load on the muscle during downhill running, possibly resulting in increased muscle damage. The ratio of fat mass to muscle mass is therefore a determinant (accounting for nearly 40% for the reduction in strength) of losses in muscle strength following downhill running. It can be concluded that individuals with increased body fat mass relative to muscle mass are at greater risk of developing muscle weakness, and potential muscle injury, following eccentric weight-bearing activities.

Supported by a Grant from Experimental and Applied Sciences

P6

VALIDATION OF AEROSPORT KB1-C PORTABLE METABOLIC SYSTEM

George A. King, James E. McLaughlin, Edward T. Howley, David R. Bassett, Jr., and Barbara E. Ainsworth. Exercise Science Unit, The University of Tennessee, Knoxville, Knoxville, TN 37996-2700

The purpose of this study was to test the validity of the Aerosport KB1-C portable metabolic measurement system against the criterion Douglas bag method. During cycle ergometry, simultaneous measurements of minute ventilation ($\dot{V}_E$), oxygen consumption ($\dot{V}O_2$), and carbon dioxide production ($\dot{V}CO_2$) were made at rest and at work rates of 50, 100, 150, 200, and 250 W. No significant differences ($P>0.05$) were observed for $\dot{V}_E$, $\dot{V}O_2$, and $\dot{V}CO_2$ between the KB1-C and Douglas bag at 100, 150, and 250 W, while the KB1-C was significantly different ($P<0.05$) from Douglas bag values at rest, 50, and 200 W. R values were found to be significantly different ($P<0.05$) at 100, 150, and 200 W, while no significant differences were observed at rest, 50, and 250 W. The fractional concentrations of oxygen (F_EO_2) and carbon dioxide (F_ECO_2) were not significantly different at 50, 100, 200, and 250 W while values at rest and 150 W were significantly different ($P<0.05$). These findings show that the Aerosport KB1-C portable metabolic system is acceptable for measuring oxygen uptake in the range of 1.5 and 3.5 $L \cdot min^{-1}$, using the medium flow pneumotach setting. At lower intensities, the low-flow pneumotach setting provides acceptable results.

Supported by a Grant from ILSI

P7

BMI AND ENERGY EXPENDITURE TRENDS BETWEEN MOTHERS AND DAUGTHERS

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It is generally believed that risk of heart disease is correlated to increases of Body Mass Index (BMI Wt kg/Ht m^2) and decreased physical activity. Besides various extrinsic factors, BMI is influenced by genetic predispostions and total energy expenditure (TEE). The purpose of this study was to explore BMI and TEE trends between mothers and daughters. Twenty-eight female athletes (mean age 15.4 +/- 3.29) and twenty-eight mothers (mean age 43.2 +/- 5.77) provided self-reported data utilizing modified questionnaires. Although there was a significant difference between mother's current (24.8 +/- 3.47) and daughter's (21.4 +/- 2.67) BMI ($p<0.0001$), the association between these variables was significant ($r=0.47$, $p=0.016$). Significant ($p<0.0001$) differences and trends toward significant associations ($p=0.10$) were observed between daughter's current TEE (1687.9 +/- 232.44) and, respectively, mother's past TEE (2175.6 +/- 321.7, $r=0.33$) and mother's current TEE (1974.7 +/- 316.1, $r=0.34$). This project concludes with findings that indicate a trend toward significant association between mothers and daughters BMI and TEE. However, the isolation of any genetic predisposition was not possible due to project scope and various multifactorial influences. Extraneous uncontrolled factors included survey validity and reliability, self-reported data collection, and long term recall bias.

P8

EFFECT OF ACCELEROMETER POSITION ON ESTIMATED ENERGY EXPENDITURE

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The purpose of this study was to evaluate the validity of the Kenz Calorie Counter Select 2 accelerometer for estimating energy expenditure when worn at five different positions along the waist (right and left hip; right and left midline of thigh; and umbilicus). Nine men and women (mean age and body mass 23.3 yr, 77.5 kg) wore the accelerometer while walking on a motorized treadmill (80 meters/min) for ten minutes each trial; the position order was randomly assigned. Oxygen uptake was measured via indirect calorimetry as a criterion measure. The estimated gross and net energy expenditure was statistically higher than the measured value (5.94 vs. 4.59 kcal/min for gross; and 4.64 vs. 3.28 kcal/min for net); however the values for each position were not statistically different form each other. The number of steps calculated by the Kenz accelerometer was virtually identical across positions ($P=.98$). In conclusion, the Kenz accelerometer can be worn at any of the five positions without a statistical difference in estimated energy expenditure, however, in each case the estimate was consistently higher than the measured energy expenditure.

P9

EFFECTS OF INTENSE SWIM TRAINING ON PLASMA LEPTIN CONCENTRATION IN MALE AND FEMALE ATHLETES. RC Noland, JT Baker, SR Boudreau, CJ Tanner, MR McCammon, RC Hickner, JA Houmard.

Leptin is the protein product of the *ob* gene and is thought to regulate satiety and/or lipid metabolism. The factors that control leptin expression, however, are not well understood. The purpose of this study was to determine if intense physical training alters plasma leptin concentrations and the factors that may regulate leptin expression. Competitive intercollegiate male (N=12) and female (N=13) swimmers were studied pre-season and two times during intense training (> 8,000 m/day). Self-reported caloric expenditure (3-day questionnaire) of the female athletes increased ($P < 0.05$) from ~2,800 to 3,200 kcal/day. No change in self-reported caloric intake (~2,500 kcal/day) of the female athletes was noted (3-day dietary recall). Body fat (hydrostatic weighing) decreased from 23.0 $\pm$ 1.1 to 19.3 $\pm$ 1.4% with the increased training load ($P < 0.05$). Plasma leptin concentration was significantly ($P < 0.05$) related to fat mass, body fat percentage, and body mass index (BMI) in the women; plasma leptin concentration did not change (11.6 $\pm$ 1.4 ng/ml), however, with training despite loss of fat mass. No significant correlations between changes in body composition and changes in leptin were determined at any of the time points. In the men, neither body composition nor plasma leptin concentrations were altered during either phase of intense swim training. With an elevation in training volume the reported caloric intake of the males decreased (~4,500 to 3,000 kcal/day) with no change in reported caloric expenditure (~3,800 kcal/day). Plasma leptin was related to body composition in the men, however, no relationship was found between changes in body composition with changes in leptin levels. In conclusion, intense training appears to produce a decline in body fat for the women without corresponding changes in plasma leptin concentration. Thus, despite evidence for a caloric deficit in the women, intense training may alter the fat mass/leptin relationship.

Supported by a grant from the North Carolina Institute of Nutrition

P10

EFFECT OF OXYGENATED WATER ON HEART RATE RESPONSES DURING SUBMAXIMAL EXERCISE

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Oxygenated water has been marketed as a way to enhance performance by reducing submaximal exercising heart rates. The purpose of this investigation was to examine the effect of oxygenated water on heart rate response and perceived exertion during submaximal exercise. Six college-aged (X=20.7 $\pm$ 0.05 yrs) recreationally active females volunteered to participate in the study. On two separate occasions, subjects walked on a treadmill at 3.5 mph, 5% elevation for 15 minutes. Exercise bouts were followed by a three minute recovery walk at 3.0 mph, 3% elevation. Exercise trials were conducted in a randomized double blind fashion at the same approximate time of day for each trial and separated by 48 hours between trials. Fifteen minutes prior to each trial, subjects consumed either 20 oz. of oxygenated water (OW) (Life Energy, Body Systems Technology, Inc.) or 20 oz. of bottled water (BW) (Thunder MTN Spring Water, Thunder MTN, Inc.) in a 5 to 10 minute period of time. During exercise and recovery, heart rate (HR) was recorded every 30 seconds and perceived exertion (RPE: Borg 6-20 Scale) was recorded every 3 minutes. The data were analyzed using dependent t tests ($p<0.05$). Analysis of HR utilized steady state HR responses from minutes 5-15 of the exercise bout. Results indicated there were no significant differences in mean exercising HR (bpm) after ingesting OW compared to BW (OW: 132.2 $\pm$ 10.3; BW: 134.8 $\pm$ 15.6) or in mean recovery HR between the two trials (OW: 123.6 $\pm$ 11.5; BW: 126.9 $\pm$ 15.8). RPEs (Borg units) were also not significantly different between trials (OW: 11.3; BW: 11.4). Therefore, it was concluded that ingesting oxygenated water 15 minutes prior to exercise does not appear to have any effect on exercising or recovery heart rate responses to submaximal treadmill exercise.

P11

LACTATE INFLUX INTO RED BLOOD CELLS OF TRAINED AND UNTRAINED GREYHOUNDS.

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The monocarboxylate-specific carrier mechanism (MCT) has been shown to be the predominant pathway for the transport of lactate across canine erythrocyte membranes. This study examined the total lactate influx and the relative contribution of the MCT pathway in red blood cells (RBCs) obtained from trained and untrained greyhounds. Total lactate influx was determined by measuring L-[^{14}C]lactate influx into lactate-depleted RBCs at six different lactate concentrations ([La]s: 2, 5, 10, 15, 25, 40 mM). The relative contribution of the MCT pathway was determined by measuring L-[^{14}C]lactate into RBCs with the addition of a known MCT pathway blocker, p-chloromercuribenzenesulfonic acid (pCMBS, 1 mM), at four [La]s (5, 10, 25, 40 mM). There were no significant differences in total lactate influx or influx via the MCT pathway into RBCs at the different [La]s between the two groups. As an example, total lactate influx at a [La] of 25 mM was 6.4 ± 0.80 and 6.33 ± 0.21 $\mu mol \cdot ml^{-1} \cdot min^{-1}$ for the trained and untrained greyhound RBCs, respectively. At this same [La], influx via the MCT pathway ($\mu mol \cdot ml^{-1} \cdot min^{-1}$) was 4.46 ± 0.84 for trained greyhound RBCs and 4.79 ± 0.38 for RBCs of untrained greyhounds. The percentage of total lactate influx through the MCT pathway at this [La] of 25 mM was 69.3% and 75.8% for RBCs of trained and untrained greyhounds, respectively. In conclusion, there appear to be no differences in total lactate influx and lactate influx via the MCT pathway in RBCs of trained and untrained greyhounds.

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P12

EFFECT OF FASTING AND CARBOHYDRATE INGESTION ON FAT UTILIZATION DURING SUBMAXIMAL EXERCISE

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The purpose of this study was to assess the effects of fasting and carbohydrate ingestion on fat utilization during submaximal exercise. Four healthy, recreationally active college aged (X = 20.3 ± 1.03 yrs) females participated in two 20 minute submaximal exercise bouts conducted on two separate occasions at least 24 hours apart. Utilizing a double blind randomized design, subjects ingested either a high carbohydrate (CHO) beverage in the form of Gatorload (GL) or a caloric neutral placebo (PL) and one hour later exercised on a treadmill at a speed of 3.5 mph and an elevation of 5%. Total CHO consumption was 2 g/kg body weight. PL consumption was an equal volume of a flavored beverage sweetened with an artificial sweetener. During the exercise bouts, respiratory gases and heart rate were monitored continuously and were recorded every 30 seconds. The data were analyzed using dependent t tests. Results showed significant differences ($p < 0.05$) in the respiratory exchange ratio (R) between GL and PL (0.936 ± 0.027 and 0.896 ± 0.037, respectively). There were no significant differences in steady state VO2 (ml/kg.min) between the two exercise bouts (GL: 18.63 ± 3.06; PL: 20.04 ± 2.11). Based on steady state R values, the caloric cost of a 45 minute exercise bout was estimated. From these estimations, it was projected there would be no significant differences in total caloric expenditure between the two exercise bouts. However, there would be a significantly higher percentage of fat calories (kcals) expended after ingesting PL compared to GL (73.3 ± 11.4 and 38.6 ± 17.9, respectively). These results suggest that in college aged recreationally active females, fasting for 12 hours prior to exercise may result in a greater percentage of fat utilization for energy production as compared to exercise after ingesting CHO.

P13

EFFECTS OF REPEATED BOUTS OF DOWNHILL RUNNING ON BLOOD LACTATE RESPONSE AND O_2 COST OF RUNNING

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The purpose of this study was to investigate the effects of repeated bouts of downhill running on blood lactate response and the oxygen cost of running at a given submaximal speed. Blood lactate and the oxygen cost of running on a level treadmill were investigated immediately before and 48 hours after downhill (-11% grade) treadmill running on two separate occasions (separated by 5 weeks) in 26 male runners. The oxygen cost of running at a given speed and respiratory exchange ratio were not different before, as compared to 48 hours after, downhill running on either occasion. Muscle damage and soreness resulting from downhill running therefore did not influence submaximal oxygen consumption and fuel selection. However, blood lactate response during running at 60% VO_2max 48 hours following downhill running was attenuated following the second bout of downhill running. Blood lactate at 60% VO_2max was 2.75±0.24 mM and 2.46±0.17 mM 48 hours following the initial and second downhill run, respectively ($P<0.05$). These data indicate that a conditioning to downhill running takes place that reduces blood lactate response to submaximal running.

Supported by a Grant from Experimental and Applied Sciences

P14

THE EFFECTS OF ENVIRONMENTAL TOBACCO SMOKE AND PHYSICAL ACTIVITY STATUS ON FIBRINOGEN LEVELS IN HEALTHY ADULTS

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Smoking and high fibrinogen levels have both been associated with increased risk of heart disease and stroke. It is unclear how environmental tobacco smoke (ETS) exposure and physical activity status interact with fibrinogen level. The purpose of this study was to determine the influence of exposure to ETS, regular smoking (15-40 cigarettes/day) vs. non-smoking (0 cigarettes/day), and physical activity level on fibrinogen level in 60 healthy adults aged 21-45 years. A questionnaire was used to classify exposure status to ETS for the nonsmokers (exposed: >1hr/wk; non-exposed: <1 hr/wk). The Paffenbarger physical activity questionnaire was used to stratify subjects into "more active" (>2500 kcals/wk) or "less active" (<2000 kcals/wk) categories. This resulted in 6 groups (n=10/group).

FIBRINOGEN RESULTS (means ± SD; $mg \cdot dL^{-1}$)

	Smokers	Non-Smokers Exposed	Non-Smokers Non-Exposed
More Active	363 (± 72)	252 (± 48.5)	315 (± 137)
Less Active	389 (± 113.5)	281 (± 78)	295 (± 55.5)

* $p < 0.05$, 3 x 2 ANOVA with Tukey Post-Hoc test.

These results suggest that increased physical activity levels (>2500 kcal/wk) are associated with lower fibrinogen levels in smokers, however more research is needed to clarify the role of ETS exposure and physical activity status on fibrinogen levels in non-smokers.

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HEART RATE AND RPE DURING INDOOR ROCK CLIMBING

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P15

The potential of rock climbing as a beneficial training mode has yet to be clearly established. Therefore, the purposes of this study were to determine the effect of self-paced rock climbing on heart rate (HR) and ratings of perceived exertion (RPE) and to examine the relationship between HR and RPE. Subjects consisted of 20 volunteers (13 male, 7 female) ages 19-25 (21.2± 1.6) who ranked themselves as beginner (n=7), or intermediate/advanced (n= 13). Each subject performed 10 minutes of continuous climbing on a 23 foot UIAA approved wall. HR was monitored each minute using a Polar telemetric monitor. RPE was measured at the descent of each climb using the Borg 6-20 scale. Results indicated a ten minute mean HR of (169.1± 14.0 bpm) and RPE of (13.6 ±1.8). There was a significant increase in HR (24.1±15.8 bpm) $p<.00002$ and RPE (7.6±2.2) $p<.00001$ from the initial to the final descent. There were no significant differences in HR or RPE based on rank classification although the advanced climbers completed more climbs in the 10 minute period. The only significant gender difference was a higher initial RPE for females climbers $p<.02$. Pearson correlations indicated an insignificant relationship ($r=.24$) between mean HR and RPE. The results suggest that the intensity of self-paced climbing increased progressively, however, perceived intensity did not correspond closely to heart rate changes. In order to receive greater aerobic training benefits, either slower paced continuous or multiple interval climbing may be necessary.

OXYGEN UPTAKE AND RPE DURING TREADMILL AND STAIRSTEP EXERCISES AT A GIVEN PERCENT OF HEART RATE RESERVE

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P16

Exercise is often prescribed based on % of heart rate reserve (HRR), given that %HRR is directly related to $\%VO_2max$ and rating of perceived exertion (RPE). Although these relationships may hold for treadmill exercise, this may not be the case for other modes of exercise. The purpose of this study was to compare $\%VO_2max$ and RPE between stairstep ergometer (SS) and treadmill (TM) steady state exercise performed at a similar heart rate (HR). Sixteen healthy men and women (age: 22.9 ± 0.8 yr; body mass: 72.5 ± 2.9 kg, mean ± SE) performed TM and SS maximal and submaximal tests on separate days. Submaximal intensity was set at 65% of HRR based on resting HR (68 ± 5 $b \cdot min^{-1}$) and maximal HR determined during maximal TM. While maximal HR did not differ (197 ± 5 vs 200 ± 4 $b \cdot min^{-1}$) between SS and TM, VO_2max for SS was 12% lower than TM (40.7 ± 3.6 vs 46.2 ± 2.0 $ml \cdot kg^{-1} \cdot min^{-1}$, $p < 0.001$). During the submaximal tests, %HRR and HR did not differ between SS and TM (66.9 ± 3.5 vs 66.2 ± 3.3% and 161 ± 3 vs 160 ± 3 $b \cdot min^{-1}$, respectively). Despite the similar HR during submaximal exercise, VO_2 during SS was lower (28.7 ± 1.6 vs 31.2 ± 1.6 $ml \cdot kg^{-1} \cdot min^{-1}$, $p < 001$) and RPE was greater (12.6 ± 0.6 vs 10.9 ± 0.5, $p < 0.01$) than TM. During TM, %HRR did not differ from % TM VO_2max (66.2 ± 3.3 vs 67.7 ± 2.4%). During SS, %HRR was greater than % TM VO_2max (66.9 ± 3.5 vs 62.1 ± 2.4%, $p < 0.01$) but was similar to % SS VO_2max (67.1 ± 3.2%). These data indicate that when %HHR is prescribed for stairstep exercise, the lower VO_2 and higher RPE should be taken into account.

CROSS VALIDATION OF THREE NON-EXERCISE VO_{2max} PREDICTION EQUATIONS IN HEALTHY YOUNG MEN

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The laboratory test generally regarded as the best measure of cardiorespiratory endurance is the direct measurement of oxygen uptake during maximal treadmill exercise (VO_{2max}). An alternate method is to estimate VO_{2max} from models which require non exercise (N-Ex) predictor variables. This provides a practical way to predict aerobic fitness without requiring expensive equipment or exercise testing. However, the models need to be evaluated in a variety of samples, so the purpose of this study was to evaluate the validity of three N-Ex prediction models in 30 healthy young men aged 20 - 35 years. The 3 prediction equations were as follows: 1) VO_{2max} (ml/kg/min) = 43.513 + (6.564 x GENDER [M = 1, F = 0]) - (0.749 x BMI) + (0.724 x PFA) + (0.788 x PAR) (George et al., 1996); 2) VO_{2max} (ml/kg/min) = 65 + (1.8 x FREQ) - (10.0 x GENDER [M = 1, F = 0]) - (0.3 x AGE) - (0.6 x BMI) (Ainsworth et al., 1992); and 3) VO_{2max} (ml/kg/min) = 50.513 + (1.589 x PAR) - (0.289 x age) - (0.552 x % BF) + (5.863 x GENDER [M = 0, F = 1]) (slightly modified from Jackson et al., 1990). The predictor variables were as follows: BMI = body mass index (kg/m^2), PFA = perceived functional ability, PAR = physical activity rating, AGE = age (yrs), % BF = percent body fat determined from skinfolds, and FREQ = frequency of strenuous exercise during an average week. VO_{2max} was assessed using the Bruce treadmill protocol (mean ± SD, 49.10 ± 13.00 ml/kg/min). R^2 and SEE values were calculated using a SAS program to cross validate the 3 N-Ex models with Bruce VO_{2max} data. Results were as follows:

	VO_{2max} (ml/kg/min)) mean ± SD	R^2	SEE (ml/kg/min)
George	47.83 ± 7.48	0.52	9.10
Ainsworth	46.56 ± 4.62	0.51	9.25
Jackson	50.81 ± 6.71	0.43	10.00

In conclusion, although the N-Ex equations were developed in samples of men and women of varying ages all three provided a reasonable estimate of aerobic fitness levels in this sample of young men.

CHANGES IN MUSCLE USE, OXYGEN UPTAKE, AND RPE DURING CONSTANT-LOAD CYCLING

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P18

During heavy constant-load exercise, the slow-component rise in oxygen uptake (VO_2) produces a progressive increase in the metabolic cost of activity. This appears to be related to an increased muscle use that also occurs during such activity. The purpose of this study was to determine if increased ratings of perceived exertion (RPE) occur during constant-load exercise that are related to increases in oxygen uptake or muscle use. Oxygen uptake, muscle use (measured using contrast shifts in magnetic resonance images), and RPE were obtained in 16 subjects during two 15-minute bouts of cycling performed at ~80% and 40% of VO_{2max}, before and after 4-weeks of endurance training. Before training, cycling at 40% VO_{2max} produced no change in oxygen uptake or muscle use from 3-15 minutes. However, RPE rose significantly (8.4±1.3, 9.9±1.5; $p<.05$). During cycling at 80% VO_{2max}, oxygen uptake (2.2±0.6; 2.5±0.6L), muscle use (T_2 = 32.5±0.8; 33.3±1.2msec), and RPE (13.3±1.9; 16.4±2.7) all rose significantly from 3-15 minutes. Changes in oxygen uptake and muscle use were significantly related ($r=0.63$, $p<.05$). However, RPE changes were not related to either oxygen uptake or muscle use. Four weeks of endurance training significantly reduced RPE changes (3.1±0.9; 1.7±1.1) during cycling at 80% VO_{2max} but these changes were not related to any training-induced reductions in VO_2 or muscle use. This evidence suggests that the increased RPE observed during constant-load exercise is not caused by increases in oxygen uptake or muscle use. In addition, the attenuated RPE responses observed following training do not appear to be the result of reductions in oxygen uptake or muscle use.

A COMPARISON OF ONE REPETITION MAXIMUMS ON SEATED LEG PRESS AND SEATED LEG EXTENSION IN COLLEGE WOMEN

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The purpose of this study was to determine if a significant correlation exists between one repetition maximum (1RM) measurements on the Cybex VR2 Seated Leg Extension and the Cybex VR2 Seated Leg Press exercises. If so, a prediction equation could be developed to predict maximum strength during Leg Extension from a 1RM measurement on Leg Press. Eighteen college females ages 18 - 23 in a beginning weight training class were the subjects for this study. The subjects were screened for previous musculoskeletal injuries, particularly to the knee. Any subject with previous knee surgery or chronic knee pain did not participate in the study. Each subject performed 1RM measurements on both the Cybex VR2 Seated Leg Press (LP1RM) and Seated Leg Extension (LE1RM) machines using a standard protocol for 1RM measurements. The correlation between 1RM measurements on the two exercises using Pearson r was significant ($r = .85$, $P < 0.0001$) . The mean 1RM on Leg Press was 225 lbs. ± 40.15. The mean 1RM for Leg Extensions was 153.33 lbs. ± 31.30. Based on this correlation, the following prediction equation was developed:

$$LE1RM = .66 * LP1RM + 4.7 \text{ lbs.}$$

This equation was then used to evaluate the accuracy of the predicted LE1RM. The correlation coefficient between the predicted and actual LE1RM was .85 ($P < 0.0001$). The standard error of estimate was 16.6 lbs. These results indicate that 1RM measurements on the Cybex VR2 Leg Extension machine can be predicted from 1RM measurements on the Cybex VR2 Leg Press machine with relative accuracy.

COMPARISON OF METABOLIC AND SUBJECTIVE RESPONSE OF THREE MODALITIES IN COLLEGE-AGE SUBJECTS

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P20

The popularity of lower body elliptical (LBE) crosstrainers has generated the introduction of upper/lower body elliptical (U/LBE) machines by manufacturers. The purpose of this study was to compare the oxygen utilization (VO2), ventilation (VE), heart rate (HR), and ratings of perceived exertion (RPE) while exercising at a self-selected intensity on a LBE, U/LBE and treadmill (TM). Twenty healthy male and female subjects (age = 22.7±4.2 yrs, wt = 73.91±17.1 kg) were familiarized with the exercise devices and then completed six-minute randomized trials for each modality. VO2, VE, and HR were continuously monitored by open circuit spirometry and telemetry. RPE was recorded at the end of each trial. MANOVA with repeated measures revealed a significant ($p < 0.001$) within group effect for VE and HR. Post-hoc comparisons and Friedman test results for RPE are shown in the table below.

VARIABLES	LBE	U/LBE	TM
VO2 (ml/kg/min)	31.19±4.9	32.32±5.8	31.36±6.2
VE (l/min)	49.08±14.4	55.63±14.9*	47.63±13.6
HR (bpm)	172.5±12.1	176.8±12.4†	167.6±13.3
RPE (units)	13.3±1.4	14.6±1.4*	13.1±1.2

*p<0.05, U/LBE>LBE=TM; †p<0.05, U/LBE>LBE>TM

Results indicate no difference in VO2. However, U/LBE elicited a higher response in VE, HR and RPE, which may partially be explained by the addition of the arms while exercising. We conclude that all modalities similarly meet ACSM guidelines for developing and maintaining cardiorespiratory fitness.

SCALING OF MAXIMAL POWER IN BOYS AND MEN 8 TO 22 YEARS OF AGE

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The purpose of this study was to examine the relationships among maximum cycling power, body mass, and lean thigh volume in 51 boys and men 8 to 22 years of age, determine allometric scaling parameters for maximum power, and determine if allometrically scaled power was affected by age. All subjects performed maximum cycling power trials against an inertial load to determine maximum power. Anthropometrics were used to estimate each subject's lean thigh volume. Age was highly related to maximum power when it was expressed as absolute power ($R^2 = 0.83$), moderately related when power was ratio scaled to body mass ($R^2 = 0.66$) and significantly related when power was ratio scaled to lean thigh volume ($R^2 = 0.15$). Linear regression of the log transformed data revealed a strong allometric relationship between maximum power and body mass ($R^2 = 0.96$), and between maximum power and lean thigh volume ($R^2 = 0.94$). The exponent relating body mass to maximum power was 1.434, and the exponent relating maximum power to lean thigh volume was 1.07. Maximum power was independent of age when it was scaled allometrically to body mass or lean thigh volume. These findings suggest age-related differences in maximum power occur secondarily to differences in body and muscle size rather than to some intrinsic property of age.

RELATIONSHIP OF PLASMA LEPTIN WITH CARDIOVASCULAR FITNESS

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P22

The hormone leptin appears to regulate body composition through modulation of appetite and energy expenditure. Plasma leptin is highly correlated with body fat across a wide range of body types, with hyperleptinemia present in obese individuals. Cardiovascular fitness is also associated with body composition. However, a relationship between plasma leptin and cardiovascular fitness has not yet been established. Therefore, the purpose of this study was to examine the association of plasma leptin with body composition and cardiovascular fitness in healthy college-age females. Sixteen women (20-24 yrs) volunteered for the study. Plasma leptin was measured from a morning, 12 hour fasted blood sample using a radioimmunoassay kit (Linco Research, Inc). Body composition was assessed using hydrostatic weighing with measured residual lung volumes. A graded exercise treadmill test was performed to determine VO_2max. Means (± SEM) and Pearson product moment correlations between plasma leptin, body fat and VO_2max values, and between body fat and VO_2max were calculated. Plasma leptin concentration was 10.3 (± 1.5) ng/ml. Percent body fat and VO_2max were 22.3% (± 1.4) and 45.4 (± 1.5) ml O_2/kg body weight/min, respectively. A statistically significant correlation ($p < 0.05$) was found only between plasma leptin and % body fat ($r = 0.696$, $p = 0.003$). VO_2max did not show a statistically significant relationship with plasma leptin ($r = -0.333$ $p = 0.245$) or % body fat ($r = -0.475$, $p = 0.101$). In conclusion, we found that plasma leptin is highly correlated to body composition in young adult females. However, leptin was not related to VO_2max, nor was VO_2max related to body fat. The effect of an exercise training program on plasma leptin should be considered for future studies.

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EFFECTIVENESS OF A 20-m SHUTTLE RUN TEST AS A PREDICTOR OF MAXIMAL OXYGEN UPTAKE IN ADULTS.

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The validity of a 20 m shuttle run test as a predictor of maximal oxygen uptake (VO_2 max) was assessed using 9 male and 8 female adult subjects with varying athletic backgrounds and aerobic fitness levels. Within a 14-day period all subjects performed a multistage shuttle run test (progressive speed increase on level gradient) and a maximal treadmill test (progressive gradient increase at constant speed) in a randomized order. The VO_2 max values predicted by the shuttle run test were significantly lower than those obtained on the treadmill, for male, female, and all subjects pooled together ($p<0.01$). When data were divided into three groups by treadmill VO_2 max readings (40-50, 50-60, and 60 + $ml \cdot kg^{-1} \cdot min^{-1}$) the shuttle run test continued to significantly underpredict scores ($p<0.01$). The underprediction was of least significance in the group with treadmill VO_2 max levels from 40-50 $ml \cdot kg^{-1} \cdot min^{-1}$. Maximum heart rates recorded for treadmill testing were considerably higher than those for the shuttle run test ($p<0.001$). Correlations showed a stronger relationship between directly measured and predicted VO_2 max for female subjects ($r=0.90$) as compared to male subjects ($r=0.81$) and all subjects together ($r=0.86$). The shuttle run test remains an effective field test for the prediction of VO_2 max for larger groups, however, this research indicates that it tends to underpredict VO_2 max, and that this underprediction may be more extreme within certain fitness ranges.

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DO CHILDREN RATE PERCEIVED EXERTION DIFFERENTLY DURING GAME PLAYING AS COMPARED TO MACHINE EXERCISE?

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This study examined the relationship between ratings of perceived exertion (RPE) and heart rate (HR) during game playing and machine exercise in 20 obese, 8-11 y-old children. Children were participants in an after-school exercise program. During the RPE testing session, a child spent the first 10 min either walking on a treadmill or cycling on a stationary bike and then transferred to the other apparatus for another 10 min of exercise. The order of presentation of the two devices was randomized. Next, the child played 20 minutes of "aerobic kickball." Aerobic kickball is a modified version of traditional kickball and was designed to keep the children moving continuously. Children wore HR monitors throughout the 40 min testing session and provided RPE responses every 3 min using the Borg 6-20 scale. During both machine exercise and aerobic kickball children self-selected their exercise intensity, but, in keeping with the protocol of the larger exercise program, were encouraged to maintain HRs of 150 bpm or higher. A mixed-model ANOVA indicated the association between RPE and HR was not significantly different ($p = 0.4617$) between machine exercise and game playing. These data suggest that monitoring exercise intensity with RPE may be feasible with children even if game playing and machine exercise are inter-mixed in single training sessions.

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P25

EFFECT OF STATIC STRETCHING AND PNF IN THE POSTERIOR PELVIC TILT POSITION ON HAMSTRING FLEXIBILITY

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The purpose of this study was to examine the effects of a stretching program in the posterior pelvic tilt position (PPT) on hamstring flexibility using two techniques, static stretching (SS) and proprioceptive neuromuscular facilitation (PNF). Sixteen female, college-age (20.1 ± 0.7 years) subjects participated in a 6-week stretching program in which the right leg was stretched by PNF and the left leg was stretched by SS. The stretching program was administered by a trained technician; subjects maintained the PPT position for each stretching method. Hamstring flexibility measurements were made with subjects in a supine position at 90° ankle, hip and knee flexion. Using a goniometer, hamstring flexibility was determined as maximal terminal knee extension with measurements reported in degrees needed to achieve full extension; thus, the measurements are reported as negative degrees. There were no significant differences ($p \leq 0.5$) in pre-test measurements of hamstring flexibility between the right and left legs. Post-test measurements showed an increase in hamstring flexibility for both SS (Pre: -33.2 ± 11.8°; Post: -13.9 ± 8.1°) and PNF (Pre: -32.6 ± 9.2°; Post: -12.9 ± 3.8°). However, no significant differences were found in the degree of change in hamstring flexibility between the SS (19.4 ± 7.7°) and PNF (19.7 ± 7.3°). The results of this study indicate that significant improvements in hamstring flexibility can be achieved by implementation of a 6-week stretching program in the PPT position but the method of stretching (SS versus PNF) has little effect on improvements in hamstring flexibility.

P26

THE EFFECTS OF PHYSICAL ACTIVITY ON THE MOOD STATES OF HEMODIALYSIS PATIENTS

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Previous research has demonstrated a positive effect of exercise on mood states in sedentary individuals. The purpose of this study was to examine mood state disturbance in active and sedentary end-stage renal disease patients (ESRD) on hemodialysis. Physical activity levels of 14 ESRD patients were assessed using the Lifestyle Exercise Inventory. Eight patients (age: $\bar{x} \pm SD = 59 \pm 11$yrs) were active (ACTIVE) and six patients (41 ± 8yrs) were sedentary (CONTROL). The patients completed the 19-item Feelings Profile. Data were analyzed by an independent t-test ($p<0.05$). The results revealed (*$p<0.05$):

	ACTIVE	CONTROL
Tension	1.63 ± 1.60	2.33 ± 2.07
Depression	0.50 ± 0.53*	2.00 ± 2.28
Anger	1.13 ± 1.36*	3.17 ± 2.04
Fatigue	4.50 ± 2.73	5.33 ± 2.07
Confusion	0.63 ± 1.06*	2.17 ± 1.60
Vigor	8.25 ± 4.27	5.50 ± 2.43
TMDS	0.13 ± 9.25*	9.50 ± 9.48

These findings suggest that physically active ESRD patients on hemodialysis have significantly higher mood states compared to their sedentary counterparts.

P27

THE EFFECT OF AERODYNAMIC POSTURE ON WORK OF BREATHING IN COMPETITIVE CYCLISTS

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Aerodynamic cycling postures and the use of "aero"-style handlebars have become very popular among competitive cyclists. The purpose of this investigation was to determine if there were any negative effects of an aerodynamic racing posture on work of breathing (WOB) during cycling. Three moderately trained cyclists performed three incremental maximal exercise tests on a cycle ergometer using three different riding positions. Testing took place on three separate days in random order. The positions used were (V) vertical with back upright and perpendicular to the ground, (H) horizontal with back parallel to the ground and elbows on the aero-bars, and (45) with back at a 45-degree angle with the ground with hands on the drop handlebars. The ergometer handlebar assembly was modified with a set of cowhorn bars and Scott Time Trial "aero-bars". Measured variables included $\dot{V}O_2$, Vt, minute ventilation ($\dot{V}_E$), breathing frequency (f), and total work of breathing expressed in joules (J). An esophageal balloon was positioned in the lower third of the esophagus and was used to measure WOB of the respiratory system. Data were analyzed with a repeated measures ANOVA with an alpha level of 0.05. There were no differences in $\dot{V}O_2$, Vt, $\dot{V}_E$ or f at 70% of max or at maximal exercise. Also, there was no significant differences in WOB between any position at 70% or at maximal exercise (mean ± SD; @70%; V, 1.87 ± 0.4, J; 45, 2.2 ± 0.6, J; H, 2.4 ± 1.1, J; @max; V, 5.2 ± 1.9, J; 45, 6.1 ± 2.9, J; H, 6.9 ± 2.1, J; $p>0.05$). Therefore, an extreme aerodynamic racing posture is not associated with an increased work of breathing in cyclists.

P28

RELATIONSHIP BETWEEN AEROBIC CAPACITY AND FASTING PLASMA GLUCOSE AS AN INDICATOR OF TYPE 2 DIABETES

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In 1979, the National Diabetes Data Group (NDDG) published the classification system for diagnosis of Type 2 (non-insulin-dependent) diabetes mellitus. This classification consisted of two groups based on fasting plasma glucose: Normal plasma glucose (NPG) <115 mg/dl and Diabetic ≥140 mg/dl. In 1997, the American Diabetes Association (ADA) developed new categories for diabetes based on fasting plasma glucose, and stated that diabetes should be classified as a fasting plasma glucose ≥126 mg/dl. The purpose of this study was to determine the relationship between aerobic capacity and categorization of type 2 diabetes. We examined an existing database of approximately 4000 males (40.4±11.5 yr) and categorized these individuals into one of four categories: Normal (NFG) fasting plasma glucose <110 mg/dl, Impaired (IFG) 110-125 mg/dl, ADA Diabetic 126-139 mg/dl, and NDDG Diabetic ≥140 mg/dl. Fasting glucose was 93.5±8.4, 114.7±4.0, 131.6±3.4, and 200.9±51.9 mg/dl in NFG, IGT, ADA, and NDDG, respectively. VO_2max estimated from a maximal treadmill test was 41.4±8.1, 36.0±8.0, 31.9±7.7, and 31.0±7.4 $ml \cdot kg^{-1} \cdot min^{-1}$ in NFG, IFG, ADA, and NDDG, respectively. VO_2max in both NFG and IFG were higher ($P<0.05$) than VO_2max values attained by ADA and NDDG. There was no difference between ADA and NDDG VO_2max. These data demonstrate a significant relationship between aerobic capacity and categorization of diabetes based on fasting plasma glucose. Furthermore, these results support the cutoff of ≥126 mg/dl for the classification of diabetes.

P29

PROGRESSION OF MULTIPLE SCLEROSIS AND MEASURES OF BALANCE

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Patients with Multiple Sclerosis (MS) experience loss of balance, tremor, unstable walking, dizziness, clumsiness of a limb and lack of coordination due to myelin damages. The purpose of this study was to determine the relationship between static balance and the length of time that patients have been diagnosed with MS. Postural sway of 20 seconds of 25 MS patients was measured by AMTI force platform. Center of Pressure (COP) was calculated based on force platform measures. COP data were evaluated by using eigen-values of the co-variation of COP at the X and Y direction. Pearson interclass correlation was used to determine the strength of relationships between age, length of disease, and measures of static balance, alpha was set a-priori at $p<0.05$. The magnitudes of eigen-value vector 2 were found significantly correlated with patients' duration of the disease ($R=0.48$, $P=0.009$), which indicates the width of the COP dispersion is strongly correlated with the progression of MS. The results suggest the patterns of quiet standing balance are altered with the progression of disease. The criterion measures employed in the study may be used in clinical settings as one of the diagnosis and evaluation tools.

P30

EFFECTS OF AN EXTERNAL NASAL DILATOR ON THE WORK OF BREATHING DURING EXERCISE

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The effects of the Breathe Right® nasal dilator on the work of breathing was measured during exercise in 4 normal, untrained college students (age, 24 ± 3 yrs). The exercise consisted of two maximal, incremental cycle tests (once per visit) on a Medgraphics® Cardio-2 cycle ergometer until exhaustion. Each subject wore a placebo or an active nasal dilator strip (randomly selected, single blind) during each exercise test. An esophageal balloon was placed through the subject's mouth and rested in the lower third of the esophagus while connected to a pressure transducer during each test. Subjects breathed through a Hans-Rudolph® face mask that covered both the mouth and nose during both tests. Expired air and esophageal pressures were collected and analyzed (at 70% of $\dot{V}O_{2Max}$, and $\dot{V}O_{2Max}$). The measured variables included $\dot{V}O_2$, $\dot{V}_E$, Vt, frequency of breathing (f) and total work of breathing (WOB), calculated from esophageal pressures and ventilatory volumes and expressed in joules. An alpha level for significance was set at $p \leq 0.05$. There were no differences in $\dot{V}O_2$, $\dot{V}_E$, Vt or f between groups, either at 70% or maximal exercise ($p>0.05$). Results of this study show there was no significant difference in WOB between the active and the placebo nasal dilator test groups at 70% of $\dot{V}O_{2max}$ (1.703 ± 0.4, J, active; 1.91 ± 1.0, J, placebo; mean ± SD, $p>0.05$). Also, there was no difference in WOB at maximal exercise between groups (3.13 ± 0.58, J, active; 3.49 ± 0.95, J, placebo; $p>0.05$). Thus, it was concluded that wearing an external nasal dilator does not significantly reduce the WOB.

P31

PEAK METABOLIC RATE IN CANINE GASTROCNEMIUS MUSCLE: INTACT ARTERIAL vs. CONTRALATERAL SHUNT PERFUSION

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The canine gastrocnemius (GP) muscle is widely used as a model for the study of metabolism in skeletal muscle. There is disagreement with regard to the maximal metabolic range in this model (Cain. Med. Sci. Sports Exerc. 27:60-64, 1995). Our previous research (Kelley et al. Med. Sci. Sports Exerc. 28(5): S-367, 1996) concentrated on the effect of different stimulation patterns and passive muscle forces on peak oxygen uptake (VO_2peak) in this model; stimulating the muscle with tetanic trains (0.2 msec stimuli for 200 msec duration at 50 Hz, once per sec) and maintaining the muscle at its optimal length produced the highest VO_2peak values for the preparation. The present study examined the effect of two variations of muscle perfusion that have been employed by investigators. The first method leaves the arterial perfusion of the muscle intact (IT) (n=8), while the second method perfuses the muscle by way of a tubing shunt from the femoral artery of the contralateral limb (CL) (n=6). The VO_2peak for the IT preparation was significantly higher than the CL preparation (256.7 $\pm$ 16.2 vs. 158.3 $\pm$ 10.4 ml·min^{-1}·kg^{-1}) because of a significantly higher muscle blood flow in the IT preparation (1.83 $\pm$ 0.14 vs. 0.97 $\pm$ 0.08 L·min^{-1}·kg^{-1}). These results suggest that the shunt from the contralateral limb imposes some limitation to blood flow. Although the diameter of the tubing should not limit blood flow, and perfusion pressure at the entrance to the muscle was normal, it is possible that this shunt adversely affects autoregulation of blood flow in the muscle. The exact cause of the deficit is unknown. The highest values for this preparation still fall short of the VO_2 and peak blood flow values measured in human leg-kick studies (602 $\pm$ 58 ml ·min^{-1}· kg^{-1} and 3.85 $\pm$ 0.26 L·min^{-1}·kg^{-1}; J. Appl. Physiol. 75(4): 1911-1916, 1993).

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P32

MEDICATION AFFECTIVENESS IN THE GAIT MECHANICS OF PARKINSON'S DISEASE INDIVIDUALS

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Parkinson's disease (PD) affects brain cells which results in a decrease of dopamine levels in the basal ganglia. After an 80% decrease in this neurotransmitter clinical symptoms such as resting tremor, rigidity, and gait instability appear. Medications such as Sinemet CR and Eldepryl can increase and maintain dopamine levels to allow improved motor function. The purpose of this study was to ascertain whether the medicated PD individual utilized normal gait mechanics.

Six male subjects 8.5 (73.4±8.5 yrs, 1.77±.07 m; 80.5±8.5 kg) diagnosed with mild levels of PD and five male subjects (67.8±6.1 yrs, 1.77±.08 m; 86.4±7.6 kg) with no known neurological conditions were examined during their self-selected walking speeds. The normal group was also examined at the average speed of the PD subjects to control for speed dependent gait parameters. Variables examined included three-dimensional ground reaction forces, center of pressure excursion, ankle, knee, and hip kinematics and kinetics, and trunk and arm kinematics. Results indicated a 17% decrease in the self-selected walking speed of the PD subjects (1.05 m/s) as compared to the normal group (1.26 m/s). However, when comparing the PD data to the normal data at the PD speed, no significant differences ($P<.05$) in the gait mechanics were found. Though the PD subjects walked at a slower speed, these data suggest that medicated PD subjects are able to use normal control mechanisms during self-selected walking without adjustments such as forward trunk lean or increase muscle torque at selected joints.

P33

CHANGES IN CIRCULATING LEVELS OF CELL ADHESION MOLECULES (CAMs) IN RESPONSE TO ONE BOUT OF HIGH INTENSITY ECCENTRIC EXERCISE

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Unaccustomed eccentrically-biased exercise results in micro-trauma to involved contractile and/or connective tissue, with the subsequent activation of an acute inflammatory response. A crucial aspect of acute inflammation in directing white blood cells (WBCs) from the circulation to the site of injured tissue. This requires *de novo* synthesis of a family of cytokines, CAMs, by endothelial cells and circulating leukocytes. The purpose of this study was to determine whether exercise-induced muscle damage would result in a significant elevation in serum levels of certain CAMs. Six, healthy, untrained, Caucasian males were required to perform the negative phase of a bench press and a leg curl (3sets, 10 reps/set, at 100% of 1RMmax$_{concentric}$ for each muscle group). Venous blood was drawn before, immediately after, 1.5h, 6h, and 12h after, and then every 24h for 6d. The following CAMs were measured (ELISA): intercellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), P-selectin, and E-selectin. Results were analyzed using a repeated measures ANOVA ($p<.05$). The only significant changes seen were in P-selectin ($p=.01$). Surprisingly, this was significantly decreased compared to baseline at 24-144 h after exercise. Since adhesion molecules are crucial to the expression of inflammation, it is recommended that future studies measure additional CAMs, and that blood samples be drawn at more frequent intervals over the initial 12 h post-injury period.

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P34

CHANGES IN SERUM INTERLEUKIN-6 (IL-6) AND CREATINE KINASE (CK), IN RESPONSE TO 3 MUSCLE BIOPSIES: A PRELIMINARY INVESTIGATION

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Muscle biopsy procedures are a frequently used technique in exercise-related research. Cytokines, in particular IL-6, are elevated in response to tissue damage, and may also be elevated in response to a bout of strenuous exercise. When serum levels are assessed after an exercise bout, plus biopsy, it is not clear if these elevations are in response to the biopsy, or to the exercise bout *per se*. The purpose of this pilot study was to determine whether serum IL-6 would be elevated after a protocol involving 3 biopsies, but with no exercise. The following procedures were performed on 2 healthy, untrained males:3 fine needle biopsies (vastus lateralis). 5 venous blood samples were drawn at specific times relative to the biopsies. Venous blood was drawn before the 1st biopsy (#1); after the 2nd biopsy (#2), after the 3rd biopsy(#3). Samples were also drawn at 1h (#4), and 2 h (#5), after the 3rd biopsy. Blood was analyzed for IL-6 and CK. Results were as follows:

	#1	#2	#3	#4	#5
IL-6 (pg/ml)	0.871	0.745	1.21	0.853	1.523
Creatine kinase (U/L)	106	98	106	183	127

It is emphasized that only 2 subjects were used. However, based on these preliminary results, when compared to baseline levels, there was an increase in CK (43%), and IL-6 (75%).

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PHYSICAL ACTIVITY BARRIERS AMONG LOW INCOME, UNDER-SERVED WOMEN: THE NORTH CAROLINA WISEWOMAN PROJECT

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O1

Prevalence of physical activity (PA) is generally low among women of low socioeconomic status. Therefore, we examined barriers to activity participation among low income women using data from the North Carolina WISEWOMAN Project, originally designed to evaluate the effectiveness of a PA and diet intervention on cardiovascular disease risk factors. Self-reported PA and corresponding barriers to exercise were measured in 772 African American and White women attending 13 health departments at baseline (1995-96). Participants were at least 50 years of age (mean 63 years) with documented hypercholesterolemia or hypertension. Further, 33.2% of these women were overweight (body mass index 25-29.9 kg/m^2) and 45.3% were obese (body mass index $\geq$30 kg/m^2). Prevalences were adjusted for age, ethnicity, and county. Participation in moderate or vigorous PA $\geq$30 minutes/day on most days of the week (CDC-ACSM guideline) was 60.9%. Among women not meeting the CDC-ACSM recommendation, difficulty "keeping up my energy level" was the most commonly reported barrier (36.7% African American and 52.2% White). Reports of being too tired or "exhausted by everything else I do", "trouble sticking with it", uncomfortable with breathlessness, soreness, and bad weather were also commonly reported. Women age 50-64 years not meeting the CDC-ACSM guideline reported friends or family not participating in activity as a common barrier to being more active (31.2%). In contrast, women age 65-86 years feared exercise "might do me more harm than good" (32.9%) and worried about "overdoing it" because of their age (32.4%). Barriers to PA such as not wanting to sweat or mess up hair, expense, lack of enjoyment, and perceiving no benefit from the activity were reported by <10% of these women. Among these older low income women with one or more cardiovascular risk factor not meeting the CDC-ACSM guideline, exhaustion from other daily activities and somatic complaints or fears were the most commonly cited barriers to PA. These data can be used to design more effective interventions aimed at increasing PA among older, low income women.

PSYCHOPHYSIOLOGICAL RESPONSES OF MEN AND WOMEN TO ANAEROBIC POWER TESTS

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O2

The purpose of the this study was to examine cardiovascular (heart rate, HR, blood pressure, BP), rating of perceived exertion (RPE), feeling scale (FS), state anxiety (SA), and power (peak and mean) responses of 15 men and 16 women to participation in randomly-ordered 30 second Wingate (WG) and 90 second (90S) bicycle ergometer tests. Measurements were taken before, during, and 3 minutes after each test. Male HR and BP was significantly higher during and after the WG and 90S tests ($p < .01$); SA scores were higher for men after the 90S test ($p < .05$); and male peak/mean power outputs were greater for the WG and 90S tests ($p < .001$). Male and female power outputs were greater during the WG test ($p < .001$). Both men and women had higher HR ($p < .01$, reported higher RPE scores ($p < .05$), and lower FS scores ($p < .001$) during and after the 90S test as compared to the WG test. In addition, SA scores were higher before and after the 90S test ($p< .05$). The results of this study suggest that men were more psychophysiologically stressed than women by both tests, but the 90S test stressed all subjects more that the WG test.

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PHYSICAL FITNESS AND PERCEIVED QUALITY OF LIFE AMONG RURAL AND URBAN LOUISIANA SENIOR WOMEN

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O3

In Louisiana (LA) the medical disability rate exceeds the national average by 33%. This is of concern with regard to, among other issues, the quality of life (QOL) for LA residents. Previous studies have reported lower fitness levels in rural dwelling individuals as compared to urban dwelling counterparts. This may explain the high disability rates experienced in rural states such as LA. Therefore, it was the purpose of this investigation to evaluate physical fitness and QOL among rural and urban LA senior citizens. Twenty-six urban dwelling women (ages 72-84) and 16 rural dwelling women (ages 70-84) were evaluated for physical fitness using the AAHPERD test battery for older adults, and QOL using the Nottingham Health Profile (NHP). Group differences for fitness scores and QOL between groups were determined from independent t-tests, and Mann-Whitney U tests, respectively. Alpha was set a-priori at $p \leq 0.05$. Results indicate a significantly lower aerobic endurance (AE) performance in senior citizens from rural LA. In addition, rural senior citizens had significantly higher scores for physical mobility and pain indicating a worse perception of QOL in comparison to the urban senior citizens.

	Aerobic Endurance	Physical Mobility	Pain
Urban	9.55±1.49 min	14.76	15.06
Rural	11.62±1.55 min	22.71	21.64
Norm	9.92 min	14.00	10.00

In conclusion, senior citizens from rural LA have lower AE, and perception of QOL than their urban counterparts. The lower AE of rural seniors in LA may be of a magnitude that is sufficient to negatively impact disability rates thereby seriously impacting QOL. Furthermore, as LA is largely a rural state, the poor AE observed in this population may have implications regarding the high disability rate in LA and the large health-care burden that this places on the public.

UTILITY OF THE THEORIES OF REASONED ACTION AND PLANNED BEHAVIOR FOR PREDICTING OBJECTIVELY MEASURED PHYSICAL ACTIVITY IN YOUTH

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O4

This study evaluated the utility of the Theory of Reasoned Action (TRA) and its extension, the Theory of Planned Behavior (TPB), in explaining objectively measured physical activity in a diverse sample of sixth grade children. 198 sixth grade students (52.0% Female, 55.1% African-American) completed an in-class survey assessing activity intentions (INT), attitude towards physical activity (ATT), social norms concerning physical activity (SN), and perceived behavioral control (PBC). Average daily participation in vigorous physical activity (VPA) ($\geq$ 6 METs) during the week immediately after survey administration was assessed via the CSA 7164 accelerometer. Path analysis showed ATT (std beta = .30, $P < .05$) but not SN (std beta = .03, $P > .05$) to be associated with INT (R^2=.10), with INT predicting VPA (std beta = .18, $P < .05$) (R^2=.04). The addition of PBC to the model (TPB) improved the prediction of INT (std beta = .18, $P < .05$) (R^2=.13), but had little effect on the prediction of VPA either directly (std beta = .07, $P > .05$) or via INT (std beta = .17, $P < .05$) (R^2=.04). These results suggest that the addition of control perceptions to the TRA enhances the prediction of intentions but not objectively measured physical activity behavior in sixth graders.

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ADHERENCE TO SOUTHEAST ACSM CURRICULAR GUIDELINES BY UNDERGRADUATE EXERCISE SCIENCE SCHOOLS IN SOUTH CAROLINA

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05

The undergraduate curriculum of 5 South Carolina schools with 9 exercise science related undergraduate degree programs were compared to the minimum content area guidelines recommended by the Southeast Regional Chapter of the American College of Sports Medicine in January of 1998. University bulletins, internet web pages, faxed materials and phone calls were utilized to evaluate each program: Coker College (B.S. in Physical Education with a concentration in Exercise Science), Furman University (B.A. or B.S. in Health and Exercise Science), Lander University (B.S. in Exercise Studies with an emphasis in Exercise Science), USCAiken (B.S. in Exercise and Sports Science with concentrations in Athletic Training, Fitness Management and Basic Sciences) and USC Columbia (B.S. in Exercise Science with tracks in Health Fitness, Motor Development and Scientific Foundations). All programs met the Anatomy and Physiology, Biomechanics, Kinesiology, and Physiology of Exercise recommendations. All other criteria was met by seven or eight of the nine programs except for Athletic Training, which only four programs included. Five programs met all of the suggested content areas. These results indicate that South Carolina exercise science programs adhere to most of the Southeast ACSM curricular guidelines, though only 56% of the programs meet the minimum standards recommended. Adherence is key to insure greater standardization of competencies for undergraduate exercise science majors, and necessary for the possible pursuit of licensure of individuals in this field.

RELATIONSHIP BETWEEN BLOOD-FLOW VELOCITY AND BRACHIAL ARTERY FLOW-MEDIATED DILATION

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06

Endothelium mediated dilation following hyperemia is believed to be secondary to the increased shear stress on the vessel wall. However, the extent of change in blood flow velocity and the corresponding effect on vessel diameter is not known. The objective of this study was to examine the relationship between the increase in blood-flow velocity following 5 min of forearm occlusion and the corresponding changes in brachial artery diameter, in 20 healthy participants (Age:38.40±11.73 yrs). High-resolution ultrasonography (Toshiba Powervision 7000) was used to measure brachial artery reactivity during and immediately following the occlusion period, and subsequent still images taken during vessel diastole for analysis (Media Cybernetics, Image-Pro Plus software). Each participant was imaged following a 12 hr fast, and after a 15min relaxation period in a supine position. Flow velocities increased from 80.8±17.9 cm/sec during the final 30 sec of occlusion to 172.55±38.36 cm/sec (p=0.001) during the first five seconds of release (119% increase, range: 10.26-406.26). Vessel diameters increased from 3.45 ± 0.82mm at baseline to 3.69±0.83mm (p=0.001) at peak, within 2 minutes of release (8.12% increase, range: −1.95-16.95). Central hemodynamic variables remained constant. The Pearson's product moment correlation coefficient for percent change in peak flow velocity and peak change in vessel diastolic diameter was r=0.58 (p=0.009). These results suggest the gradient of change in brachial artery diameter is influenced by the degree of increase in artery blood-flow velocity.

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INTERRATER OBJECTIVITY AND TEST-RETEST RELIABILITY OF THE ROBERTSON MODIFIED CURL-UP TEST

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07

Traditional sit-up tests may test endurance of the hip flexors, in addition to the abdominal muscles. For this reason, curl-up tests have become more popular tests of abdominal muscular endurance, because they isolate the abdominal muscles. However, the shorter range of motion involved in curl-ups may make it more difficult to judge scores consistently. Additionally, the unfamiliarity of the curl-up motion may mean that a practice trial is needed. The purpose of this study was to investigate the inter-rater objectivity and test-retest reliability of the Robertson Modified Curl-Up Test (MCUT). Subjects were 33 female college-age students. Two trials of the MCUT were administered seven days apart. At each trial, two raters scored subjects' performances independently. Two Velcro adhesive strips were placed on a gymnastics mat 3 in. apart, to help subjects to determine the beginning and end points of the MCUT. Intraclass correlation coefficients (ICC) from a one-way analysis of variance were used to estimate the reliabilities. High coefficients for interrater objectivity (ICC = .96 & .97 for Test 1 and Test 2, respectively) indicated that the Robertson MCUT was an easy curl-up test to score consistently. Coefficients for test-retest reliability were low (ICC = .56 & .63 for Rater 1 and Rater 2, respectively). Mean scores for the second trial were also significantly ($p < .05$) higher than for the first trial. We concluded that the Robertson MCUT is a standardized protocol that can be judged with a high degree of objectivity. However, a full practice test should be used to familiarize subjects with the test.

FUNCTIONAL CAPACITY IN PATIENTS EARLY AFTER CORONARY ARTERY GRAFT SURGERY

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08

The purpose of this study was to determine functional capacity in individuals early (22.2 days) after coronary bypass graft surgery (CABGS) and how they improve over time. The study group consisted of 3 male patients, ages 47-70, who volunteered to participate in this investigation. Each patient underwent a series of four symptom-limited maximal graded exercise treadmill tests approximately 3 weeks apart using a Sensor Medics Vmax 229 automated metabolic system for breath by breath collection of expired gases to directly measure oxygen uptake (VO_2), carbon dioxide production (VCO_2), and ventilation (VE). Testing was repeated approximately every 3 weeks over a 12 week period. All patients began participation in a cardiac rehabilitation program at the time of their first assessment. Initial metabolic testing showed an average group functional capacity of 20.6 ml/kg/min, or 5.8 METs. After 12 weeks, VO_2 rose to 27.0 ml/kg/min, or 7.7 METs, for an overall increase of 31.0%. Mean analyses of VO_2 showed improvements between tests of 15.%, 7.4%, and 5.7%. These results suggest that patients after coronary artery bypass surgery are functionally limited, however, are capable of significant improvement with 12 weeks of exercise training. This information has importance in determining what activities individuals are able to do immediately after surgery, when they may return to work and their potential for more rapid improvement through early participation in cardiac rehabilitation. A larger study population will increase the validity of these findings and is being pursued.

EFFECTS OF STATIC AND HOLD-RELAX STRETCHING ON HAMSTRING RANGE OF MOTION USING THE FLEXABILITY LE1000

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O9

The purpose of this study was to determine the effects of Static and Hold-Relax hamstring stretching on hamstring range of motion. Forty-two subjects (18-25 yrs. old) were assigned to either the Control, Static or Hold-Relax training group. Subjects were stretched four times a week over a six-week period with four thirty-second stretches per session using an Instrumental Straight Leg Raise method on the FlexAbility LE1000. It was determined that both Static and Hold-Relax techniques significantly improved hamstring flexibility (ISLR: +33.08°±9.08° and +35.17°±10.39°, respectively). Subjects of both techniques reached a plateau effect in flexibility improvement between the forth and fifth weeks of training. Thus, a Static or Hold-Relax stretching method is equally effective in improving hamstring ROM.

THE EFFECT OF WALKING, JOGGING, AND EXERSTRIDING® ON HEART RATE, SYSTOLIC BLOOD PRESSURE, AND PERCEIVED EXERTION

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O10

The effect of walking, jogging, and Exerstriding® on heart rate, systolic blood pressure, and Ratings of Perceived Exertion in 18 female subjects was investigated. Each subject participated in three 10-minute, low intensity, steady state work bouts. Walking consisted of treadmill walking at 3.5 mph. with 0% elevation. Jogging was done on a treadmill at a pace of 5.0 mph. with 0% elevation. Exerstriding® involved treadmill walking at 3.5 mph. with 0% elevation while using Exerstrider® walking poles. During each work bout, heart rate (HR) and perceived exertion (RPE) were recorded at two (2) minute intervals, and systolic blood pressure (SBP) was recorded at three (3) minute intervals. Results revealed that the Exerstriding® produced a significantly higher ($p < .01$) heart rate (117.83 ±15.45bpm) than walking (100.00 ±14.55bpm) and a significantly lower ($p < .01$) heart rate than jogging (155.61 ±19.10bpm). With respect to systolic blood pressure, there was no significant difference ($p > .01$) in systolic blood pressures elicited by the Exerstriding® (109.67 ±11.44mmHg) and walking (108.11 ±12.62mmHg) or jogging (114.11 ±12.47mmHg). Rating of perceived exertion during the Exerstriding® (10.00 ±1.68) was significantly higher ($p < .01$) than that associated with walking (8.11 ±1.68), and significantly lower ($p < .01$) than that reported while jogging (12.28 ±1.64). These results suggest that using Exerstrider® walking poles can increase the heart rate response during a sub-maximal walking bout with minimal effect on systolic blood pressure. This could make Exerstriding® an attractive alternative form of exercise for persons wishing to increase exercise heart rate while maintaining a moderate walking pace.

Supported by a Grant from the Lander University Foundation

HOGAN, M.P. *The effects of helmet and no helmet use on thermoregulatory responses to cycling outdoors.* **Purpose:** The purpose of this study was to determine whether WEARING a bicycle helmet affected body temperature regulation outdoors in sunshine as compared to a non-helmet condition. **Methods:** Five trained male cyclists (mean ± SD; age 32.6 ± 8.0 yr, mass 73.4 ± 4.4 kg) underwent two 60 minute submaximal cycling trials in a random order outdoors in sunshine (mean trial air temperature- 26.8°C ± 1.0°C, mean trial relative humidity- 67.6% ± 9.8%). The subjects exercised at a constant work load of 70% VO_2 reserve on a Magna ® bicycle connected to a Minoura ® stationary trainer with and without a helmet. Body temperature responses were recorded on a Thermoscan ® infrared tympanic membrane thermometer. The helmet used was a commercially available Specialized ® Air Wave ™. **Results:** The results showed that there were no significant differences ($p > 0.05$) between the two conditions for tympanic membrane temperature. **Conclusion:** It was concluded that wearing a modern, commercially available cycling helmet does not accentuate body temperature responses to prolonged submaximal cycling outdoors in sunshine as compared to a non-helmet condition.

O11

LACTATE AND VENTILATORY THRESHOLDS OCCUR AT THE SAME RELATIVE OXYGEN CONSUMPTION

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O12

Anaerobic threshold is commonly determined by blood lactate (BLA) and/or gas exchange parameters. This study was designed to determine if lactate threshold (LT) and ventilatory threshold (VT) occur at a similar relative oxygen consumption ($\dot{V}O_2$) when factors known to dissociate the two are controlled (e.g. cardiorespiratory fitness level, glycogen depletion, diet, caffeine ingestion, exercise mode/protocol). Ten apparently healthy, male subjects (age = 25 ± 3 y, ht = 180 ± 4 cm, wt = 78 ± 12 kg, $\dot{V}O_{2peak}$ = 47.4 ± 5 $ml \cdot kg^{-1} \cdot min^{-1}$) were maximal treadmill tested to determine LT and VT. Minute ventilation ($\dot{V}_E$), $\dot{V}O_2$ and finger tip arterialized venous blood samples were collected at the end of each two-minute stage. BLA and $\dot{V}_E$ were plotted against $\dot{V}O_2$ to determine LT and VT. Three experienced, independent raters determined LT and VT by visual inspection. All statistics were conducted at $\alpha = 0.05$. Intra-class correlations and a one-way ANOVA were conducted to determine inter-rater reliability for LT and VT. A significant correlation (LT, $r = 0.94$, $p \leq 0.001$; VT, $r = 0.78$, $p \leq 0.01$) and no significant difference (LT, $F = 0.112$, $p = 0.89$; VT, $F = 0.415$, $p = 0.67$) was found between raters. A dependent t-test and a Pearson r were conducted between mean LT and mean VT. The mean $\dot{V}O_2$ at LT was 37.7 ± 4.8 $ml \cdot kg^{-1} \cdot min^{-1}$ and the mean $\dot{V}O_2$ at VT was 38.2 ± 4.9 $ml \cdot kg^{-1} \cdot min^{-1}$, ($t = -0.530$, $p = 0.61$). A significant correlation ($r = 0.80$, $p = 0.005$) was found between LT and VT. These results suggest VT and LT occur at a similar relative $\dot{V}O_2$ when factors previously shown to dissociate the two are controlled.

VAGAL MODULATION OF THE HEART AND CENTRAL HEMODYNAMICS DURING HANDGRIP EXERCISE

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O13

The purpose was to determine the effect of dynamic hand grip exercise on autonomic modulation of the heart and central hemodynamics. Blood pressure measurements and continuous EKG recordings were obtained from 12 college age men and women during spontaneous breathing (SB1:5 minutes), dynamic hand grip exercise at 20% of MVC (HG20: 1 contract/sec for a max of 5 min), spontaneous breathing (SB2: 5 min), and dynamic hand grip exercise at 60% of MVC (HG60: 1 contract/sec for a max of 5 min). Blood pressures were obtained from the non-working arm during SB and immediately after HG20 and HG60. EKG was recorded with a Biopac MP100 system. Analysis was performed with *Acqknowledge* version 3 software and included mean and standard deviation (SDNN) of the RR intervals over 90 seconds. Coefficient of variation (CV) was the ratio of the SDNN and the mean RR. An ANOVA with preplanned contrasts was used for statistical analysis. The results are summarized in the table below.

	SB1	HG20	SB2	HG60
Mean RR	1024.2±104.3	922.6±91.7*	1008.9±122.1	719.7±104.6*
SDNN	60.3±22.2	47.9±16.7†	55.6±21.6	38.5±11.8†
CV	0.059±0.024	0.048±0.013*	0.064±0.021	0.067±0.027
MAP	80.9±8.7	81.6±10.2	83.7±8.3	87.7±9.8*

* $p \leq 0.012$ from all; † $p = 0.0001$ from SB

Results revealed an intensity dependent increase in heart rate and decrease in SDNN. However, CV only decreased during HG20, and MAP only increased following HG60. These data suggest that HG20 resulted in parasympathetic withdrawal, whereas the response to HG60 included an increase in sympathetic drive (as indicated by MAP). The intensity dependent effect of HG on CV implicates the potential for characterizing sympathovagal balance as SDNN relative to the mean RR.

THE EFFECTS OF CREATINE LOADING ON REPEATED UPPER AND LOWER BODY WINGATE PERFORMANCE

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O14

In a randomized, double-blind study, 19 physically active males supplemented their diet with 20g/day creatine monohydrate (Cr group) or placebo (Pl group) for 6 days. Before and after supplementation, subjects performed 3 consecutive arm Wingates (AW1, AW2, AW3) and leg Wingates (LW1, LW2, LW3). Arms and legs were tested on successive days, and Wingate bouts were separated by 2 minutes each. Mean power (MP), peak power (PP), and percent decrease (%D) [(PP - minimum power) / PP x 100] were compared between and within groups using unpaired and paired t-tests. Significance was accepted at $p \leq 0.05$. MP was not significantly different between pre-test and post-test for arm or leg trials. Similarly, PP (pre vs. post) was not significantly different for LW1, LW2, and LW3. PP increased significantly in the Cr group in AW1 and for Pl group in AW1 and AW3. There were no significant differences between groups for MP or PP. Mean %D increased significantly in Pl group for AW1, AW3, and LW3. For Cr group mean %D decreased significantly (pre vs. post) and was significantly lower than Pl group for LW2 (post). Delta values (post - pre) for MP and PP were not significantly different between or within groups for arm or leg trials. Results suggest that creatine loading does not affect MP or PP during repeated arm and leg Wingate performance. However, reduced %D in LW2 may suggest a possible ergogenic effect of creatine loading.

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RELATIONSHIP BETWEEN CREATINE SUPPLEMENTATION HISTORY AND MARKERS OF CLINICAL STATUS IN COLLEGE FOOTBALL PLAYERS

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O15

Although no clinically significant side effects have been reported from creatine supplementation in the scientific literature, concern has been expressed regarding its long-term safety. This study examined the relationship between prior creatine use and markers of clinical status. 79 Division IA college football players (19.6±1 yrs, 72.5±3 in, 101.2±19 kg) completed creatine use history questionnaires; donated fasting blood and 24-h urine samples; had body composition determined using DEXA; and, had resting blood pressure and 12-lead ECGs performed. A comprehensive 31 panel clinical chemistry analysis was run on serum samples while whole blood samples were analyzed for cell blood counts. Serum creatine was also determined. A quantitative clinical urinalysis as well as creatine, creatinine, and creatinine clearance were determined from urine samples. The relationship between the subjects' history of taking creatine and markers of clinical status was analyzed by Pearson Product-Moment correlation analysis. In addition, subjects were classified as non-users (N, n= 22), former users (F, n=40) and current creatine users (C, n=17) and data were analyzed by one-way ANOVA with Bonferroni post-hoc analysis. Data are presented as means ± standard error of means for the N, F, and C groups respectively. Reported creatine use was 0.0±0, 5±1, and 11.3±3 months. Correlation analysis revealed that creatine use history (months) was significantly correlated to the blood urea nitrogen/creatinine ratio (r=0.24), serum phosphorus (r=-0.26), and the cholesterol/HDL ratio (r=0.25). When categorized as N, F, and C groups, creatine use was significantly correlated to serum globulin (r=-0.23), the albumin/globulin ratio (r=0.44), serum phosphorus (r=-0.33), monocytes (r=-0.26), serum creatine (r=0.32), and urine creatine (r=0.34). ANOVA revealed that serum (0.3±0.02, 0.4±0.04, 1.0±0.4 mg/dl) and urine (124±60, 266±170, 1,809±860 mg/24h) creatine levels were significantly greater ($p>0.05$) in the C group. In addition, serum phosphorus levels (4.2±0.1, 4.0±0.1, 3.7±0.2 mg/dl) in the C group was significantly lower than the N group. No significant differences were observed among groups in remaining serum metabolic variables, creatinine, muscle & liver enzymes, electrolytes, or hematological variables. No differences were observed in urine specific gravity, creatinine, or creatinine clearance. No significant differences were observed in body composition, resting heart rate, resting blood pressure, or ECG determined ventricular hypertrophy. All values were within normal ranges for athletes. Results indicate that current and former creatine use does not appear to significantly affect markers of clinical status although creatine use was weakly correlated to isolated variables.

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CREATINE MONOHYDRATE AND CYCLE ERGOMETRY: EFFECTS ON BODY MASS and POWER OUTPUT

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O16

We studied the impact of creatine monohydrate(CMH) supplementation upon brief, repeat bouts of maximal cycle exercise. Six male (age=28.2±1.2 yrs) subjects performed four, 15s Wingate tests (one minute rest period), against a resistance of 0.74 $N \cdot kg^{-1}$ body mass under two randomly assigned conditions; CMH (20g·d^{-1} for 6d) and Placebo (PL: sucrose 24g·d^{-1} for 6d). Subjects also performed the Wingate protocol as part of a control (CTL) session prior to supplementation. Resistance was recalculated for each condition to the same % of body mass. Experimental conditions were separated by 30 days, after which subjects crossed over to the opposite supplementation protocol. Subjects were urged to continue current nutritional and training practices during this time. Baseline body mass, body fat, Wtot and $VO_{2\,peak}$ were 82.4±3.5 kg, 12.4±2.0 %, 40.8±1.4 kJ and 54.8±4.2 $ml \cdot kg^{-1} \cdot min^{-1}$, respectively. Although, body mass increased 1.6% (83.7±3.8) and 1.5% (83.6±3.3 kg) for PL and CMH, these changes were not significant. Of interest, total work (Wtot) was not different between PL or CMH (PL: 42.6±2.0; CMH: 42.8±1.7 kJ) and neither was significantly elevated over CTL when resistance was recalculated for the increase in body mass. Peak and mean power output (PPO & MPO), and minimum PO were not different between CMH and PL. Repeat measures ANOVA revealed a difference in HR response between bouts, but not between CMH and PL. Fatigue index (difference between peak and minimum PO), increased across the four work bouts ($p<0.05$), however, no difference was noted between CHM and PL. Importantly, body mass was significantly correlated to MPO (r=0.60, 0.75, 0.71, and 0.72) and PPO (r=0.57, 0.70, 0.77, 0.76) for all four bouts. This suggests that the benefits of CMH supplementation are dependent upon increased body mass. Furthermore, this benefit of CMH supplementation disappears when adjustments are made for the change in body mass.

O17

EFFECTS OF EXERCISE ON CORTICOTROPIN-RELEASING FACTOR (CRF) IN THE RAT BRAIN.

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CRF is the primary neuroendocrine regulator for homeostatic restoration during various stressors. We tested if a single bout of fatiguing exercise increases CRF concentration in the hypothalamus, amygdala, and cortex. These are tissues in which CRF levels change during stress. Male Wistar rats (n=64) were divided into 3 groups: cage control (CC), treadmill control (TC), and exercise (EX). At fatigue (~60min, 30m/min, 5%grade), the EX animals (n=29) were immediately sacrificed and target tissues were isolated and frozen in liquid nitrogen. TC animals (n=10) were placed on the treadmill for approximately 1 hr, brain tissues were then collected. CC animals (n=25) were sacrificed without exposure to the treadmill and brain tissues were collected. CRF concentration (pg/mg soluble Protein) was determined using a double antibody RIA procedure. These analyses showed a significantly ($p<0.05$) higher CRF concentration in the hypothalamus of the EX group (1600±140pg/mg sP) when compared to either the CC (1100.1±110pg/mg sP) or the TC (753±10pg/mg sP) groups. No differences were seen between the CC and TC groups. No significant differences from control values were seen in either the EX amygdala or cortex samples. These results indicate that a single bout of fatiguing exercise increases CRF concentrations in the hypothalamus, but not other selected brain regions responsive to stressful stimuli. This differential regulation is likely due to specific types of stressful stimuli targeted toward distinct brain regions.

O18

IMMUNE FUNCTION IN FEMALE ELITE ROWERS AND NONATHLETES

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The immune function of female rowers and controls was compared while in the resting state, and then related to a 2-month history of upper respiratory tract infection (URTI). Subjects included 20 elite female rowers located at the ARCO Olympic Training Center in Chula Vista, California, and 19 nonathletic female controls. PHA-induced lymphocyte proliferation (separated cell method), granulocyte/monocyte phagocytosis and oxidative burst activity, and plasma cytokine concentrations (IL-6, tumor necrosis factor, and IL-1ra) did not differ significantly between groups. PHA-induced lymphocyte proliferative responses (whole blood method) was significantly higher (31% and 36% for optimal and suboptimal concentrations, respectively) in rowers compared to controls. Natural killer cell activity (NKCA) was substantially higher (1.6-fold for lytic units) in the female rowers compared to controls. Two-month health logs revealed 5.2±1.2 and 3.3±1.1 days with URTI symptoms for the rowers and controls, respectively ($P=0.268$). For all 39 subjects combined, and for the 20 rowers separately, none of the immune parameters were significantly correlated with number of days with URTI symptoms. In this cross-sectional comparison of 20 elite female rowers and 19 female nonathletes, a group difference was found for NKCA and PHA-induced proliferative response (whole blood technique), but not other measures of immune function. The number of days with URTI symptoms during the spring season did not differ between groups, and variances in blood measures of immunity were unrelated to URTI.

Supported by a grant from the United States Olympic Committee

O19

CHANGES IN BLOOD LEPTIN LEVELS AFTER A BOUT OF ECCENTRIC EXERCISE?

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Blood leptin levels generally increase in response to elevations in circulating insulin. However, during an infectious episode, leptin levels are elevated in response to interleukin-1β (IL-1β) and/or tumor necrosis factor (TNFα), and is involved in sickness-related reduction in appetite. Since elevated IL-1 and TNF have been seen in response to damage-inducing eccentrically biased exercise, it was hypothesized that these cytokines might result in an increase in serum leptin. The purpose of this study was to determine whether exercise-induced muscle trauma would result in an elevation in cytokines (IL-1 and TNF), and a concomitant increase in blood leptin levels. Seven, healthy active, untrained, Caucasian males (BF ≤ 20%), ran down a 15% grade at a speed eliciting 75% VO2max. Blood was drawn before exercise (fasted), IPE, 2, 24, 48, 72, 96, 120, 144 h after. Samples were analyzed for IL-1β, and TNFα, insulin, and creatine kinase; delayed muscle soreness (DOMS) was assessed. Data was analyzed using a one-way repeated ANOVA ($p<.05$), with a Bonferroni post-hoc test. Significant elevations were seen in TNFα ($p=.026$), immediately after; CK was elevated ($p=.004$) at 24 and 48 h post; DOMS was elevated ($p=.001$) between 24-96h. There was no significant elevation in leptin ($p=.278$) or IL-1β ($p=.105$). Insulin levels remained close to pre-exercise levels as anticipated ($p=.95$). Significant elevations in TNFα and CK as well as severe DOMS, are strongly suggestive of muscle damage. However, contrary to the proposed hypothesis, elevated TNFα did not result in a significant elevation in leptin levels.

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O20

IMMUNE RESPONSE TO ROWING IN ELITE FEMALE ROWERS

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The influence of carbohydrate (C) versus placebo (P) beverage consumption on the immune and hormonal responses to normal rowing training sessions was measured in 15 elite female rowers residing at the U.S. Olympic Training Center. In a randomized, counterbalanced design, the athletes received C or P beverages (double-blinded) before, during, and after two 2-hour bouts of rowing (one day apart). Blood samples were collected before, and 5-10 minutes and 1.5 hours after rowing. Metabolic measures indicated that training was performed at moderate intensities, with some high intensity intervals interspersed throughout the sessions. Glucose and insulin were significantly lower after two hours of rowing with ingestion of P compared to C. The patterns of change in cortisol, growth hormone, epinephrine, and norepinephrine did not differ between C and P rowing trials. Blood neutrophil cell counts and the neutrophil/lymphocyte ratio were significantly higher following P versus C rowing sessions. The patterns of change in blood lymphocyte and lymphocyte subset counts, and lymphocyte proliferative responses did not differ between P and C trials, except for a slight difference in NK cell counts and activity. In summary, minimal changes in blood hormonal and immune measures were found following two-hour bouts of training in elite female rowers. Carbohydrate compared to placebo ingestion attenuated the moderate rise in blood neutrophil counts, but had slight or no effects on other immune parameters.

Supported by a grant from the United States Olympic Committee

DAY-TO-DAY RELIABILITY OF SPINE, HIP, AND WHOLE BODY DEXA SCANS IN COLLEGE MEN AND WOMEN

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O21

Over the last decade dual energy x-ray absorptiometry (DEXA) has served as a valuable diagnostic tool for the determination of bone mineral area (BMA), bone mineral content (BMC), and bone mineral density (BMD). More recently, DEXA has been used as a method of determining whole and regional body composition in athletic and non-athletic populations. Although the reliability of performing multiple DEXA scans has been reported for spine and hip, less is known regarding the normal day-to-day variation in using DEXA as a method to assess whole and regional body composition. The purpose of this study was to evaluate the day-to-day reliability of performing spine, hip, and whole body DEXA scans in active, college-aged individuals. 10 male and 7 female subjects (25±5 yrs, 68.9±5 in, 77.7±22 kg) volunteered to participate in this study. Subjects observed an overnight fast and then reported to the lab, where spine, hip, and whole body DEXA scans were performed using a Hologic 4500W DEXA. The subjects repeated the experiment 48 and 96 hours later, following identical procedures. Percent variation around day 1 mean values were calculated. In addition, data were analyzed using SPSS reliability analysis procedures and one-way ANOVA. Data are presented as percent variation and inter-item alpha reliability coefficients, respectively. ANOVA revealed no significant differences ($p>0.05$) among means for any variable analyzed. In addition, reliability analysis revealed low variation and high reliability of day-to-day spine BMA (0.26%, r=0.993), BMC (0.66%, r=0.998) and BMD (0.96%, r=0.994) measurements. Likewise, low variation and high reliability values were observed in hip BMA (1.1%, r=0.998), BMC (1.00%, r=0.999) and BMD (0.17%, r=0.999) measurements. Whole body analysis also revealed that day-to-day BMC (0.20%, r=0.999), soft/lean tissue mass (0.81%, r=0.999), soft/lean tissue plus bone mass (0.79%, r=0.999), fat mass (1.10%, r=0.998), total weight (0.67%, r=0.999), and percent body fat (1.05%, r=0.999) measurements had low variability and high reliability. These findings indicate that DEXA can serve as a highly reliable method to assess day-to-day variations in spine, hip, and whole body bone and soft tissue. Further, that the day-to-day percent variation in values observed were less than 1.1%.

Supported by Metabolic Response Sciences, Aptos, CA

CHANGES IN AEROBIC CAPACITY, BODY COMPOSITION, PHYSICAL ACTIVITY, AND LEPTIN CONSEQUENT TO AEROBIC TRAINING IN OBESE CHILDREN

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O22

Effects of an 8-week aerobic training program on aerobic capacity, body composition, physical activity, and serum leptin were examined in 21 (17 training group, 4 control group) prepubescent, obese children. A maximal treadmill test, skinfolds, a blood draw to assess leptin, and physical activity questionnaires were administered before and after training. The training group trained 3 days per week for 30 minutes at 65-80% of heart rate reserve for 8 weeks. Two-way repeated measures analyses of variance were used to examine changes. Cohen's delta (d) was used to examine the magnitude of change for each group. The training group increased maximal treadmill time by an average of 1.8 minutes ($d = 0.83$), while the control group increased 0.2 minutes ($d = 0.07$). The training group demonstrated a 7.6 mm decrease in the sum of triceps and calf skinfolds ($d = 0.64$). The control group showed no significant changes in body composition ($d = 0.03$). Physical activity was assessed with self-report questionnaires to examine the effects of the structured aerobic training program on spontaneous or unstructured physical activity. Responses to the physical activity questionnaires revealed that participation in the structured training program produced no decrease in strenuous spontaneous physical activity. The training group demonstrated a small ($d = 0.27$) decrease in leptin of 3.5 $ng \cdot ml^{-1}$ (13% decrease) and the control group had a negligible ($d = 0.09$) increase of 1.0 $ng \cdot ml^{-1}$. In summary, an 8-week training program resulted in improvements in aerobic capacity and body composition in obese, prepubescent children. The small improvement in leptin in the training group suggests the need for future study. Structured aerobic training programs for prepubescent children may be an effective tool in the control and prevention of obesity.

Supported by a Grant from the North Carolina Institute of Nutrition

COMPARISON OF BODY COMPOSITION AND NUTRITION PATTERNS BETWEEN ADOLESCENTS IN PUBLIC AND PRIVATE HIGH SCHOOLS

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O23

The purpose of this study was to examine the differences in body composition and nutrition patterns among students attending public (PUBHS) and private high schools (PVTHS) in a South Carolina (n=6,627). The 1995 CDC Youth Risk Behavior Survey was used to collect self-report information. Chi-square analyses were performed for comparing PVTHS and PUBHS students on health habits. PVTHS females were more likely to report trying to lose weight through dieting and exercise than PUBHS females ($p< .01$). PUBHS males were more likely to report trying to gain weight than PVTHS males ($p < .001$). Both male and female PVTHS students were more likely to indicate that they had consumed more fruit, juice, green salad and cooked vegetables than PUBHS males and females ($p < .001$). Moreover, PUBHS students were more likely to indicate eating more meat and fried foods than PVTHS students ($p < .01$). These findings suggest that differences may exist as to how PVTHS females view weight loss and PUBHS males view weight gain as well as suggest that PVTHS students may make healthier choices about eating than PUBHS students.

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THE EFFECTS OF A SIX-MONTH DRY LAND RESISTANCE TRAINING PROGRAM ON THE BONE MINERAL DENSITY OF COMPETITIVE ADOLESCENT FEMALE SWIMMERS

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O24

Regular weight-bearing exercise may help prevent osteoporosis by maximizing peak bone mass and reducing the loss of bone mineral with age. Non-weight-bearing exercise, i.e., swimming, may not benefit bone mass, despite voluminous training. The purpose of this study was to investigate whether a dry land resistance training program, added to competitive swim training, would help augment bone mass in young female swimmers (mean age=14.5±1.9 yr). Subjects had been swim training an average of 5.3±2.5 yr. Three groups of swimmers were followed for a six-month period, swimming 10.9±3.8 hr/wk: Group 1 (n=10) participated in swim training only (S), Group 2 (n=17) swam and performed plyometric exercises twice a week (S+P); Group 3 (n=11) swam, and performed plyometrics and weight-trained (2 times/wk each) (S+P+W). Bone mineral density (BMD) was measured using DXA at the femoral neck (FN), lumbar spine (LS), and whole body (WB). Age at menarche (12.6±1.3 yr), menstrual cycle status and maturity level (Tanner pubertal staging) did not differ significantly among groups; calcium intake was similar (1026±434 mg/day). When controlling for weight, FN, LS and WB BMD did not differ among groups at baseline, and were considered normal for age and gender. The percent change in FN, LS and WB BMD were not significantly different among groups; however, there were some significant ($p<0.05$) within group changes. FN BMD increased in the S+P (2.7±3.7%) and S+P+W (2.0±2.4%) groups, but not in the S group (1.6±3.4%). LS BMD increased in the S (3.7±4.9%) and S+P (3.8±4.8%) groups, but not in the S+P+W (1.6±2.9%) group. WB BMD increased in all groups (S=2.0±2.2%, S+P= 2.0±1.4%, S+P+W=1.9±2.0%). Pubertal stage did not change over the six months; there were, however, significant changes in body composition: S increased body weight, lean and fat mass; S+P increased height, weight, lean and fat mass; and S+P+W increased height, weight, and fat mass. The changes in height and fat mass were significantly different among groups. Adolescent female swimmers with normal bone mass values increased BMD at some sites over the six-month period. Although changes in maturation were not apparent, changes in body size (height and body composition), may play a role. In addition to traditional swim training, mechanical loading of the skeleton from additional dry land (i.e., weight-bearing) exercise, may further augment bone mass at specific skeletal sites.

RESTING ENERGY EXPENDITURE AND FAT OXIDATION AFTER ONE 40-MIN AND TWO 20-MIN AEROBIC EXERCISE BOUTS

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O25

To study the effects of a single exercise bout vs. two exercise bouts (65-70% $\dot{V}O_2$max; equal total energy expenditure) on resting energy expenditure and fat oxidation during a 24-hr period following exercise, 8 untrained, college-aged subjects (6 men, 2 women) had their resting energy expenditure (RMR) determined at five different times during a 24-hr period (8 AM, 12 PM, 4 PM, 8 PM, and 8 AM the next day) under three randomly assigned conditions: control (C), one 40-min exercise session (8:30 AM) (1EX), and two 20-min exercise sessions (8:30 AM; 12:30 PM) (2EX). RMR was assessed via open-circuit indirect calorimetry during the final 10 min of a 30-min period at each time point. For each subject, diet for the 24 hr during and preceding each trial was the same. $\dot{V}O_2$ (l/min), caloric expenditure (kcal/min), respiratory exchange ratio (R) and fat oxidation (g/min) were averaged for the time periods 12 PM through 8 AM the following morning. One-way ANOVAs were performed to determine differences between trials. Mean fat oxidation for 1EX (.074 $\pm$ .021g/min) and 2EX (073 $\pm$ .021g/min) were not different from one another but were significantly ($P < 0.05$) greater than C (.059 $\pm$ .024g/min). R tended to be lower in 1EX (0.86 $\pm$ 0.03) and 2EX (0.86 $\pm$ 0.03) compared to C (0.88 $\pm$ 0.05) ($P = 0.10$). $\dot{V}O_2$ and kcal/min were not different between trials. We conclude that, during a 20-to-24-hr period following exercise, cumulative resting fat oxidation is stimulated to the same extent regardless of whether the exercise is performed in one 40-min session or two 20-min sessions.

PROSPECTIVE STUDY OF KNEE INJURIES IN HIGH SCHOOL FEMALE ATHLETES

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O26

We prospectively examined factors believed to be significant in predicting an increased liklihood of ACL injury in 98 high school female athletes. Subjects completed a questionnaire which detailed family history, prior injuries, resistance training emphasis, whether bracing and/or taping was consistently used, and age of initial menses. The physical examination detailed knee ligament laxity with traditional orthopaedic tests. Lower extremity alignment and general laxity were also measured. Sixty-five percent of participants had prior injury, 57% participated in resistance training of some type and 22% used bracing. There were a total of 13 knee injuries in 12 athletes. Two were ACL injuries that required repair. Additionally, there were three meniscal tears, three collateral ligament injuries, three with patellar tendinitis, and two knee strains. Overall knee injury rate was 13%, relative risk of previous injury to new injury was 2.4. The results suggest no obvious correlation between menstrual cycle and injury, however there was a trend between no resistance exercise and injury.

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AUTONOMIC CONTROL IS NOT DIFFERENT IN HEALTHY YOUNG AFRICAN-AMERICANS

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O27

Epidemiological data suggest that African-Americans (AA) are at a higher risk for cardiovascular disease than European-Americans (EA). However, the mechanisms responsible for this increased risk are unclear. The purpose of this study was to compare the autonomic control systems of healthy young AA and EA subjects. Informed consent and medical history forms were collected and 7 AA males, 5 AA females, 6 EA males, and 7 EA females. Groups were then matched according to age, height, weight, fitness level, and anxiety state. Neither the subjects nor their parents had a history of hypertension. Autonomic balance was determined using a fast fourier transform of a ten minute controlled-breathing sample of the subject's electrocardiogram. Carotid sinus functioning was determined using neck suction. Cardiopulmonary baroreceptor functioning was determined using forearm blood flow measurements during -5, -10, -15, and -20 mm Hg lower body negative pressure (LBNP). No significant difference was found in the slope of the neck pressure response between the groups ($p=0.50$; AA male=4.2±1.4, EA male=4.0±1.33, AA female=4.2±1.4, EA female=5.9±1.3; mean±SE). Overall, there was no significant differences between the groups in spectral analysis; however, AA females had an elevated high frequency power corresponding to a greater parasympathetic response (AA female=3.6±0.6 units, EA female=2.6±0.7 units; AA male=1.6±0.5 units, EA male=2.1±0.5 units). There was no difference in forearm blood flow responses between the groups during LBNP at any stage. These results suggest that in young, healthy African-Americans who do not have a family history of hypertension, there is not an alteration in baroreceptor functioning that may predispose or predict later cardiovascular disease.

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CLOTTING ACTIVITY CHANGES AFTER EXERCISE IN MALES

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O28

Males (N=10, 23.5 yr) ran at 70-75% VO_2 max or slowly walked at 1.2 mph for 30 min. to determine clotting activity changes immediately after and during the one-hour period following these treatments. VO_2 max's were determined on a motorized treadmill and subjects completed the treatments in a randomized order. Subjects reported in the morning(10-12Hrs post-absorptive) and rested for 15-30 min. Venous blood was obtained at rest, immediately after the run or walk and every 20 mins during the one hr recovery. Plasma was analyzed for activated partial thromboplastin time (APTT), and factor VIII activity (FVIII). A 2 X 4 repeated measures ANOVA was used to analyze the data. Resting values for APTT and FVIII were not different prior to the treatments but were not included in the statistical analysis. The post-exercise main effect means for APTT were 30.78 and 32.99 s for the running and walking conditions, respectively [$F(1,9)=22.48$, $p=0.001$]. The post-exercise main effect means for FVIII were 195.9 and 128.8 % for the running and walking conditions, respectively [$F(1,9)= 21.79$, $p=0.001$]. There was no time X treatment interaction effect on the dependent variables ($p \geq 0.65$). These data indicate that running at 70-75% VO_2 max for 30 mins elevates clotting activity during the one hour recovery period compared to slow walking.

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PREDICTORS OF LOWER EXTREMITY INJURY AMONG RECREATIONALLY ACTIVE MEN AND WOMEN

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O29

The purpose of this study was to examine the association between lower extremity (LEX) injury and factors related to body composition, fitness, activity level and injury history among a cohort of recreationally active adults. Subjects (5,030 men and 1,285 women) were participants in the Aerobics Center Longitudinal Study (Dallas,TX), who had at least one clinic visit and who completed a mailed survey in 1986. The first occurrence of a self-reported LEX injury that required a medical consultation was the outcome measure. Over the five year follow-up period, 37.2% of men and 32.2% of women reported a LEX injury. Among subjects (1,218 men, 287 women) with complete data on all predictor variables, univariate hazard ratios and multivariate prediction models, stratified by gender, are presented using Cox Proportional Hazard analysis. Among men, age, fitness level, injury history and mileage are all significant independent predictors of LEX injury. Mileage and injury history are significant independent predictors of LEX injury among women. BMI, experience level, years participating in a run/walk/jog program and strenuous sport participation were not significant predictors for either gender. In the final model, two variables remained significant predictors for LEX injury. Reporting a previous orthopedic injury increased the risk of LEX injury by 61% (HR=1.61,95%CI 1.10-2.40) and 81% (HR=1.81, 95%CI 1.51-2.20) among men and women respectively. Weekly mileage greater than 20 miles/week increases the risk of LEX injury 71% for men (HR=1.71, 1.40-2.10) and 88% for women (HR=1.88, 95%CI 1.16-3.03). These data suggest risk factors for LEX injury vary greatly by gender and a significant need exists for injury prevention programs targeted towards recreationally active adults.

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EFFECT OF SEVEN DAYS OF ENDURANCE TRAINING ON INSULIN ACTION IN MIDDLE-AGED MEN

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O30

Aging is associated with decreasing insulin action leading to an increased risk for non-insulin dependent diabetes mellitus and coronary artery disease. Endurance exercise has been shown to reverse this insulin resistance. However, it is not evident if aged individuals can respond to the extent of young individuals. The purpose of this investigation was to examine insulin stimulated glucose uptake in aged individuals before and after seven days of endurance training. Nine previously sedentary non-diabetic middle-age males volunteered for the study. Mean age, height, weight, and % fat were 58.1±1.5 y, 179.0±1.8 cm, 93.4±5.1 kg, and 24.8±1.9 %, respectively. All subjects completed seven days of cycling training at a moderate intensity (~75% VO_2max) for 1 hour per day. Before and after the training period, a euglycemic hyperinsulinemic clamp was administered to measure insulin action. There was a significant (~33%) increase in insulin stimulated glucose uptake following training. This was in the absence of any change in fasting insulin (8.8±1.4 vs. 6.8±1.4 μU/mL) or fasting glucose (100.4±5.1 vs. 97.0±4.9 mg/dL) levels. Furthermore, body weight was unchanged during the study. In young individuals we have seen a 25% increase in insulin action following similar training. These data provide evidence that middle-aged men can respond to endurance exercise in terms of improving insulin action. Furthermore, this was accomplished without weight loss.

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ALTERED GAIT KINETICS IN OBESITY

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O31

Obese people walk slower, have longer stance time, shorter strides, and lower stride rate than normal-weight people. It is conceivable that the large mass requires obese people to modify their strategy of gait resulting in altered joint kinetics. Twenty-six normal-weight (73.7 kg) and 20 obese men and women (117 kg) walked 5 times at a self selected pace over a force plate while being video taped. Obese compared to normal-weight subjects used shorter step length (0.68 vs. 0.75 m), walked slower (1.37 vs. 1.57 m/s), and had shorter swing time (35.4 vs. 38.1%) and longer stance time (64.6 vs. 61.9%, all $p < .05$). Hip, knee, and ankle torques and powers were computed from the ground reaction force and kinematic data. Extensor angular impulse during stance and positive work at each joint were derived from the torques and powers. The Table shows the mean (±SD) joint position, extensor angular impulse, and positive work during stance (* $p < .05$). Thus, obese people walk with a more erect posture and with a different distribution of joint torques. The largest re-distribution of joint torque, impulse, and work occurred as a reduction in knee extensor output and an increase in ankle plantar flexor output. Future studies will have to determine whether the reduced knee joint function is a protective mechanism against overloading or it is an adaptation to early stage of joint disease.

Variable	Group	Hip	Knee	Ankle
Joint pos. (deg)	Normal	-4.4 (3.5)	-16.6 (3.4)	-5.1 (3.6)
	Obese	-0.4 (5.9)*	-13.0 (4.1)*	-0.5 (2.6)*.
Impulse (Nms)	Normal	8.5 (3.5)	9.1 (3.4)	32.1 (10.7)
	Obese	10.2 (6.4)	6.4 (5.4)*	52.5 (19.2)*
Pos. work (J)	Normal	5.2 (3.7)	4.7 (2.7)	36.0 (12.1)
	Obese	6.1 (4.1)	3.3 (2.7)*	48.2 (14.5)*

Supported by the North Carolina Institute of Nutrition

BIOMECHANICAL ANALYSIS OF THE SQUAT AND DEADLIFT: COMPARISON OF SEGMENTAL LENGTHS BETWEEN COMPETITIVE WEIGHT GROUPS

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O32

The purpose of this study was to analyze the kinematics of the trunk, and upper and lower extremities as the subjects performed a squat and deadlift during a competitive powerlifting event. The sample group consisted of 25 male powerlifters from 5 different weight classes. The athletes were video-recorded (60 Hz) while performing competitive lifts at a regional powerlifting event. Two positions were chosen as significant events in which the "sticking region" and "sticking point" were defined. A two-way MANOVA was used for the statistical analysis. The data were analyzed to determine similarities and differences between weight groups and lift types for the specified variables at each position (α=0.05). No significant differences were found between or within the weight groups, indicating the kinematic variables were not influenced by body weight. However, significant differences were revealed for segmental lengths between lift types. The results suggest that segmental lengths may have an effect on the amount of weight a competitor is able to lift successfully.

KINEMATIC COMPARISON OF THE TENNIS SERVICE OF 1996 ATLANTA OLYMPIC COMPETITORS BY SERVICE TYPE AND GENDER

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O33

The purpose of this study was to investigate the linear kinematics of the body center of mass (CM) of the power tennis serve and to explore differences within and between genders for first and second serves of elite players. A total of 14 male and female tennis players were video recorded (200 Hz) during competitive matches at the 1996 Atlanta Summer Olympic Games. The results depicted a significant difference in peak ball velocity, but no significant differences in linear CM kinematics between first and second serves. Similar peak racket velocities at ball contact, with variable racket trajectories and impact positions, accentuated the ability of the the players to mask mechanical differences between service type while executing fast and slow serves. Significant differences in horizontal velocities and vertical displacements between gender indicated that males were moving more aggressively towards the net and reaching higher contact heights with the ball. An isolated significant difference in timing mechanics indicated that females had a tendency to hit up and into the ball during the second serve resulting in a higher ball trajectory and net clearance when compared to the male players.

THE IMPACT OF A BIOFEEDBACK DEVICE ON CONTROLLING FORWARD TRUNK FLEXION DURING A LIFTING TASK: IMPLICATIONS FOR LOW BACK INJURY PREVENTION

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O34

This study investigated the impact of a biofeedback device (The BackBuddy™) worn in the upper back position in a small backpack on lifting postures which may be associated with low back injuries for 25 college-aged subjects (11 male and 14 female). The device monitors the position of the trunk in the sagittal and frontal planes and provides an alarm mechanism (beep or vibrate) if an excessive trunk posture is assumed (adjustable to meet demands of many human tasks) in either or both planes of motion. The device is constructed with an external LED that alerts the researcher only when the subject positions the trunk in an excessive posture which may contribute to injury of the low back. The device used in this research also had an external switch which allowed the researcher to toggle the alert mode between an LED only signal and a beep/vibrate signal. When in the beep/vibrate mode the subject was alerted to a trunk posture violation while performing a lift, however, when in the LED only mode the subject was not alerted to posture violations. Each subject was required to perform six sets of lifting trials with 10 lifts per trial (60 total lifts). The subject was required to lift the object, a soccer ball, from the floor with two hands, stand upright and then toss the ball to the researcher for placement on the floor for the next repetition. Subjects were monitored for lifting postural violations during all trials which had various conditions of knowledge and alert mechanism applied. A repeated measures ANOVA ($\alpha \leq 0.05$) was employed to determine significant differences between trials. The researchers found that the number of lifting violations (extreme trunk flexion) were significantly reduced ($p<0.01$) when the biofeedback device was alerting the subjects. The researchers concluded that the device does help reduce the number of excessive trunk postures assumed in performing a series of lifts when an alert mechanism was present.

A BIOMECHANICAL CASE STUDY OF PRE- AND POST-OPERATIVE KNEE REPLACEMENT GAIT CHARACTERISTICS

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O35

The purpose of this study was to measure and compare kinematic and temporal components of gait for a 57 year-old male before and after knee replacement surgery. Four trials were recorded before and after surgery using high-speed videography (200 Hz) and reflective joint markers to allow for two-dimensional motion analysis of the effects of unilateral total knee arthroplasty on walking mechanics. Linear and angular kinematics of the lower body, body center of mass linear kinematics and stride length and frequency were measured. Post-operative gait kinematic and temporal variables (i.e. gait velocity, stride length, stride rate, etc.) were found to have improved when compared to pre-operative measures. These data indicate an improvement in gait mechanics occurred three months following total unilateral knee replacement surgery for this subject.

CHANGES IN VAGAL MODULATION OF THE HEART AND CENTRAL HEMODYNAMICS DURING NECK FLEXION

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O36

Previous research has reported that head-down neck flexion (HDNF) elicits an increase in sympathetic activity. The purpose of this study was to examine changes in sympathovagal balance measured by heart rate variability (HRV) in response to HDNF, which activates both the otoliths and neck afferents, and lateral decubitus neck flexion (LDNF), which primarily activates neck afferents. We further examined changes in mean arterial pressure (MAP), forearm blood flow (FBF) and forearm vascular resistance (FVR) using plethysmography. Five-minute ECG segments were collected and plethysmography measures were taken in 12 healthy participants (age 21-25) in the following positions: prone, HDNF, lateral decubitus (LD), and LDNF. The ECG segments were assessed for spectral parameters and reported as normalized units (LFnu and HFnu) and a paired samples t-test was used to compare the different test conditions. Results revealed increases in MAP ($p<0.05$), FVR ($p=0.11$), and LFnu ($p<0.05$) and decreases in HFnu ($p<0.05$) and FBF ($p=0.2$) during HDNF compared to prone. Similar HRV results were noted for LDNF compared to LD, however, MAP was markedly lower during LD and did not change during LDNF. The hemodynamic changes observed during HDNF suggest activation of the vestibulosympathetic reflex, as previously described. However, the significant changes in HRV during both conditions suggest an even more complicated cardiovascular reflex involving alterations in sympathovagal balance during changes in head positions.

	HR	MAP	FBF	FVR	HFnu	LFnu	lo/hi
Prone	65.2±.1.4	83.3±1.8	5.54±0.77	18.3±1.85	55.1±4.6	44.9±4.6	0.96±0.16
HDNF	66.1±1.6	86.8±6.6*	4.94±0.70	22.3±2.66	44.3±4.1*	55.7±4.1*	1.56±0.32*
LD	65.8±1.3	56.5±2.5	4.53±0.47	13.1±1.35	57.0±5.6	43.0±5.6	1.13±0.39
LDNF	65.3±1.4	58.5±2.3	4.81±0.68	13.5±1.42	46.9±4.8$^{\phi}$	53.1±4.8$^{\phi}$	1.58±0.46$^{\phi}$

Values are mean±SEM. *$p<0.05$ vs. Prone; $^{\phi}p<0.05$ vs. LD.

ASSOCIATION BETWEEN CHANGES IN MEAN ARTERIAL PRESSURE AND HEART RATE VARIABILITY DURING UPRIGHT TILT

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O37

Passive tilt from supine to 70° upright results in a transient decrease in mean arterial pressure (MAP) and a subsequent decrease in heart rate variability. Some investigators quantify baroreceptor sensitivity as the initial drop in MAP divided by the decrease in the standard deviation of RR-intervals (SDNN). The purpose of this study was to examine the relationship between the initial decrease in blood pressure and the decrease in SDNN during upright tilt. Therefore, systolic and diastolic blood pressure (SBP & DBP) and electrocardiograph data were examined in 16 college-aged, healthy participants while supine and during the first 2 and last 2 minutes of 4 minutes of 70° tilt (T-I & T-II, respectively). MAP is expressed as (SBP-DBP)/3 + DBP. SDNN was collected during the last 2 minutes of supine rest and during both 2-minute stages of 70° tilt. Repeated measures ANOVAs were used to examine RR-interval, SDNN, and MAP across test conditions. Furthermore, interclass correlation was used to examine the relationships between change in SDNN and changes in MAP and SBP from supine to T-I. The alpha level was set *a priori* at $p < 0.05$. The results indicated that T-I MAP (78.3 ± 6.2) was significantly lower than supine MAP (80.4 ± 6.8), and that T-II MAP (82.7 ± 6.1) was higher than both supine and T-I MAP. RR-interval decreased from supine (937.7 ± 80.2) to T-I (772.9 ± 100.9) and from T-I to T-II (724.0 ± 83.3). SDNN dropped from supine (77.0 ± 34.8) to T-I (59.7 ± 27.8) but did not change significantly between T-I and T-II (55.1 ± 21.0). From supine to T-I, the change in SDNN was not related to either SBP or MAP. These results suggest that the initial changes (T-I) during upright tilt are mediated by a withdrawl of parasympathetic control and a sympathetic drive that persist later (T-II) into the normalization process. However, the lack of association between changes in MAP and SDNN suggests inter-individual variation that makes it difficult to predict changes in modulation of the heart from the initial pressure change during upright tilt.

VALIDATION OF A PREDICTION EQUATION FOR MAXIMAL HEART RATE OF DEEP WATER RUNNING

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O38

The purposes of this study were to compare heart rate (HR) and rate of perceived exertion (RPE) responses of a Deep Water (DW) and Dry Land Treadmill (TM) maximal exercise test and to compare a traditional method of calculating max HR, 220 - age, (TMP) to a suggested method of calculating DW max HR, 200 - age, (DWP) in an attempt to validate the DWP equation. Eight subjects (age=21.0±3.4 yrs;ht=173.1±10.5 cm;wt=69.5±16.0 kg) performed both a DW & TM max test to volitional fatigue in a randomized order. HR & RPE responses were recorded every minute of both tests. A repeated measures ANOVA was performed on all data. Significant differences ($p<.05$) were found between measured max HRs (TM=195.3±5.8;DW= 179.6±8.5), and between TMP & DW max HR(196.0±4.3;179.6±8.5). Measured TM & DW HRs when RPE=13, 15 and 17 were also found to be significantly different ($p<.05$). No significant difference ($p>.05$) was found between DWP & DW HR(179±3.4;179.6±8.5). Additionally the HRs at which RPEs=13, 15 & 17 occurred were converted to a percentage of actual max HR (HR%). No significant differences ($p>.05$) were found for HR% when RPE=13 (TM=90.9±3.5; DW=88.1±6.2), RPE=15 (TM=94.3±2.9;DW=92.4±5.0) or RPE=17 (TM=97.6±1.3; DW=97.6±3.6). These results indicate that there is no significant difference between RPEs when compared as a percentage of max HR between DW & TM. Also 200 - age may be a better predictor of DW max HR than 220 - age and may be more accurate for calculating target heart zones when participating in DW running.

INVESTIGATION OF A PRACTICE EFFECT AND INTERTRIAL CONSISTENCY FOR THE WINGATE ANAEROBIC TEST

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O39

The purposes of this study were to (a) investigate the presence of a testing effect and (b) to test for inter-trial consistency of performance on the Wingate Anaerobic Test (WAnT). Subjects were young adult males (n = 31, mean age 20 yr.). Subjects performed a total of three trials of the WAnT. Trial I was a practice session, including a full administration of the WAnT. Trials II and III were administered one week following Trial I, and were separated by a 10-minute rest period. Mean Peak Power (PP) and Mean Power (MP) for Trials I and II were compared using Fisher's LSD. Fisher's LSD was also used to test the mean differences between Trials II and III. An intraclass correlation coefficient (ICC) from a one-way repeated measures ANOVA was used to estimate the inter-trial reliability of trials II and III. Results indicated that subjects had a significantly higher ($p < .05$) mean PP and MP score on Trial II than on Trial I, indicating a practice effect occurred. Mean MP score for Trial II was significantly ($p < .05$) higher than Trial III, but a marginally non-significant mean difference existed for PP. Inter-trial consistency for Trials II and III was high for PP (ICC = .86) and MP (ICC = .87). ICC adjusted for a single trial was 0.75 for PP and 0.77 for MP. It was recommended that, due to the occurrence of a practice effect, a full practice test should be given prior to any intended use of the WAnT. Following a practice session, the average of two trials of the WAnT should be used if a highly reliable measure of anaerobic power is desired.

PREDICTIVE ABILITY OF THE YMCA CADENCE BENCH PRESS TEST AND THE SELF-DETERMINED BENCH PRESS TEST

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O40

Perhaps the most popular measure of upper body strength is the one repetition maximum (1RM) bench press test. However, this test may carry an increased risk of injury compared to submaximal bench press tests. The purpose of this study was to compare the effectiveness of two submaximal bench press tests at predicting 1RM bench press performance. Thirty college-age males with recreational weight training experience ($\bar{X}$ = 6.12 yr.) attended three testing sessions each separated by one week. Session I consisted of a 1RM test, while sessions II and III were counterbalanced between a cadence (YMCA) and self-determined rate (BPR) test. The YMCA test was performed with an 80 lb. barbell at a cadence of 30 lifts per minute, until muscular failure. The BPR test involved a self-selected barbell load, self-determined exercise cadence, and muscular failure between one and 10 reps. Results from a simple linear regression analysis revealed that scores on the BPR test used in conjunction with the Brzycki Equation were more effective for predicting 1RM bench press performance ($r^2 = .96$; SEE = 11.26 lb.) than scores on the YMCA test ($r^2 = .45$ and .76, depending on inclusion/exclusion of outliers; SEE = 44.05 lb. and 29.08 lb., respectively). Additionally, the slope and intercept for the Brzycki-predicted 1RM were not significantly ($p > .05$) different from 1 and 0, respectively. The higher predictive ability of the BPR test makes it the more suitable test, particularly for weight trainers with some experience. The YMCA Test may be an acceptable alternative for novice weight trainers.

EFFECT OF CARBOHYDRATE ENERGY SUBSTRATE AND HORMONAL REGULATION ON RATINGS OF PERCEIVED EXERTION DURING PROLONGED RUNNING AND CYCLING.

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041

Objective and Methods: This randomized, double-blind, placebo-controlled study was designed to determine the influence of exercise mode, and 6% carbohydrate (C) versus placebo (P) beverage ingestion, on ratings of perceived exertion (RPE) and hormonal regulation to 2.5 h of high-intensity running and cycling (~75% VO_{2max}) by 10 triathletes who acted as their own controls. Statistical significance was set at $P \leq 0.05$. **Results:** The pattern of change in RPE over time was significantly different between C and P ingestion ($P<0.001$) and between running and cycling modes ($P=0.001$). The lowest RPE values were seen in the C-cycling sessions and the highest in the P-running sessions. The pattern of change in the respiratory exchange ratio and fat and carbohydrate oxidation rates were significantly different between the C and P conditions but not between the running and cycling modes. C relative to P ingestion (but not exercise mode) was associated with higher plasma levels of glucose and insulin and lower plasma cortisol and growth hormone levels. The pattern of change in plasma catecholamines and lactate did not differ between the C and P conditions.**Conclusion:** These data indicate that a lower exertional perception was associated with a higher carbohydrate oxidation, a higher plasma glucose and insulin levels, and lower plasma cortisol and growth hormone levels during cycle exercise following C supplementation as compared to P feeding. These finding supports a physiological link between the perception of exertion and carbohydrate substrate availability as well as selected hormonal regulation.

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TESTING AN URBAN LEGEND - DOES ANKLE CIRCUMFERENCE PREDICT JUMP HEIGHT?

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042

The purpose of this study was to examine the contention that ankle circumference can predict maximal vertical standing-jump height. The urban legend that vertical jump height in sports can be estimated by observing the narrowness of the leg (the area just above the ankle) persists. To determine if this was true, 64 females and 23 males (mean age = 21.9y) were recruited from general physical education classes for the jump test. Besides height (cm) and weight (kgs as an expression of mass), other anthropometric measures were taken with a tape measure: thigh length (TL), leg length (LL), foot length (FL), thigh circumference (TC), leg circumference (LC), and ankle circumference (AC). TC and LC were taken at the widest aspects of the thigh and the leg while AC was taken at the narrowest part of the leg above the ankle. After measures were taken and following a brief warm-up (50m jog and stretching) each subject performed three maximal bare-foot standing vertical jumps (JH) measured against a Vertex. Statistical analysis by ANCOVA, regression analysis (both adjusted for gender), and correlational analysis failed to reveal any association between anthropometric measures (including AC) and JH. The results from this study do not support the urban legend that ankle circumference, or other selected anthropometric measures, can predict jump height; it is a myth.

RELATIONSHIP BETWEEN BLOOD LIPIDS AND BRACHIAL ARTERY FLOW-MEDIATED DILATION IN NORMOCHOLESTEROLEMICS

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043

The deleterious effects of hyperlipidemia on flow-mediated dilation (FMD) are well recognized and appear to be concentration dependent. However, the relationship between blood lipids and brachial artery FMD in normocholesterolemics is not well understood. The objective was to examine brachial artery FMD following forearm occlusion in 17 normocholesterolemics (Age:38±12yrs; range: 22-57). High-resolution ultrasonography (Toshiba PowerVision 7000) was used to measure brachial artery diameters prior to and immediately following 5 min. of forearm occlusion, and still images of the vessel in diastole were analyzed using Image-Pro Plus software (Media Cybernetics). Each subject was tested following a 12 hr fast, and after 15-min. rest in a supine position. Vessel diameter increased from 3.45±0.83mm at base to 3.66±0.86 mm (p= 0.0001) at peak, within 2 min. of release (8.17% increase, range -1.95 to 15.97%). Based on the NCEP classification blood lipids were in the desirable range (see table). Pearson's product moment correlation coefficient for peak change in vessel diameter and serum lipids indicated significance for TC/HDL (r=-0.521 (p=0.03) and LDL/HDL (r=-0.546 (p=0.02).

	n	RANGE	MIN	MAX	MEAN	sd	r	p
TC	17	92.00	121.00	213.00	168.12	21.97	-0.005	0.98
HDL	17	51.00	39.00	90.00	58.68	15.41	0.440	0.07
LDL	17	56.00	64.00	120.00	93.82	16.09	-0.344	0.17
TRIG	17	147.00	28.00	175.00	74.65	42.39	-0.201	0.44
TC/HDL	17	2.46	2.15	4.62	2.99	0.66	-0.521	0.03
LDL/HDL	17	1.85	1.02	2.87	1.70	0.52	-0.546	0.02

These results suggest that even in normocholesterolemics the degree of brachial artery FMD is in part dependent on the balance between blood lipids.

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THE EFFECT OF VOLUNTARY FATIGUE ON THE INVOLUNTARY MUSCLE ACTIVITY OF SELECTED ARM MUSCLES

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044

Reflexes are actions that serve to protect and stabilize the human body. Fatigue is a result of the body exhausting its readily available reserve of fuel that enables the muscle to work. It is not clearly understood how skeletal muscle reflexes are affected when the body reaches a state of fatigue. The purpose of this study was to investigate the effect of fatigue on the reflexive responses of the biceps brachaii, triceps brachaii, and the brachialis. Eighteen male Division I football players volunteered to be the subjects in this study. The subjects completed six trials of the study. Each trial consisted of the subject holding a 5 pound weight via a rope and handle. The subjects had to react to the unannounced drop of the weight. The weight dropped 20 centimeters, causing a rapid elbow extension. Average mean muscle activity of the muscles were recorded along with joint angle displacement and joint angle acceleration. Muscle activity did not change ($F(5,85)=0.92$, $p=0.48$), nor did joint acceleration($F(5,85)=1.18$, $p=0.33$), or angular displacement ($F(5,85)=0.89$, $p=0.49$). It is possible that the results may have been influenced by failure to reach peripheral fatigue, biochemical changes in the muscle, the methodology of the test, and differences in the subject pool. Which may indicate that in the latter halves of athletic events when the number of injuries seems to increase, this may not be due to a lag in the reflexive action of the muscles resulting from fatigue but rather a delay in the cognitive processes of the individual.

O45

EXERCISE INCREASES CAPILLARITY, BUT NOT bFGF CONTENT IN OCCLUDED MUSCLE

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Peripheral Arterial Insufficiency (PAI) limits exercise capacity due to compromised delivery of blood to working skeletal muscle. Exercise training has been found to improve blood flow and functional capacity in PAI afflicted muscle. Similar effects have been documented with administration of exogenous basic Fibroblast Growth Factor (bFGF), a potent angiogenic cytokine. The purpose of this investigation was to determine: 1) whether exercise training increased the expression of endogenous bFGF in muscle with PAI, and 2) if such changes were coupled with enhanced capillarity. Femoral arteries of male Sprague-Dawley rats (~325 g) were ligated to impair exercise-induced hyperemia. Rats then either remained sedentary, or ran on a treadmill 4 times/day. Sedentary and trained rats were euthanized following 1, 2, 3, 5, or 7 days of treatment. Fast-twitch, white (type IIb) muscle sections from the gastrocnemius were analyzed for capillarity (contacts/fiber) and bFGF content. Histochemical results indicated that 7 days of training significantly ($P<0.05$) enriched capillarity. However, western blot analysis failed to detect training-induced modifications in endogenous bFGF content. It appears that while exercise stimulates neovascularization in occluded skeletal muscle, this effect is independent of changes in the expression of bFGF.

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O46

EFFECTS OF CRYOTHERAPY ON GROUND REACTION FORCES AND MUSCLE ACTIVITY DURING A FUNCTIONAL MOVEMENT

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Cryotherapy is a therapeutic modality commonly used to treat athletes before, during, and after physical activity. The vertical jump represents a sport-specific task that can be used to estimate an athlete's ability to produce lower extremity functional strength. The aim of our research was to apply a standard 20-minute ice bath immersion to the leg at 10°C to determine if cryotherapy altered vertical ground reaction forces and the EMG activity of the gastrocnemius, tibialis anterior, rectus femoris, vastus lateralis, and semitendinosus during a one-legged vertical jump. Fifteen physically active subjects performed one-legged vertical jumps with their preferred extremity. Each subject completed 25 jumps (5 prior to cryotherapy treatment and 20 post treatment) with a 1 minute rest between each. The 25 jumps were reduced into 5 average trials and evaluated. Peak vertical ground reaction force, average muscle activity, peak muscle activity, and time-to-peak muscle activity were measured. Cryotherapy treatment did not affect peak vertical ground reaction force ($P>0.05$) or peak activity of each muscle during the jumps ($P>0.05$). Average muscle activity ($P<0.05$) and time-to-peak muscle activity ($P<0.05$) in the thigh muscles increased immediately following cryotherapy and these measurements returned to normal within the 20 minute post-treatment session. It is possible peak vertical ground reaction forces are uneffected due to motor programming or acclimation while average and time-to-peak muscle activity changes resulted from proprioceptive compensatory mechanisms. Finally, it seems that cryotherapy application prior to functional activity has no detrimental effect.

O47

DELAYED ONSET MUSCLE SORENESS IS ASSOCIATED WITH IMPAIRED MAXIMAL MUSCLE TENSION, BUT NOT ELECTRICAL ACTIVATION

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Delayed onset muscle soreness (DOMS) is commonly experienced following unaccustomed muscular exertion. It has been established that DOMS is characterized not only by discomfort, but also by impaired muscle performance. However, the cause(s) of this decrement have yet to be clearly defined. The objective of the this study was to ascertain whether the reduction in maximal muscle force typically displayed with DOMS was associated with alterations in the electrical activation of the involved musculature.

Nine healthy, untrained men (20.9 ± 1.0 yr, 174.8 ± 2.0 cm, 72.3 ± 6.1 kg; mean ± SE) served as subjects. Maximal isometric muscle force, electrical activation via electromyography (EMG) of the 3 surface heads of the quadriceps, and subjective evaluations of soreness of those muscles were quantified prior to, and for 1, 2, 3, 5, 7, and 10 days following a DOMS inducing series of concentric/eccentric contractions. Results indicate that significant ($P<0.05$) soreness of the quadriceps occurred 1, 2, and 3 days following unaccustomed exertion. Peak and total isometric torque were significantly ($P<0.05$) attenuated 1, 2, 3, and 5 days after the DOMS evoking event. In contrast, EMG data, averaged among the 3 muscles examined, failed to demonstrate significant alterations at any time during the investigation. These data suggest that the diminution of muscle force observed with DOMS is not related to disturbances in the capacity to electrically activate the affected muscle mass.

O48

MONITORING THE EFFECTS OF VASOACTIVE COMPOUNDS ON SKELETAL MUSCLE NUTRITIVE FLOW USING MICRODIALYSIS

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Nutritive flow is that flow which allows for, and affects, nutrient exchange within skeletal muscle, and consists primarily of changes in local capillary blood flow, but is also comprised of changes in interstitial fluid volume and lymph flow. We investigated, using the microdialysis ethanol technique, the response of nutritive flow within skeletal muscle to vasoactive substances that affect nitric oxide release and/or action. Nine healthy male subjects (31±6 yrs) participated in this study. Four microdialysis probes were placed in the vastus lateralis of the quadriceps femoris muscle group and perfused with a Ringer solution containing 10 mM ethanol and three successively higher doses of sodium nitroprusside (SN), acetylcholine (AC), N^G-monomethyl-L-arginine (LN), norepinephrine (NE), or no additional substance (control). Data obtained with the ethanol technique are expressed as the ethanol outflow/inflow ratio (o/i ratio), which is inversely related to changes in local nutritive flow. The ethanol o/i ratio was decreased as compared to control (indicating increased nutritive flow) in response to SN and AC. The ethanol o/i ratio was increased as compared to control (indicating reduced blood flow) in response to NE and LN (Table 1: data expressed as % difference from control and are mean ± SE). These data indicate that the microdialysis ethanol technique can be used in vivo in humans to investigate the effects of nitric oxide on the microvasculature of skeletal muscle.

AC1	AC2	AC3	SN1	SN2	SN3	NE1	NE2	NE3	LN1	LN2	LN3
-10.7	-8.7	-18.2	-11.6	-15.6	-19.6	16.3	13.8	3.5	7.9	8.2	5.1
6.5	*5.2*	*2.5*	*6.0*	*5.2*	*7.4*	*8.6*	*10.1*	*4.4*	*9.0*	*8.1*	*9.3*

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THE EFFECTS OF GLYCOLYTIC METABOLITES ON SACROPLASMIC RETICULUM Ca^{2+} HANDLING.

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O49

Many suggest that skeletal muscle fatigue occurs secondary to alterations in excitation-contraction coupling (ECC). Some studies suggest that increases in intracellular metabolite concentrations may contribute to alterations in sacroplasmic reticulum (SR) function which, in turn may adversely affect ECC. We sought to examine the effects of various glycolytic metabolites on isolated SR Ca^{2+} handling. Using rat gastrocnemius muscles, heavy and light fractions of SR were isolated (HSR, LSR). Ca^{2+} uptake and release were then measured in the presence of 5 mM glucose, 5 mM glucose 1-phosphate, 5 mM glucose 6-phosphate (G-6-P), 5 mM fructose 6-phosphate, 1 mM pyruvate and 25 mM lactate, concentrations representative of those found in skeletal muscle during repetitive exercise. Ca^{2+} uptake rates (in $nmol \cdot mg^{-1} \cdot min^{-1}$) in the LSR, were significantly reduced by G-6-P (19.23±3.211) and lactate (32.874±1.861) compared to control (39.852 ±1.565), whereas the other metabolites had no effect. Ca^{2+} release rates (in $nmol \cdot mg^{-1} \cdot min^{-1}$) in the HSR, which were initated by 25 μM $AgNO_3$, were significantly reduced by G-6-P (41.286±2.721), pyruvate (64.851±3.652) and lactate (61.879±1.65), when compared to the non-treated HSR (80.321±1.033). In addition, Ca^{2+} uptake and release amounts (in $nmol \cdot mg^{-1}$) were reduced to 40.366±4.088 and 38.281±3.662, respectively, in the presence of G-6-P, when compared to control amounts 91.321±4.826 and 83.327±2.026. These results suggest that some glycolytic metabolites, which accumulate during muscular activity effect SR Ca^{2+} handling and may play an important role in the alterations in ECC during muscle fatigue.

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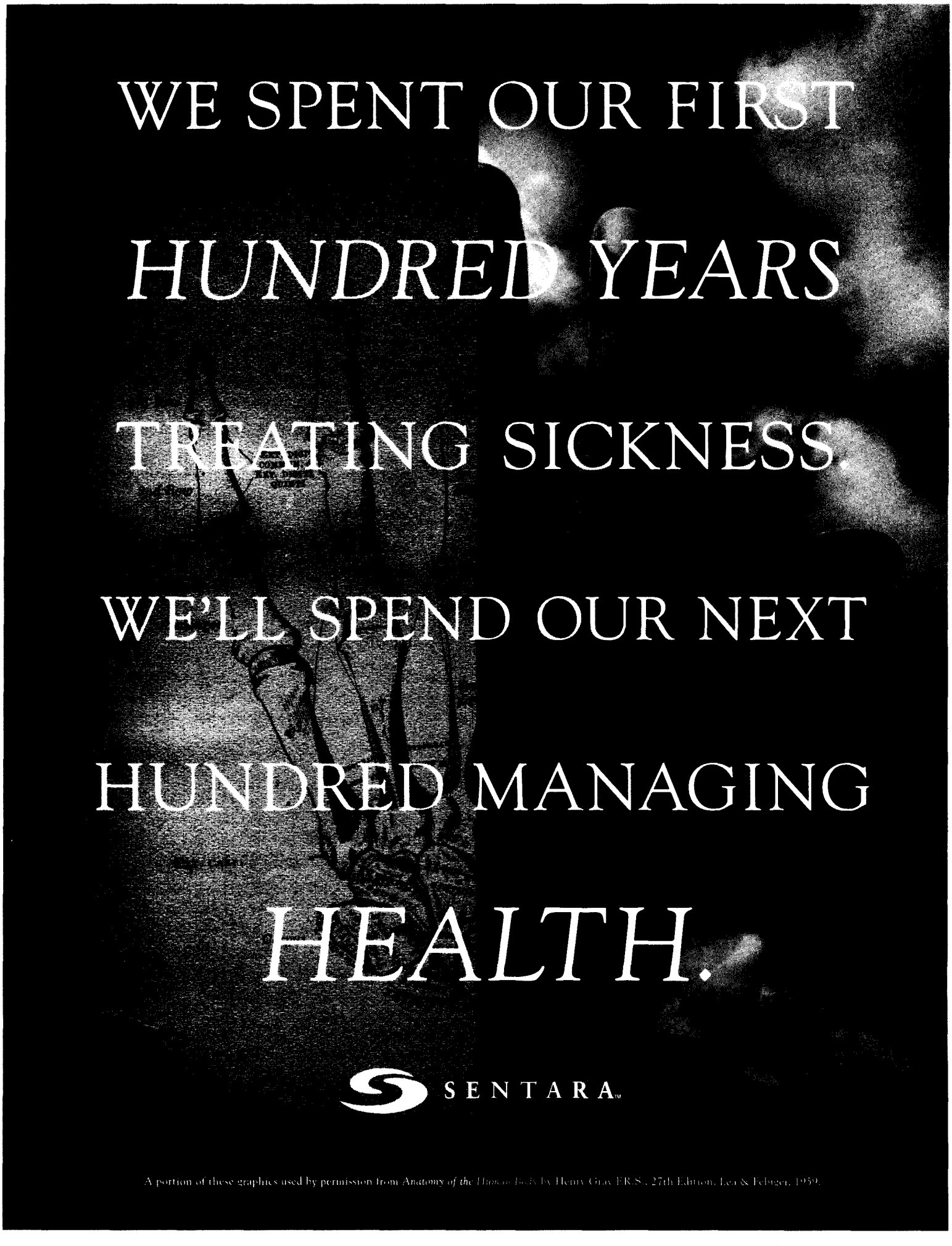
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