

**Southeast  
Chapter of the  
AMERICAN COLLEGE  
OF SPORTS MEDICINE**

**annual meeting**

**Jan. 31 — Feb. 2, 1985  
Appalachian  
State University  
Boone, North Carolina**



**CONFERENCE  
ABSTRACTS**

**Twelfth Annual Meeting**  
**Southeastern Regional Chapter of the**  
**AMERICAN COLLEGE OF SPORTS MEDICINE**

**annual meeting**

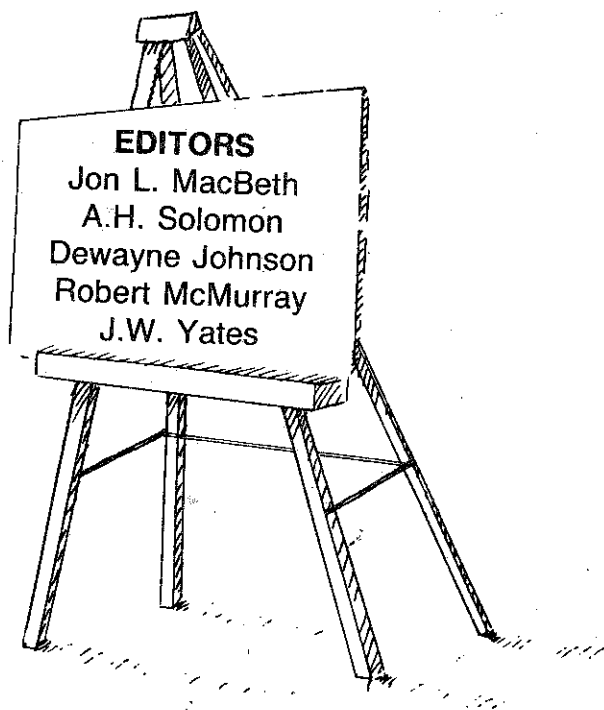
**January 31 — February 2, 1985**  
**Appalachian State University**  
**Boone, North Carolina**

**Free Communications**  
**Poster Presentations**  
**Lab Tours**

**Symposia**  
**Workshops**  
**Mini-Sessions**

**SEACSM OFFICERS**

**President** — Christian Zauner  
**Past President** — Kirk Cureton  
**President Elect** — Robert McMurray  
**Executive Secretary** — Ron Bos



**CONFERENCE ABSTRACTS**

is published by the  
Health, Physical Education, Recreation and Safety Department  
Middle Tennessee State University  
Murfreesboro, Tennessee 37132

# ANNUAL MEETING PROGRAM

## SOUTHEAST CHAPTER

### AMERICAN COLLEGE OF SPORTS MEDICINE

#### SEACSM PROGRAM

Thursday Jan. 31

- 1:00 - 7:00 pm Registration Buffet Area
- 7:00 Broyhill Auditorium  
Welcome (Vaughn Christian, Appalachian State University)  
Comments on schedule (Robert McMurray, President-Elect)  
Introduction of candidates and open nominations  
(Christian Zauner, President SEACSM)
- 7:15 Keynote Address - Carl Gisolfi, University of Iowa,  
President-Elect American College of Sports Medicine  
"The Challenge of Exercising in the Heat"  
Introduction by Dr. Christian Zauner
- 8:30 Social Bernhardt & Duggins Lounges

Friday Feb. 1

- 8:00-12:00 Registration
- 8:30-11:45 Workshops
1. Simple Assessment of Body Composition Broyhill A  
Dr. Dave Kaufmann - Physical Education Dept.,  
University of Florida  
Dr. Harvey Murphy - Physical Education Dept.,  
University of North Carolina at Charlotte
  2. Injury Assessment Boren Room  
Dr. William Prentice - Coordinator Athletic  
Training Program, University of North Carolina at  
Chapel Hill
  3. Interfacing Your Apple Computer with the Laboratory  
World Jefferson Room  
Dr. Richard N. Godsen - Physical Education Dept.,  
College of Charleston
- 8:30-10:00 Dialogues I
1. Stress Testing for Apparently Healthy Broyhill B,C,D  
Introduction by Dr. Harry DuVal  
Speakers:  
Dr. Rankin Cooter - Physical Education Dept.,  
Georgia State University  
Dr. David Cundiff - Physical Education Dept.,  
University of Southern Mississippi  
Dr. Dalynn Badenhop - Charlotte Institute for  
Health Promotion Inc.
  2. Controversy in Sports Nutrition Broyhill E,F,G  
Introduction by Dr. Diane Spitler  
Speakers:  
Dr. Terry Bazarre - Nutrition Dept., University of  
North Carolina - Greensboro  
Jeane Crane - Nutrition Dept., University of North  
Carolina - Greensboro  
Len Marquart - Nutrition Dept., University of North  
Carolina - Greensboro
- 10:00-10:30 Refreshments Buffet Area
- 10:30-12:00 Dialogues II
1. Stress Testing for Cardiacs Broyhill B,C,D

Introduction by Dr. J.W. Yates

Speakers:

Dr. Paul Ribisl - Physical Education Dept., Wake Forest University

Dr. William Herbert, Physical Education Dept., Virginia Tech

2. Weight Control and Nutrition Boryhill E,F,G

Introduction by Dr. John Billing

Speakers:

Dr. Janet Walberg - Division of HPER, Virginia Tech

Dr. Diane Ward - Physical Education Dept., University of South Carolina

Dr. R. Sargent - Nutrition Dept., University of South Carolina

Mr. Robert Wright - Sea Pines Behavioral Institute

Dr. Terry Bazzarre - Nutrition Dept., University of North Carolina - Greensboro

12:00-1:30 Lunch on own

1:30-2:30 Tutorials: Section A

1. Protein Nutrition for the Athlete Broyhill A

Introduction by Dr. Robert McMurray

Speaker:

Dr. G. Lynis Dohm - Medical School, East Carolina University

2. Role Modelling in Health Promotion: A National Health Training Grant

Broyhill B,C,D

Introduction by Dr. John Billing

Speakers:

Dr. John Douglas - Dept. of Sports & Leisure Studies, University of Connecticut

Dr. Priscilla Douglas - Dept. of Allied Health Professions, University of Connecticut

3. Relationship of the Vasti Muscles to Knee Injury Northwestern Room

Introduction by Dr. Dan Joyce, MD

Speaker:

Dr. Barney LeVeau - Physical Therapy Dept., University of North Carolina - Chapel Hill

4. Guidelines for Counseling Clients When Using the Body Composition Approach to Desirable Weight

Broyhill E,F,G

Introduction by Dr. Diane Spitler

Speakers:

Dr. Phillip B. Sparling - Physical Education Dept., Georgia Institute of Technology

Grace Wilson - Physical Education Dept., Georgia Institute of Technology

Debbie Robinson - Physical Education Dept., Georgia Institute of Technology

2:30-2:45 Break

2:45-3:45 Tutorials: Section B

1. Heat Abnormalities and Thermoregulation

Broyhill B,C,D

Introduction by Dr. Christian Zauner

Speaker:

Dr. Emily Haynes - Physical Education Dept.,  
Florida State University

2. Biomechanical Considerations in the Design and Selection of a Running Shoe. **Northwestern Room**  
Introduction by Dr. J.W. Yates

Speaker:

Dr. Stephen Messier - Physical Education Dept.,  
Wake Forest University

3. Exercise and Lipid Metabolism **Broyhill A**  
Introduction by Dr. Robert McMurray

Speaker:

Dr. J. Larry Durstine - Physical Education Dept.,  
University of South Carolina

4. Marketing Wellness Programs: An Introduction to Smokeless and Managing Stress **Broyhill E,F,G**  
Introduction by Dr. Kirk Cureton

Speaker:

Jan A. Wagoner - Iredell Memorial Hospital,  
Statesville, NC

3:45-4:15 Refreshments Buffet Area

4:15-5:15

1. Behavioral Barriers to Physical Fitness  
**Broyhill E,F,G**

Introduction by Dr. Harry DuVal

Speaker:

Dr. Rod Dishman - Physical Education Dept.,  
University of Georgia

2. Sports Medicine and the NCAA **Broyhill B,C,D**  
Drug Abuse

Introduction by Dr. Ron Bos

Speakers:

Dr. Carl Blyth - Chair, Drug Education & Special  
Drug Testing Committees of the NCAA, University  
of North Carolina-Chapel Hill

Catastrophic Injury in Sport

Dr. Fred Mueller - Physical Education Dept.,  
University of North Carolina-Chapel

3. Introductory ECG Interpretation for Exercise  
Physiologist **Broyhill A**

Introduction by Dr. J.W. Yates

Speaker:

Dr. Michael Payne, MD - Internal Medicine, Adjunct  
Faculty, Virginia Tech

5:30-7:00 Poster presentations with authors

**Boren Room**

A Comparison of the Bioelectrical Impedance  
Technique with Underwater Weighing and Skinfold  
Methods for Predicting Percent Body Fat

J.F. Smith, P.A. Bishop, & J.L. Bonner - University  
of Alabama

Validation and Reliability of a Computerized  
Hydrostatic Weighing System

M.L. Roccio and B.A. McClenaghan - University of  
South Carolina

Association of Upper Arm Circumference Measures  
With Muscle-Thickness Sonograms of the Anterior and  
Posterior Upper Arm in Young Children

L. W. Weiss - Georgia Southern College

Validation of Hydrostatic Weighing Without Head  
Submersion

T.E. Brown, R.G. Israel, J.E. Donnelly & K.F.  
O'Brien - East Carolina University and Kearney  
State College

Skinfold and Percent Body Fat Differences between  
Black and White Male Soldiers

R.E. Keith and K.P. Hobson - Auburn University  
Health-Related Physical Fitness in Type I (Insulin  
Dependent) Diabetic Youth

W.G. Hornsby and K.M. Spicer - Medical University  
of South Carolina

#### **Burris Room**

The Relationship Between Perceptual Style and  
Accuracy of Perception of Physical Effort

M. Mangum and E.G. Hall - Louisiana State  
University

The Effects of MCT Oil and a Glucose Polymer on  
Endurance Performance

B.L. Orr, J.L. Walberg, E. Clegg & F. Thye -  
Virginia Tech University

Effects of Caffeine Ingestion on Skin Temperature,  
Respiratory Quotient and Work Performance in Endurance  
Athletes

R.H. Slade and C.W. Zauner - University of Florida  
Maximum Physiological Responses of Triathletes

During Cycle Ergometer and Treadmill Exercise

M.L. Millard, K.J. Cureton, J.T. Farris & C.A. Ray  
- University of Georgia

Effect of Sodium Bicarbonate on Male and Female  
Anaerobic Performance

W. Burgess, P.E. Smith, M.L. Rocchio, & J.M. Davis  
- University of South Carolina

The Kinetics of Respiratory Gases and Ventilation  
During Submaximal Constant Load Work

M.J. Berry, T. Moritani, & D.W. Bacharach - Texas  
A&M University & University of North Carolina  
Chapel Hill

#### **Jefferson Room**

The Effect of the Full Squat Exercise on Knee  
Stability

J. Chandler, D. Wilson, M. Stone, J. McMillan -  
Auburn University

Selected Myoelectric Activity Differences in Skilled  
and Unskilled Female Dancers

P. McGrain, D. Emerson, & J. La Pointe - University  
of North Carolina-Chapel Hill

Effects of High Frequency Electrical Stimulation on  
Dynamic Strength of Normal Quadriceps

Ian B. Pyka - University of Tennessee

Heart Rate and Lactate Response in Trained and

Untrained Young Males During Resistive Exercise

M.H. Stone, K. Pierce, R. Godsen, R. Rozenek, G.D. Wilson, & D. Blessing - Auburn University

The Effect of Acute Thermal Dehydration on Isokinetic Muscular Endurance

A. Caterisano, R.T. Murphy, V.J. Gonino, T. Druge, M. Fiengo and D.N. Camaione - University of Connecticut & Furman University

Oxygen Uptake Response of Older Women to a Tethered Swim

K. Moracco - University of North Carolina-Greensboro

Physiological and Perceptual Responses to Lower Extremity Isokinetic Exercise

M. Marconyak - Old Dominion University

7:00-on Free

Sat Feb 2

8:00-10:00 AM

Orthotics and Sports Injuries Carolina Freight Room

Introduction by Dr. Dan Joyce, MD

Speaker:

Dr. Richard Schuster, Podiatrist - Merritt Island, Fla

8:00-9:00 AM Free communications

HEMO-PHYSIOLOGY Broyhill A

Introduction by Dr. Diane Spitler

Speakers:

1. Plasma Volume Shift During Heavy-Resistance Weight Lifting  
M.A. Collins, D.W. Hill, J.J. DeMello, & K.J. Cureton - University of Georgia
2. Acute Effects of Various Exercise Intensities on Hemolytic Blood Parameters  
B. Miller, L. Rocchio, B. Burgess & J.M. Davis - University of South Carolina
3. Effects of a 450 ml Blood Loss During Submaximal Endurance Exercise in Man  
J.A. Sulentic, L.H. Getchell, & D.O. Eddy - Ball State University
4. Effect of Marathon Running on Plasma Indicators of Trauma  
L.J. Goodyear, D. VanHouten, E. Dover, J. Durstine - University of South Carolina and The Nike Sport Research Lab

METABOLISM Broyhill B,C,D

Introduction by Dr. Robert McMurray

Speakers:

1. Changes in Urinary 3-Methylhistidine/Creatine Ratio in Human Subjects after Strenuous Exercise  
G.L. Dohm, R.G. Israel, R.L. Breedlove - East Carolina University & E.W. Askew - Tripler Army Medical Center
2. The Effects of High Fat Diet and Exercise on Lipoprotein Lipase  
D.S. Myers, D. VanHouten, J.M. Davis, & J.L.

- Durstine - University of South Carolina
3. Different Intensity Exercise Bouts and their Effect on Plasma High-Density Lipoprotein Cholesterol Subfractions  
J.E. Rasnake and J.L. Durstine - University of South Carolina
  4. Lipoprotein Cholesterol in Response to a High Fat Diet and Acute Exercise  
D.R. Van Houten, D.S. Myers, M.L. Rocchio, P.E. Smith, & J.L. Durstine - University of South Carolina

**OBESITY Broyhill E,F,G**  
Introduction by Dr. Ron Bos  
Speakers:

*Mrs DeLozier  
Messen Shaw + Israel  
Susan & Mike McCammon  
E. Carolina*

1. The Effects of Large Weight Loss Following Gastric Bypass Surgery on General Well-Being and Physical Self-Efficacy  
*Richard* M.R. McCammon, *Susan* R.G. Israel, *Mike* S.L. McCammon, *Michelle* M.G. DeLozier - East Carolina University, & *Robt.* F.A. Shaw - East Carolina School of Medicine
2. The Effect of a Partnership Program on Adherence and Success During Weight Reduction  
K. Higgins, J. Walberg, & C. Baffi - Virginia Tech University
3. Resting Metabolic Rate (RMR) in Obese Zucker Rats: Effects of a High Fat Diet and Exercise  
*MARK* J.M. Davis, M.L. Lambert, & J.L. Durstine - University of South Carolina
4. Resting Metabolic Response to Short-Term Caloric Deprivation  
*Diane* D.S. Ward, M.L. Rocchio, *MARK* J.M. Davis, S. Sadri, R. Sargent, & J. Schumacher - University of South Carolina

*Mark Davis  
Lambert & Durstine*

*(Signature)*

9:00-10:30 Symposium

*Diane Ward  
Rocchio  
Davis  
Sadri  
Sargent  
Schumacher*

1. Respiration and Exercise **Integon Room**  
Dr. Scott Powers - Physical Education Dept., Louisiana State University  
Dr. Robert McMurray - Physical Education Dept., University of North Carolina at Chapel Hill  
Dr. Micheal Berry - Physical Education Dept., University of North Carolina at Chapel Hill
2. Perceived Exertion **Rankin-Daniels Room**  
Introduction by Dr. John Billing  
Speakers:  
Dr. Charles Hardy - Physical Education Dept., University of North Carolina at Chapel Hill  
Dr. Jack Rejeski - Physical Education Dept., Wake Forest University
3. Are GXT Protocols for Cardiac Patients Supramaximal? **Carolina Freight Room**  
Introduction by Dr. Harry DuVal  
Speakers:  
Dr. Edward T. Howley - Physical Education Dept.,



University of Tennessee  
A. Daniel Martin - Physical Education Dept.,  
University of Tennessee  
Randall Claytor - Physical Education Dept.,  
University of Tennessee

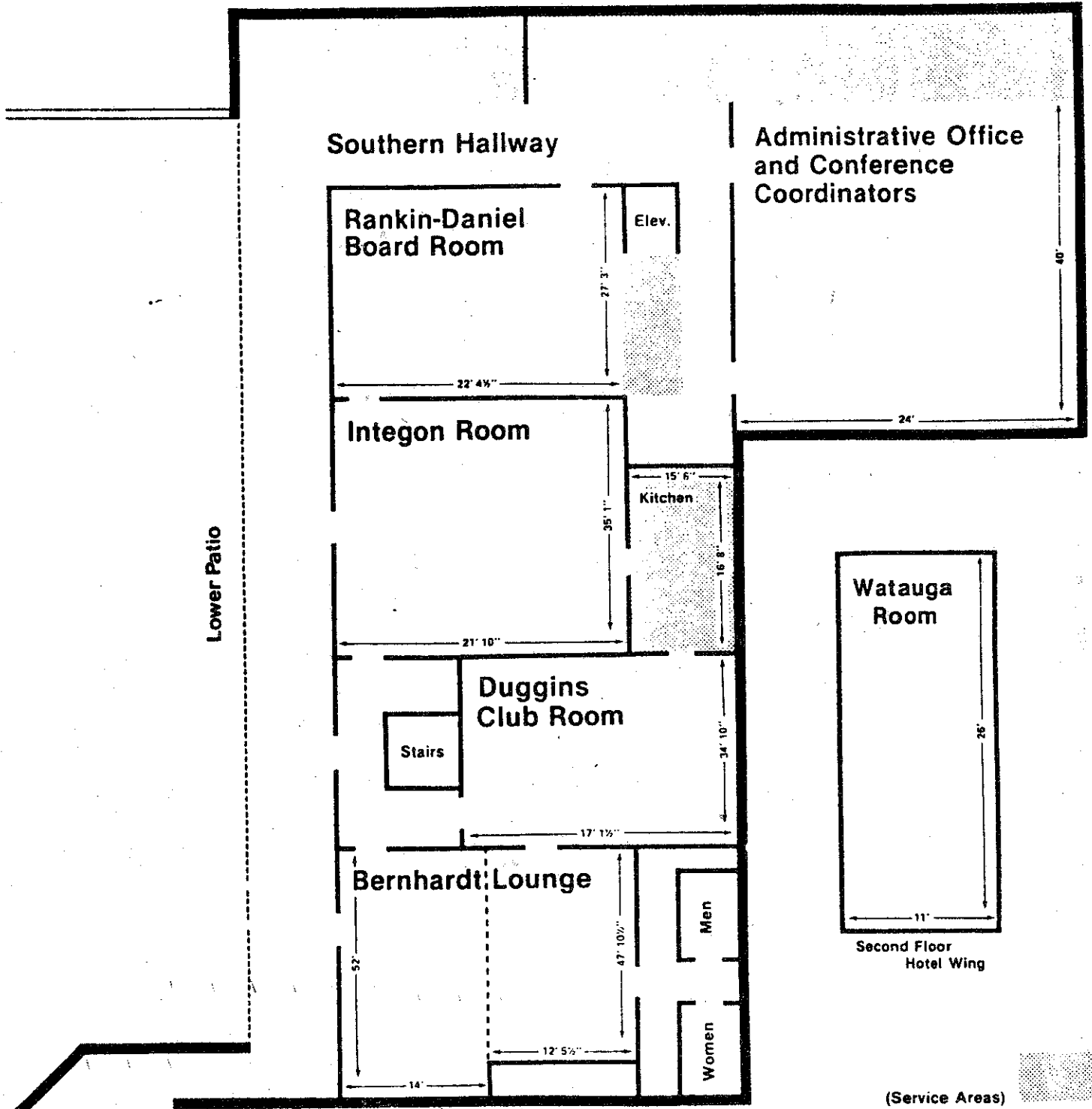
4. Fluid Replacement during Exercise Northwestern Room  
Introduction by Dr. Christian Zauner

Speaker:

Dr. Robert Cade - Department of Medicine,  
University of Florida Medical School

10:30-11:00 Refreshments Buffet Area -  
11:00-11:30 Business Meeting Broyhill Auditorium  
11:30-12:15 Luncheon Featured Speaker Broyhill Auditorium  
George Pfeiffer, The Center for Corporate Health  
Promotions; President, Association for Fitness in  
Business  
"Corporate Fitness: A Look to the Future"  
Introduction by Dr. Christian Zauner  
12:15 Luncheon Broyhill Auditorium

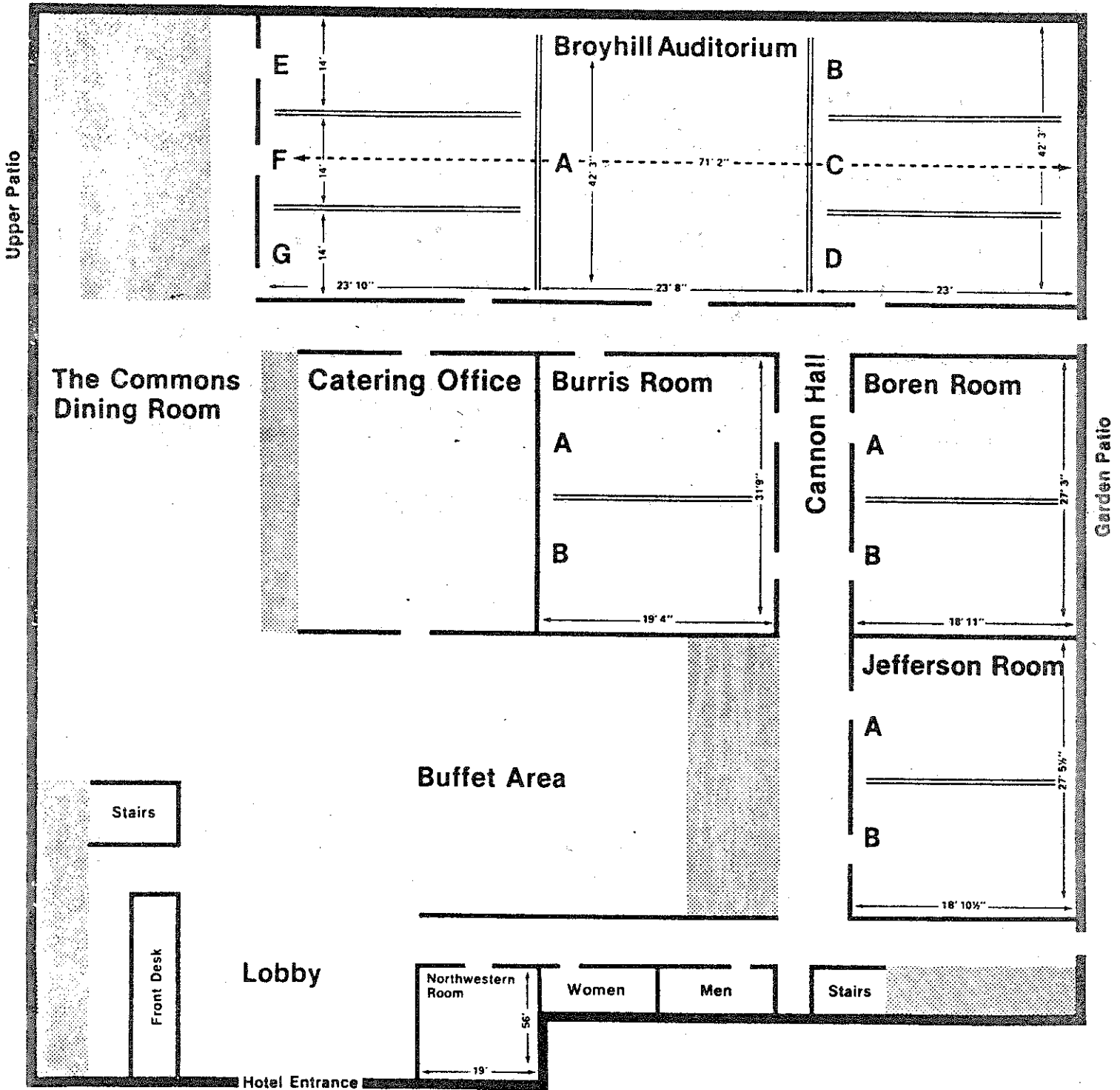
# LOWER LEVEL



Second Floor  
Hotel Wing

(Service Areas)

# FIRST LEVEL



# PLASMA VOLUME SHIFT DURING HEAVY-RESISTANCE WEIGHT LIFTING

**M.A. COLLINS**, D.W. Hill, J.J. DeMello, and K.J. Cureton. Human Performance Laboratory,  
University of Georgia, Athens, GA 30602 **Broyhill A.**

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To determine changes in plasma volume, blood samples were obtained from 6 males (mean  $\pm$  S.E.M. age =  $27.0 \pm 1.9$  yrs; height =  $174.2 \pm 2.1$  cm; weight =  $72.3 \pm 3.6$  kg), before and over a 60-minute period following a bout of heavy-resistance weight lifting. Weight lifting consisted of 3 circuits using 4 exercises (arm curl, bench press, bent-arm row, and parallel squat) performed at 70% of one-repetition maximum for as many repetitions as possible, with 30 seconds of rest following each exercise. The average duration of the weight lifting bout was  $14 \pm .98$  minutes. Plasma volume changes were determined from hemoglobin concentration and hematocrit using the method of Dill and Costill. During the weight lifting, the average rate of energy expenditure and heart rate were 9.8 kcal/min and 158 bts/min, respectively. Plasma volume was decreased significantly ( $p < .05$ ) immediately post-exercise (-14.3%) and at 15 minutes following exercise (-7.0%), but returned to the resting level within 30 minutes. It was concluded that heavy-resistance weight lifting elicits a significant decrease in plasma volume.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# ACUTE EFFECTS OF VARIOUS EXERCISE INTENSITIES ON HEMOLYTIC BLOOD PARAMETERS

B. MILLER, L. Rocchio, B. Burgess and J.M. Davis. Human Performance Lab., University of South Carolina, Columbia, SC 29208 **Broyhill A.**

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This study observed the effects of 10 Kilometer (Km) treadmill runs at intensities of 50% and 70%  $VO_2$ max on various blood indices. This was done to determine whether the magnitude of hemolysis is effected by the running intensity. Six trained male distance runners (mean  $VO_2$ max= 69.1 ml/kg/min) served as subjects. Pre and post exercise blood samples were collected and analyzed for hemoglobin, hematocrit, plasma free hemoglobin, osmotic fragility and haptoglobin concentrations. ANOVA revealed no significant differences between pre and post blood parameters at either intensity indicating that no overt hemolysis occurred. The results of this study suggest that running 10 Km at a low and moderately high intensity elicits little or no hemolysis.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# **EFFECTS OF A 450 ml BLOOD LOSS DURING SUBMAXIMAL ENDURANCE EXERCISE IN MAN**

**JULIE A. SULENTIC**, Leroy H. Getchell, and Duane O. Eddy. Human Performance Lab., Ball State University, Muncie, IN 47306 **Broyhill A.**

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EFFECTS OF A 450 ml BLOOD LOSS DURING SUBMAXIMAL ENDURANCE EXERCISE IN MAN  
Julie A. Sulentic, Leroy H. Getchell, and Duane O. Eddy. Human Performance Lab., Ball State University, Muncie, IN 47306

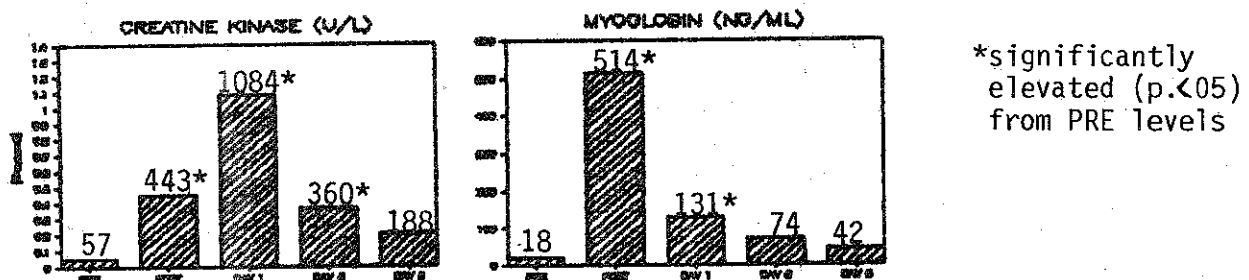
To study how blood loss effects physical performance, six middle-aged male volunteers ( $\bar{x}$  age = 43.3) ran a distance of six miles on a treadmill ( $\approx 75\% \text{VO}_2 \text{ max}$ ) under two conditions: 1) twenty-four hours following a 450 ml blood loss and 2) twenty-four hours following a sham (control) withdrawal of blood. The two conditions were separated by a three week interval and all subjects were kept blind as to which trial they had donated a pint of blood. The criteria used to assess physical performance included heart rate response, ventilation, oxygen uptake, lactic acid values and a rating of perceived exertion. There was no statistical difference found between the experimental trial when compared to the control trial on any of the variables measured when analyzed by a two-way ANOVA ( $P > .05$ ). These results suggest that, physiologically, a six mile run performed at  $75\% \text{VO}_2 \text{ max}$  is essentially unaltered twenty-four hours following blood donation.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# EFFECT OF MARATHON RUNNING ON PLASMA INDICATORS OF TRAUMA

L.J. GOODYEAR, D. VanHouten, E. Dover, J. Durstine. U. of South Carolina, Columbia, SC and The Nike Sport Research Lab, Exeter, NH **Broyhill A.**

In males, marathon running is known to produce acute biochemical and histological alterations of skeletal muscle that often are of such severity that fiber trauma or necrosis occurs. The purpose of this investigation was to determine how moderately trained female runners respond to the stress of marathon running by measuring two established indicators of muscle trauma: plasma myoglobin and creatine kinase (CK). Blood samples were obtained from twelve women 1-3 days prior to (PRE), 10-15 minutes following (POST), and 24 (DAY1), 72 (DAY 3), and 120 hours (DAY 5) after a 42.2 KM marathon. Results are shown below.



It has been suggested that female runners, who typically have a smaller muscle mass, may experience less muscle trauma in response to marathoning because their post race CK levels have been measured lower than those of male runners. However, our data show CK levels 100% higher than previously reported in women, and increases in myoglobin comparable to or exceeding those of male marathoners. These data suggest that women, similar to men, experience considerable muscle trauma following marathon running as indicated by a large and prolonged elevation of CK and myoglobin.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

## CHANGES IN URINARY 3-METHYLHISTIDINE / CREATININE RATIO IN HUMAN SUBJECTS AFTER STRENUOUS EXERCISE.

G. Lynis Dohm, Richard G. Israel, Robin L. Breedlove, and E. Wayne Askew. East Carolina University, Greenville, NC 27834; Tripler Army Medical Center, Honolulu, HI 96859

Broyhill BCD

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We previously reported that 3-methylhistidine excretion was increased in human subjects after a strenuous bout of exercise, but other investigators have not corroborated this finding. Considering the disparate results, it seemed reasonable that 3-methylhistidine excretion must be decreased under some conditions and increased under other conditions. We undertook the present study to define conditions which result in decreased and increased 3-methylhistidine excretion in human subjects. In the first experiment 15 well trained subjects ran on a treadmill at approximately 75% of  $V_{O2max}$  for 90 min. In the second experiment 10 untrained subjects were exercised for 2 hrs. each day for 7 consecutive days. The subjects were instructed to run/walk as far as they could on a cross country course during the 2 hr. period. The average daily distance traversed was  $11.2 \pm 0.3$  miles. The results of these studies suggest that there is a biphasic response to exercise with an immediate decrease in the 3-methylhistidine/creatinine ratio during exercise, followed by a prolonged increase which persists for more than 24 hrs. The magnitude of the negative and positive responses determines whether one observes an increase, no change, or a decrease in the total daily excretion of 3-methylhistidine. The immediate decrease in the 3-methylhistidine/creatinine ratio may be due to a decrease in muscle protein turnover, an increase in creatinine production, or altered clearance of 3-methylhistidine and/or creatinine. The prolonged increase in 3-methylhistidine excretion is most likely due to increased muscle protein breakdown associated with repair of muscle damage.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS



# THE EFFECTS OF HIGH FAT DIET AND EXERCISE ON LIPOPROTEIN LIPASE.

D.S. MYERS, D. Van Houten, J.M. Davis and J.L. Durstine. Department of Physical Education, University of South Carolina, Columbia, SC 29208 **Broyhill BCD**

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The function of lipoprotein lipase (LPL) is to hydrolyze and enhance the uptake of triglyceride from chylomicrons and very low density lipoprotein. Previous studies have shown that exercise will increase myocardial LPL activity. High fat diets have also been shown to elevate myocardial LPL activity. The purpose of this study was to determine if both exercise and a high fat diet would further increase LPL activity in the heart. 36 male Sprague-Dawley rats (240 gm) were randomly divided into a high fat diet group or a high carbohydrate diet group. The high fat diet (in Kcal) consisted of 68.2 percent fat, 12.1 percent protein and 19.6 percent carbohydrate. The high carbohydrate diet was made of 7 percent fat, 18 percent protein and 74 percent carbohydrate. Dietary period was 14 days. Each diet group was divided into an inactive group or active group. Exercise for the active group consisted of one swim to exhaustion on the last day of their diet.

RESULTS:*	High Carbohydrate	High Fat
INACTIVE:	73 + 12	159 + 28
ACTIVE:	187 + 38	192 + 28

\*Data are given as mean and  $S_e$ , mean values are for fatty acid produced in  $\mu\text{mol/h-g}^{-1}$ .

Significant changes ( $p < 0.05$ ) in LPL activity as a result of the diet were found. Exercise also elevated heart LPL activity ( $p < 0.05$ ). These data indicate that both diet and exercise will alter heart LPL activity. However, the data do not show a combined effect on LPL activity brought on by a diet high in fat content and exercise.

This study was supported by funds from NIH Biomedical Research Support Grant.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# DIFFERENT INTENSITY EXERCISE BOUTS AND THEIR EFFECT ON PLASMA HIGH-DENSITY LIPOPROTEIN CHOLESTEROL SUBFRACTIONS.

**JUDY E. RASNAKE** and J. Larry Durstine. Department of Physical Education, University of South Carolina, Columbia, SC 29208 **Broyhill BCD**

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Coronary heart disease (CHD) has been shown to be inversely related to the level of high-density lipoprotein cholesterol (HDL-C) and more recently to the HDL<sub>2</sub> cholesterol subfraction. Previous studies suggest that HDL-C levels may increase immediately following an acute bout of exercise. However, none of these studies have examined the effects of an acute bout of exercise on HDL<sub>2</sub> and HDL<sub>3</sub> cholesterol subfractions. In addition, duration and intensity effects and their impact on HDL-C have not been examined. Thus, the purpose of this study was to determine the effects of two exercise bouts of different intensities on HDL-C and HDL cholesterol subfractions. Nine trained male runners were randomly assigned to complete two bouts of treadmill exercise; one bout at 70%  $\dot{V}O_{2max}$  and a second at 35%  $\dot{V}O_{2max}$ . Plasma triglyceride, cholesterol, HDL-C, HDL<sub>2</sub> and HDL<sub>3</sub> cholesterol were measured in a fasted state 24 hours prior to exercise, immediately before, every fifteen minutes during exercise, immediately following exercise and one hour post exercise. Plasma cholesterol and triglyceride levels were not affected by the exercise bouts. Although not significant HDL-C was increased ( $51 \pm 2$  to  $54 \pm 2$  mg/d) during the 70% bout of exercise and represents 6% change. HDL<sub>2</sub> and HDL<sub>3</sub> cholesterol were not altered during this exercise bout. However, HDL-C was not altered during the low intensity exercise bout. But HDL<sub>2</sub> increased from  $19 \pm 2$  to  $21 \pm 2$  mg/dl and HDL<sub>3</sub> decreased from  $34 \pm 2$  to  $32 \pm 2$  mg/dl. This represents a change of 6% in HDL<sub>3</sub> cholesterol. These data indicate that short duration activity does not bring about significant changes in HDL-C and its subfractions but that favorable trends may occur during the low intensity activities.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# LIPOPROTEIN CHOLESTEROL IN RESPONSE TO A HIGH FAT DIET AND ACUTE EXERCISE.

**D.R. Van Houten**, D.S. Myers, M.L. Rocchio, P.E. Smith and J.L. Durstine. Department of Physical Education, University of South Carolina, Columbia, SC 29208 **Broyhill BCD**

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High fat diets have been associated with increased cholesterol in very low density lipoprotein (VLDL) and low density lipoprotein (LDL) fractions and decreases in the high density lipoprotein (HDL) fraction. Evidence suggests that a single, prolonged bout of exercise will alter the lipid components of plasma lipoproteins. Thus, the purpose of this study was to determine the effects of a single bout of exercise on plasma lipoprotein cholesterol from rats fed a diet high in fat content. 52 Sprague-Dawley rats (mean weight 240 gms) were divided into four groups, high fat control (HFC), high fat exercise (HFE), low fat control (LFC), and low fat exercise (LFE). The high fat diet contained 68 percent of the calories as fat, 12 percent protein and 20 percent carbohydrate. The low fat diet contained 7 percent calories from fat, 18 percent from protein and 74 percent from carbohydrates. Animals were given water and food ad libitum. Animals on the high fat diet consumed significantly more calories ( $129 \pm 3$  Kcal/day) than the low fat group ( $107 \pm 3$  Kcal/day) ( $p < 0.05$ ). Exercise consisted of a swim to exhaustion following 14 days of the diet treatment. Results of a two-way ANOVA indicated LDL cholesterol was higher ( $p < 0.05$ ) in the high fat group ( $14 \pm 1$  mg/dl) than low fat ( $10 \pm 1$  mg/dl). Plasma VLDL cholesterol was lower ( $p < 0.05$ ) in the LFE group ( $5 \pm 1$  mg/dl) than the LFC group ( $7 \pm 1$  mg/dl). No change in HDL or total cholesterol was found. Thus, a 14 day high fat diet and swim to exhaustion affected VLDL and LDL cholesterol. However, HDL and total cholesterol were unchanged. These data indicate a high fat diet and a single bout of exercise influenced the distribution of cholesterol among plasma lipoproteins, but did not alter total cholesterol levels.

This study was supported by funds from NIH Biomedical Research Support Grant Award.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE EFFECTS OF LARGE WEIGHT LOSS FOLLOWING GASTRIC BYPASS SURGERY ON GENERAL WELL-BEING AND PHYSICAL SELF-EFFICACY.

**M.R. McCAMMON**, R.G. Israel, S.L. McCammon, M.G. Delozier and R.A. Shaw. Human Performance Lab. and East Carolina School of Medicine, East Carolina University, Greenville, NC 27834 **Broyhill EFG**

Ten morbidly obese women volunteered to be subjects in an experiment designed to assess the effect of large weight loss following gastric bypass surgery, on body composition, aerobic capacity, general well-being and physical self-efficacy. Aerobic capacity (ml/kg/min) was assessed by a Beckman MMC, body composition was determined hydrostatically, and psychological assessments were determined by the General Well-Being (GWB) and Physical Self-Efficacy (PSE) Scales. Average pre-and post-surgery physiological and psychological assessments were as follows:

VARIABLE	UNIT	PRE-SURGERY	6-MONTHS POST-SURGERY
Height	cm	164.6 ± 9.65	
Weight	kg	142.4 ± 29.3	102.7 ± 21.8
Percent Fat	--	52.2 ± 4.7	43.4 ± 6.4
$\dot{V}O_2$ Max	ml/kg/min	13.9 ± 3.8	18.3 ± 4.4
GWB	--	77.1 ± 12.7	87.0 ± 12.9
PSE	--	80.0 ± 5.8	77.1 ± 6.9

Correlated t-tests revealed significant ( $p < .05$ ) decreases in weight and %fat with significant increases in  $\dot{V}O_2$  max and general well-being. No significant change occurred in physical self-efficacy. Results from these tests indicate that as a procedure for inducing weight loss the gastric bypass method is very effective. However, failure to observe change in physical self-efficacy was unexpected, since this variable is sensitive to changes in physical status.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE EFFECT OF A PARTNERSHIP PROGRAM ON ADHERENCE AND SUCCESS DURING WEIGHT REDUCTION.

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Fourteen sedentary subjects, between the ages 18-35 and greater than 24 percent body fat, were randomly assigned to one of two groups, single (N = 6) and partner (N = 8). These individuals volunteered to participate in an exercise and nutrition program designed to assess the importance of increased social support during weight reduction. Collectively the 14 subjects attended an exercise session 3 times per week, walking/jogging within a prescribed target heart rate at 70 percent maximum as determined from a maximal graded exercise test. Identical nutrition classes incorporating nutrition principles, calorie content of foods, behavior modification, and calorie restriction, were attended separately by the partner and single group one time per week. Time was allotted for the discussion of assigned weekly partnership activities; for example, eating a meal together, arranging an exercise activity, or phone calls. Attendance was recorded for each scheduled session. Pre and post data collection included: Skinfold, body girth, and body weight measurements. The results of the study indicated the group as a whole significantly decreased in body weight, percent fat, and abdomen girth. Separated by group, the change in body fat of the partner group was significantly different ( $p = .08$ ), than the single group. Analysis of attendance rate shows that the partner group attended significantly more exercise ( $p = .07$ ) and also nutrition classes ( $p = .01$ ). These results are encouraging when considering the duration of the program. This study suggests that increased social support may improve attendance and enhance success during weight reduction programs.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# RESTING METABOLIC RATE (RMR) IN OBESE ZUCKER RATS: EFFECTS OF A HIGH FAT DIET AND EXERCISE

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Zucker fa/fa rats store a greater percentage of their caloric intake as fat due to a defect in one or more thermogenic processes. Both a high fat diet and exercise increase RMR in normal lean rats. To test whether these treatments do so in Zucker rats, 5-6 wk old obese (OB) and lean (L) rats were divided into two groups. One group ran (24 m/min, 5% grade) 1 hr/day, 5 days/wk (EX) while the other remained sedentary (SED). These groups were further subdivided into a high fat diet (FD) or control diet (CD) group. Body wt and food intake were measured weekly. RMR was measured for 45 min during week 8 of the treatments. Metabolic rate was assessed by measuring O<sub>2</sub> consumption using an open-circuit metabolic chamber. The automated system continuously monitors O<sub>2</sub> in the mixed outflow of air from the chamber via an oxygen analyzer. O<sub>2</sub> consumption is calculated and plotted each minute using an Apple computer with appropriate software.

**RESULTS:** Overall, body wt gain and caloric intake (CI) were greater in OB vs. L. OB had lower RMR than L and failed to increase RMR in response to FD. OB-FD gained more wt than OB-CD. In contrast, L-FD increased RMR and showed a similar body wt gain vs. L-CD. Caloric intake was similar in FD and CD. EX did not influence RMR, wt gain or CI, although CI tended to increase in CD-EX groups. These data suggest that fa/fa rats gain wt in part due to a failure to properly regulate thermogenesis. Research is under way to determine whether this effect may be the result of a sympathetic nervous system dysfunction which has been suggested to occur in genetically obese animals and in some types of human obesity.

Supported by NIH Biomedical Research Support grant, Research and Productive Scholarship grant and a S.C. Heart Association grant.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# RESTING METABOLIC RESPONSE TO SHORT-TERM CALORIC DEPRIVATION

*Ms. Roelke*

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Eight normal weight ( $\bar{x}$  BF=25.6%) and seven obese ( $\bar{x}$  BF=39.2%) college-aged females classified as nonexercisers participated in a study to determine the effects of a short-term calorie restricted diet (~800 kcal/d) on resting metabolic rate (RMR). RMR was determined for approximately 30 minutes by indirect, open circuit calorimetry before and after five days of restricted eating. Initial RMR based on body weight differed significantly between the groups ( $N=3.41 \pm .14$ ,  $O=2.69 \pm .14$  ml  $O_2 \cdot kg^{-1} \cdot min^{-1}$ ); however, when calculated relative to fat free mass no differences were noted. A significant decrease in weight occurred in both normal ( $\Delta 1.28$  kg  $\pm 0.39$ ) and overweight ( $\Delta 1.48$  kg  $\pm .23$ ) subjects. RMR relative to both body weight and free fat mass decreased significantly ( $p < .01$ ) in the normal weight group. However, significant changes in RMR were not observed in the obese group. The results of this study support the hypothesis that obese females respond differently to short-term caloric deprivation than do normal weight females.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# VALIDATION OF HYDROSTATIC WEIGHING WITHOUT HEAD SUBMERSION

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A pilot study was performed for the purpose of validating a recently proposed [Donnelly et al. AAHPERD abstract 1984] alternate technique for determining body composition by hydrostatic weighing. Twenty college aged males were hydrostatically weighed at total lung capacity with the head submerged [TLCs] and with the head above water [TLCa]. Residual volume [RV] was determined by the indirect technique described by Wilmore. Vital capacity [VC] was obtained while the subject was seated in the water and breathed into a 13.5L respirometer. Total lung capacity BTPS was calculated as VC + RV. Subjects were administered 5 trials of each method TLCs, TLCa. Head measurements of width, length and breadth were determined for each subject with a slide caliper. Head circumference was determined with a Gulick tape. A multiple regression equation was obtained using the four head measurements as independent variables in order to predict the difference in percent fat between TLCs and TLCa. Calculations of observed vs. predicted % fat revealed an  $r=.95$  within the group. A repeated measures ANOVA exhibited no significant difference [ $p>.05$ ] between TLCs and TLCa, [ $F=.004$ ]. These results suggest that hydrostatic weighing without head submersion may be a viable alternative to conventional hydrostatic methods for subjects who are unable to perform head submersion.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS



# HEALTH-RELATED PHYSICAL FITNESS IN TYPE I (INSULIN-DEPENDENT) DIABETIC YOUTH.

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Health-related physical fitness was measured in 32 girls and 19 boys (age 9-14 yrs) attending the South Carolina Camp for Children With Diabetes, and results were compared to normative data for South Carolina school students. All subjects had type I (insulin-dependent) diabetes mellitus. The South Carolina Physical Fitness Test (consisting of one mile run, tricep and abdominal skinfold measures, sit-ups in one minute, and sit-and-reach test) was administered over a two day period. Mean percentile scores for individual test items were:

	Mile Run	Skinfolds	Sit-Ups	Sit-and-Reach
Diabetic Girls	34.0	43.1	49.8	43.4
Diabetic Boys	60.8	62.6	65.8	39.7

Differences were seen in health-related fitness components for diabetic youth on the basis of gender. Although insulin deficiency is generally associated with an extremely lean body build, excess body fat was a significant problem for diabetic girls. Insulin replacement should be critically examined in pre-adolescent and adolescent diabetic females to prevent excessive fat accumulation. Poor performance in cardiorespiratory endurance in this group is probably related to body habitus. Diabetic boys scored above the 60th percentile on tests of cardiorespiratory endurance, body composition, and abdominal muscular endurance, yet fell below the 40th percentile for flexibility. Limited joint mobility has been reported previously in diabetic children. Attention should be directed to activities to increase flexibility in diabetic youth.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# ASSOCIATION OF UPPER ARM CIRCUMFERENCE MEASURES WITH MUSCLE-THICKNESS SONOGRAMS OF THE ANTERIOR AND POSTERIOR UPPER ARM IN YOUNG CHILDREN.

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An investigation involving 32 children in the second grade was conducted for the following purposes: (1) to assess the reliability of separate anterior and posterior upper-arm muscle sonograms repeated within 30 min., and (2) to determine the association between these sonograms and corresponding circumference and net circumference measures. Sixteen boys and 16 girls, 7 to 9 years of age, served as subjects. B-mode ultrasound (General Electric Datason DB) was used to determine muscle thickness at both arm sites, a controlled-tension Lufkin tape was used for circumference measures, and skinfold calipers (Harpenden) were used to obtain the correction factor for the net circumference measurement. Reliability coefficients (intraclass correlations) were high for sonograms at both the anterior site (boys:  $r = .99$ , girls:  $r = .98$ ) and the posterior site (boys:  $r = .91$ , girls:  $r = .94$ ). Associations (Pearson correlations) between muscle sonograms and arm circumference measures were as follows:

		Arm Circumference		Arm Net Circumference	
		Boys	Girls	Boys	Girls
Anterior Sonogram	$r =$	.89	.51	.88	.62
Posterior Sonogram	$r =$	.83	.28	.86	.35

It was concluded that anterior and posterior upper arm muscle sonograms can be reliably obtained in young children for scans repeated within 30 minutes. It was further concluded that associations between muscle sonograms and circumference measures were moderately high in boys, while the same associations for girls were low to moderate. Further, although not specifically tested, it was speculated that muscle sonograms may more accurately represent the muscle layer than circumference measures.

Supported by Bulloch Memorial Hospital, Statesboro, Georgia 30458.

## QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# SKINFOLD AND PERCENT BODY FAT DIFFERENCES BETWEEN BLACK AND WHITE MALE SOLDIERS.

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The present study was conducted to investigate racial differences in skinfold thickness and calculated percent body fat in normal weight basic trainees (113 black, 113 white) and overweight career soldiers (38 black, 38 white) 17-39 years of age. Soldiers, randomly selected from a larger group were matched for age, height and weight. Skinfold measurements were taken at the triceps, biceps, subscapular and suprailiac sites. Percent body fat was calculated from skinfold measurements using the formula of Durnin and Womersley. Results showed that black basic trainees and overweight soldiers had significantly smaller triceps, biceps and suprailiac skinfold measurements when compared to their appropriate white counterparts. Calculated percent body fat averaged approximately 2% less in black soldiers.

	Skinfolds (mm)				Body Fat (%)
	Tricep	Bicep	Subscap	Iliac	
Basic Trainees					
Black	10.5*	5.9*	12.6	14.7*	16.6*
White	13.9	6.9	13.4	16.8	18.4
Overweight Soldiers					
Black	16.7#	8.0#	20.8	24.9#	22.6#
White	21.5	9.4	23.0	29.6	24.3

\*P < 0.01, #P < 0.05

Results from the present study indicate that black males matched for age, height and weight with an appropriate white group are either 1) leaner and/or 2) have a body fat distribution that is more intramuscular or internal. It is uncertain as to whether these differences are genetic or due to variations in physical activity levels.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# A COMPARISON OF THE BIOELECTRICAL IMPEDANCE TECHNIQUE WITH UNDERWATER WEIGHING AND SKINFOLD METHODS FOR PREDICTING PERCENT BODY FAT.

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The bioelectrical impedance (BI) method, which is based on the relationship between total body impedance and total body water, provides an alternative approach for estimation of body composition. In order to compare BI estimates of body fat with underwater weighing (UWW) and skinfold (SF) estimates of body fat, measurements were made on ten females, before and after (20 total observations) a four week diet program inducing substantial changes in body composition. A JRL Systems Bioelectrical Impedance Analyzer was used to provide the BI estimates of percent fat. Percent fat was also estimated from body density measured by UWW and estimated by the Jackson-Pollock generalized prediction equation for women (3 SF model). Percent fat means and standard deviations for each method are shown below:

	UWW	SF	BI
Mean	24.5	31.0	31.3
SD	5.7	3.6	4.1

A one-way ANOVA comparing the three methods resulted in an F of 14.39 ( $p < .05$ ,  $df = 2, 57$ ). Follow-up procedures revealed significant differences between the UWW and SF technique and the UWW and BI technique with the SF and BI techniques producing larger percent fats in both cases. Correlation coefficients comparing the three methods were as follows: UWW and SF,  $r = .613$ ; UWW and BI,  $r = .738$ ; and SF and BI,  $r = .390$ . The higher BI-UWW correlation as compared to the SF-UWW correlation suggests that BI techniques may provide a better estimate of body fat than SF. The significant difference between the BI and UWW methods suggests the possibility that the regression equation used in the BI technique may not be appropriate for this sample. Further studies with other populations and large sample sizes are needed.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# VALIDATION AND RELIABILITY OF A COMPUTERIZED HYDROSTATIC WEIGHING SYSTEM.

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Hydrostatic weighing has been widely accepted as the most accurate indirect technique for evaluating body composition. The purpose of this study was to design and evaluate the validity and reliability of an automated technique to assess body density using a computerized hydrostatic weighing system. An existing system was modified and interfaced with a micro-computer equipped with analog to digital (A/D) converter. This system was designed to measure 3 point vertical force with piezoelectric transducers. Output of each transducer was electronically summed into an analog voltage, representative of weight. Software was designed to input variables, control the collection of data, calculate selected measurements, and provide a summary of the results of each session. Computerization allowed for the rapid sampling of the analog signal and the calculation of an averaged underwater weight for each trial. This method of data collection was utilized to dampen fluctuations in the output signal resulting from slight movements of the subject and the dynamic effects of the water. Reliability of the system was determined utilizing data collected on 16 subjects on two occasions. Inter-session and intra-trial reliability revealed a significant correlation ( $r=.99$ ,  $p < .0001$ ). Validity of the instrumentation was determined utilizing objects of known underwater weight (range = 0.5 kg - 5.0 kg). Values obtained from the instrumentation were significantly correlated ( $r=.99$ ,  $p < .0001$ ) with the known weights representative of the normal operating range of the system. Results indicate that a computerized hydrostatic weighing system is a valid and reliable method for determining underwater body weight.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE KINETICS OF RESPIRATORY GASES AND VENTILATION DURING SUB-MAXIMAL CONSTANT LOAD WORK.

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Burriss Room

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To determine the effects of running and walking on the kinetics of oxygen consumption ( $\dot{V}O_2$ ), carbon dioxide production ( $\dot{V}CO_2$ ) and ventilation ( $\dot{V}_E$ ), eleven male subjects performed two sub-anaerobic test on the treadmill. One test consisted of walking at a speed of 5 km/h on a 15% grade. The other test consisted of running at 9 km/h on a 0% grade. Stride frequency during running increased by 47% compared to walking ( $p < .01$ ). The time constants for  $\dot{V}O_2$ ,  $\dot{V}CO_2$  and  $\dot{V}_E$  were determined for the transition from rest to steady state. The time constants for  $\dot{V}CO_2$  and  $\dot{V}_E$  during the walking test were 72 and 76 sec respectively, a non significant difference. The time constants for  $\dot{V}CO_2$  and  $\dot{V}_E$  during the running test were 65 and 72 sec respectively, a non significant difference. The time constants for  $\dot{V}O_2$ , 49 sec during walking and 51 sec during running, were found to be significantly faster than the time constants of  $\dot{V}CO_2$  and  $\dot{V}_E$  during running and walking ( $p < .01$ ). The faster kinetics of  $\dot{V}O_2$  when compared to  $\dot{V}CO_2$  is reflective of the body's increased extravascular capacitance for  $CO_2$  over  $O_2$ . In addition, the tight coupling of  $\dot{V}_E$  and  $\dot{V}CO_2$  during the non steady state are indicative of the link between ventilation and the body's metabolic state.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# **EFFECT OF SODIUM BICARBONATE ON MALE AND FEMALE ANAEROBIC PERFORMANCE.**

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**Burris Room**

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Ingestion of sodium bicarbonate has been shown to increase anaerobic performance in males by its ability to buffer intracellular pH. The purpose of the study was to determine the effects of sodium bicarbonate on anaerobic performance during a maximal cycle exercise bout in males and females. Five males and five females performed a one minute maximal exercise bout one hour after receiving a placebo or sodium bicarbonate (.3 g/kg lean body weight) on separate occasions. Blood lactate concentrations and blood pH were measured pre-ingestion, pre-exercise, immediate post-exercise and five minutes post-exercise. Work was measured as the number of pedal revolutions turned in one minute. ANOVA showed that ingestion of sodium bicarbonate produced no significant increase in pH. A tendency towards an increase in work performed was observed although it wasn't significant. Lactate levels at five minutes post-exercise were significantly increased ( $p < .05$ ) in both males and females following ingestion of sodium bicarbonate. Males increased 29% and females 45% as compared to the control. This indicates the ability of sodium bicarbonate to cause an increase in efflux of lactate from the muscle cells. These data indicate that although no significant increase in anaerobic performance was observed, the increased efflux of lactate may allow anaerobic activity to continue for longer periods of time. No differences were found between the sexes for any of the parameters investigated.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# MAXIMUM PHYSIOLOGICAL RESPONSES OF TRIATHLETES DURING CYCLE ERGOMETER AND TREADMILL EXERCISE.

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The purpose of this study was to describe the physiological responses of triathletes to maximal cycle ergometer and treadmill exercise. The subjects were ten male amateur triathletes from the Team Atlanta Triathlon Club. Their physical characteristics were: age,  $26.4 \pm 3.2$  yrs; weight,  $68.2 \pm 4.6$  kg; and % fat,  $10.6 \pm 5.5\%$ . All subjects had participated in at least 2 triathlons (over 2 hr duration) in the past year. The mean total number of triathlons completed was  $4.6 \pm 2.0$ . The subjects' mean weekly training distances were  $224.0 \pm 133.2$  km cycling,  $67.1 \pm 23.3$  km running, and  $8778.0 \pm 5120.1$  m swimming. Mean best performance times were  $36.3 \pm 2.25$  min for 10 km run,  $25.9 \pm 6.3$  min for 1500 m swim, and  $3.2 \pm 0.31$  hrs for the marathon. Resting [hb] and hct were  $14.8 \pm 0.9$  gm/dl and  $43.0 \pm 2.2\%$ , respectively. The following maximum physiological responses for graded cycle ergometer and treadmill tests were obtained:

	Treadmill	Cycle Ergometer
$\dot{V}E$ BTPS (l/min)	$167.4 \pm 24.1$	$173.2 \pm 27.2$
$\dot{V}O_2$ max (l/min)	$4.88 \pm 0.29$	$4.63 \pm 0.44^*$
$\dot{V}O_2$ max (ml/kg x min)	$71.9 \pm 3.6$	$67.8 \pm 3.9^*$
$\dot{V}E/\dot{V}O_2$ max	$27.7 \pm 2.8$	$30.5 \pm 3.6$
HR max (bts/min)	$189.5 \pm 9.4$	$180.3 \pm 9.5^*$
R max	$1.07 \pm 0.04$	$1.13 \pm 0.04^*$
HLa max (mmol/l)	$10.4 \pm 2.7$	$10.4 \pm 3.3$

\*Differences between treadmill and cycle ergometer significant at  $p < 0.05$ . These data suggest amateur triathletes have very high maximal aerobic power, comparable to elite long distance runners. Maximal  $\dot{V}O_2$  and heart rate is lower during cycle ergometry than during treadmill running in these athletes who are well-trained in both modes of exercise.

Supported by a grant from Ross Laboratories.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS



# THE RELATIONSHIP BETWEEN PERCEPTUAL STYLE AND ACCURACY OF PERCEPTION OF PHYSICAL EFFORT.

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The purpose of the present study was to examine the relationship between perceptual style (PS) and perception of physical effort (PPE). Seven males and eight females ( $n = 15$ ) were selected as subjects. PS was assessed by the Rod-and-Frame apparatus. Difference in heart rate response between a pre-selected standard work task (SWT) on a cycle ergometer and the subjects' self-adjusted workload was used as an objective measure of PPE. Heart rate on the SWT was extremely variable, ranging from 111-188  $b \cdot \text{min}^{-1}$  ( $X = 153 \pm 23.9 b \text{ min}^{-1}$ ). However, average error between HR during the SWT and the subjects' self-adjusted workload was extremely low (range: 0-18  $b \cdot \text{min}^{-1}$ ;  $X = 5.6 \pm 5.6 b \text{ min}^{-1}$ ). Pearson correlations showed a moderate relationship ( $r = .74$ ) between HR and RPE, but was insignificant ( $r = .03$ ) between PS and PPE. These data confirm the absence of any relationship between perceptual style (i. e., field independence/dependence) and ability to reproduce a SWT (i. e., pace) In addition, these results emphasize the positive bias produced by studies which examine HR/RPE and workload/RPE relationships during incremental testing.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE EFFECTS OF MCT OIL AND A GLUCOSE POLYMER ON ENDURANCE PERFORMANCE.

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Burris Room

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Seven experienced male bicyclists performed four bicycle ergometer endurance tests at 70%  $\dot{V}O_2$  max at 90 RPM over a four week period. During each test, heart rate (HR), rate of perceived exertion (RPE),  $\dot{V}O_2$ , respiratory exchange ratio (R) were measured at ten minute intervals. Serum free fatty acid (FFA) and glucose levels were measured from blood samples taken via an indwelling catheter at 15 and 30 minute intervals. One of four test feeding treatments was randomly administered, at 5, 25, and 40 minutes of each exercise bout. The control trial (CTR) included gelatin capsules containing water, and a lemonade beverage (150 ml each feeding) sweetened with an artificial sweetener (Saccharin). The test mixtures were made up in the same manner as the control with the addition of one of the test substances: 1) MCT oil (M), 2) glucose polymer (P)(Polycose, Ross Laboratories), 3) MCT plus glucose polymer (MP). Depending on the treatment used, MCT oil-containing capsules replaced water-capsules and/or Polycose was dissolved in the lemonade beverage. Total caloric intake of each trial, except control, was 360 calories. No significant difference was found between mean time to exhaustion, R,  $\dot{V}O_2$ , HR among the four treatments. M and MP trials induced nausea in a majority of subjects. Significantly greater RPE values were found over the first 60 minutes of exercise for C treatment as compared to the other three treatments ( $p < 0.05$ ). Repeated measures ANOVA showed that significantly higher serum glucose values existed for treatment P as compared to M. Also, significantly higher serum FFA values existed for treatment M as compared to both P and MP over the first 60 minutes of exercise ( $p < 0.05$ ). Although the combination of MCT oil and Polycose would theoretically enhance endurance performance due to an increased supply of both FFA and glucose available for muscular metabolism, this dietary treatment was ineffective in prolonging exercise time.

Supported by a grant from Ross Laboratories

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# EFFECTS OF CAFFEINE INGESTION ON SKIN TEMPERATURE, RESPIRATORY QUOTIENT AND WORK PERFORMANCE IN ENDURANCE ATHLETES.

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**Burris Room**

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Five male endurance athletes were studied to determine the effects of caffeine ingestion on covered skin temperature ( $T_{cs}$ ), steady state respiratory quotient (RQ) and total work performance ( $Work_t$ ). Subjects performed cycle ergometry (= 65% of treadmill established  $VO_{2max}$ ) in three dosage trials. A double blind administration of Placebo, 200mgs (Low), or 400mgs (High) of caffeine preceded exercise by two hours. After 50 minutes of steady state exercise, increasing workloads were used to bring the subjects to declared exhaustion. High trial mean  $T_{cs}$  and mean  $Work_t$  were significantly greater ( $p < .05$ ) than Placebo trials. No significant difference in RQ was discovered. The peripheral vasodilating effects of caffeine ingestion in the High trials were deemed responsible for increased  $T_{cs}$ . This may have aided the athletes in heat dissipation and thus, reduced the heat stress associated with exercise. The increased  $Work_t$  may have been related to the temperature regulating enhancement as well as the stimulating property of the drug.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

## SELECTED MYOELECTRIC ACTIVITY DIFFERENCES IN SKILLED AND UN-SKILLED FEMALE DANCERS.

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**Jefferson Room**

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Nine skilled and 9 beginner female dancers were monitored electromyographically on the gracilis (G) and long head of the biceps femoris (BF) muscles while performing the releve sur les pointes. The task was performed in both the standard turned out position (TOP) and with the feet in a parallel position (PP). A Teca Model TE-4 electromyograph recorded the myograms on light sensitive paper. Results of independent  $t$  tests revealed no significant differences between the groups,  $p > .05$ . Dependent  $t$  tests revealed significantly more activity in the turned-out position for the G during the preparation phase and for the BF during the rise phase. It was concluded that the TOP requires more activity in these muscle than the PP.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# EFFECTS OF HIGH FREQUENCY ELECTRICAL STIMULATION ON DYNAMIC STRENGTH OF NORMAL QUADRICEPS.

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Jefferson Room

This study evaluated the effects of high frequency (2500 Hz) electrical muscle stimulation (EMS) on the dynamic strength of the quadriceps muscle group. Twelve college-aged male volunteers, who were regularly involved in vigorous physical activity, took part in the study. The non-dominant leg of all subjects was pre-tested and post-tested isokinetically at movement speeds of 30° and 60° per second, using a Cybex II. Each subject was randomly placed in one of three groups. Group A (N = 4) received (EMS) treatments isometrically at 65° of knee flexion. Group B (N = 4) received (EMS) treatments isometrically at both 35° and 65° of knee flexion. Group C (N = 4) was the control and received no stimulation. Stimulation to the non-dominant legs of the experimental groups consisted of 10 maximal involuntary contractions with a duration of 15 seconds per contraction interrupted by a 50 second rest interval. Each treatment session lasted approximately 15 minutes and was administered 5 days per week, for 4 weeks. A Two Factor (stimulation, speed of movement) Analysis of Covariance, using pre-test measurements as covariates, determined a significant difference between Groups A, B and C (DF = 2, F = 12.656, P < .001). No significance was seen for speed of movement (F = .302) and no interaction across speed of movement and stimulation was seen (F = 1.284, P > .302). A Duncan Post-Hoc Test showed a significant difference between Groups B and C (P < .05) but no difference between Groups A and C, or Groups A and B (P > .05). However, at P < .10 there were significant differences between Groups A and B, A and C, and B and C. Results of this study indicate that use of high frequency (2500 Hz) electrical muscle stimulation does increase the dynamic strength of normal quadriceps. Furthermore, increases in dynamic strength were greater when the subjects were stimulated at two angles of knee flexion.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# HEART RATE AND LACTATE RESPONSE IN TRAINED AND UNTRAINED YOUNG MALES DURING RESISTIVE EXERCISE.

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The purpose of this study was to observe the effects of squats (sets of 10 to exhaustion) on heart rate and lactate levels. Five (5) untrained (UT) but physically active males and 5 trained (T) males volunteered. Heart rate was measured using a Quinton ECG with a CM<sub>5</sub> lead, lactate was measured using a Yellow Springs Lactate Analyser. Blood was obtained by finger prick with a sterile lancet. Work (squatting) consisted of sets of 10 with 2 1/2 minutes between sets. The squatting cadence was 1 rep/5 secs. Each set was raised by 12.5 kg until exhaustion. (Total positive work per set was estimated by  $\text{Bar} + \text{BW} \times \text{vertical displacement}$ .) Heart rate, lactate and RPE were measured standing, immediately before work, after each set and 5 min after the last repetition. The subjects average ages were T = 27.4 ± 6.1 and UT = 30.2 ± 5.3 yrs. and bodyweights T = 81.6 ± 13.6 and UT = 79.0 ± 13.8 kg. The T subjects performed more work at a given bar weight, and more total work (more sets) than UT. At exhaustion T had higher HR's and lactate's than UT. At a given bar weight or submaximal workload the T had lower HR's and lactate than UT. This suggests that this type of training may cause adaptations resulting in reduced fatigue (and/or enhanced recovery) as evidenced by the observed HRs and lactates

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE EFFECT OF ACUTE THERMAL DEHYDRATION ON ISOKINETIC MUSCULAR ENDURANCE.

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The purpose of the study was to investigate the effect of acute thermal dehydration (minus 3% body weight) on the isokinetic muscular endurance capacity of differentially trained, college aged males. The eighteen subjects included six anaerobically trained field athletes (Group I), six aerobically trained distance runners (Group II), and six sedentary individuals (Group III). All were tested under two experimental conditions: 1) full hydration, and 2) acute thermal dehydration, with all trials randomized. Muscular endurance capacity was monitored during repeated maximal leg extensions performed at a constant rate set by a metronome on a Cybex II isokinetic dynamometer (at a speed of 180° per second). Repetitions in which torque could be maintained at a level greater than 50% of peak torque were compared. A repeated measures ANOVA followed by a TURKEY HSD showed a significant decrease in muscular endurance in Groups I and III during dehydration (19.45% and 19.30% respectively;  $P < 0.05$ ). The subjects in Group II, however, did not show a significant decline in muscular endurance under similar conditions. It was concluded that aerobic training may enable an individual to withstand the otherwise deleterious effects of acute thermal dehydration of minus 3% body weight. This may be a result of increased plasma volumes associated with long term aerobic training.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# THE EFFECT OF THE FULL SQUAT EXERCISE ON KNEE STABILITY.

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Previous research has indicated the possibility that full squat exercises may cause ligamentous instability of the knee joint. The purpose of this study was to examine the effect of 9 weeks of full squat exercises on knee stability. A full squat was defined as squatting to the point where the tops of the thighs are parallel to the floor or lower. The instrument used to quantify knee stability was the KT-1000 Knee Ligament Arthrometer (MEDmetric Corporation, San Diego, CA). Subjects in the experimental group were 36 untrained college students enrolled in beginning weight training classes at Auburn University. The control group consisted of 10 students not participating in strenuous exercise. Subjects in the experimental group performed squats 3 days per week using 3 sets of 10 repetitions for 3 weeks, 3 sets of 5 repetitions for 3 weeks, and 3 sets of 3 repetitions for 3 weeks not including warmup sets. The following pre and post measures of knee stability were taken: the anterior drawer, the posterior drawer, the maximal manual drawer, and the active drawer. Statistical tests used to compare the experimental and control groups indicated no significant differences on any of the 4 measures at the .05 level of significance. This data suggests that ligament stability as measured by the KT-1000 was not effected by 9 weeks of full squat training.



# PHYSIOLOGICAL AND PERCEPTUAL RESPONSES TO LOWER EXTREMITY ISOKINETIC EXERCISE.

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Thirty males, aged 25-35 years, underwent bilateral knee flexion/extension testing on the CYBEX II Isokinetic System. The protocol consisted of 3 repeated maximal contractions (strength tests) of quadriceps/hamstrings muscle groups at 60°, 120°, and 180° per second. One endurance test at 180° per second was conducted with repeated contractions to an endpoint of 50% decrease in quadriceps peak torque. This first extremity protocol (trial 1) was duplicated on the second extremity (trial 2). Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and ratings of perceived exertion (RPE) responses were obtained prior to each trial, and immediately after each of the three strength tests and single endurance test. Mean and standard deviation data were calculated for all variables. Subject responses as raw data were related to test speed as associated with order of testing and analysis of variance was applied. Test responses compared with pretrial responses were similarly analyzed. Variation of individual responses in quantitative and qualitative fashion was noted.

Trial 1 indicates that HR, SBP and RPE responses increase while DBP increases and then decreases for strength followed by endurance testing. Trail 2 responses depict similar patterns. Linear regression analysis of the RPE/physiological response relationship reveals no significant difference for HR, SBP nor DBP in this isokinetic testing protocol.

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QUESTIONS TO BE ASKED/NOTES AND COMMENTS

# OXYGEN UPTAKE RESPONSE OF OLDER WOMEN TO A TETHERED SWIM TEST.

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**Jefferspm Room**

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The purposes of this investigation were to: (1) determine the effectiveness of the tethered swim test for assessing max  $\dot{V}O_2$  in female swimmers (52-69 years of age), and (2) compare the physiological responses to the test of master and recreational swimmers. Four subjects were master swimmers, one nationally ranked. Master swimmers were enrolled in a master program and swimming/training 3 days/week for at least five months prior to the study. The five recreational swimmers swam an average of 2 days/week, 1/4 mile per session. Eight swimmers had been swimming for three or more years on a regular basis. The protocol described by Magel et al (1966) for the tethered swim test was modified for this age group due to their inability to support the starting weight and swim for the prescribed time. It consisted of 2-minute swim bouts with a 3-4 minute rest period. The starting workload was 2.7 kg and each successive workload was increased by 1.14 kg. Expired gas was collected during the last minute of each workout and at each minute as maximum work was approached. Post-exercise heartrate was measured for ten seconds immediately upon completion of the swim bout. There were no group differences on any variable including age, height, weight, body fat, and vital capacity. The mean  $\dot{V}O_2$  max for all subjects was 26.52 (+/- 6.65) ml/kg·min<sup>-1</sup> with mean  $\dot{V}E$  values of 49.11 (+/- 17.81) l/min. Maximum achieved heartrate was 155 (+/- 11.14) bpm. The results of this study indicate that the tethered swim test can be used with this aged population to test for cardiovascular response to exercise. Further research is needed utilizing the tethered swim apparatus to assess the physiological response of older female subjects to exercise or to training and to quantify the results against standardized tests of aerobic capacity.

QUESTIONS TO BE ASKED/NOTES AND COMMENTS

