AMERICAN COLLEGE OF SPORTS MEDICINE

CENTRAL STATES CHAPTER

1998 ANNUAL MEETING

EMBASSY SUITES
KANSAS CITY, MO

OCTOBER 23-24, 1998

Friday October 23rd

7:45 am	**Onsite registration begins**
8:45-9:00 am	**Welcome and opening comments - Jeffrey A. Potteiger, Past-president**
9:00-10:10 am	**General Session**
9:00-9:30 am	**Wendy Kohrt, Washington University** **Interactions of exercise and estrogens on bone mineral density and body composition in older women**
9:30-10:00 am	**Barbara Lukert, University of Kansas** **Osteoporosis: what's new?**
10:00-10:10 am	**Questions/Discussion**
10:10-10:30 am	**Morning break**
10:30-12:15 pm	**Concurrent Sessions**
	Science
10:30-11:00 am	**Marci Chan, University of Kansas** **Exercise-induced immune regulation**
11:00-11:30 am	**Timothy Musch, Kansas State University** **Skeletal muscle blood flow response to exercise in rats with chronic heart failure induced by myocardial infarction**
11:30-12:00 pm	**Ronald Terjung, University of Missouri** **Exercise and angiogenic growth factor induced increases in peripheral collateral blood flow to skeletal muscle**
12:00-12:15 pm	**Questions/Discussion**
	Clinical Session
10:30-11:00 am	**Carol Zebas, University of Kansas** **Are running shoes hazardous to your health?**
11:00-11:30 am	**Greg Kandt, Fort Hayes State University and Eric Larson, Hayes Heart Center** **Cardiac rehabilitation in Western Kansas: cooperative program implementation between Hays Heart Center and Fort Hayes State University**
11:30-12:00 pm	**Dennis Jacobsen, University of Kansas** **The effects of long-term exercise on body composition and metabolic fitness**
12:00-12:15 pm	**Questions/Discussion**
12:15-1:30 pm	**Lunch**
1:30-2:40 pm	**General Session**
1:30-2:00 pm	**David Poole, Kansas State University** **Determinants of muscle oxygen exchange**

continued on back

ABSTRACTS OF RESEARCH PRESENTATIONS

The American College of Sports Medicine's Professional Education Committee certifies that this Continuing Education offering meets the criteria for 10 credit hours of ACSM Continuing Education Credit.

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POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

PROGRESSIVE TRAINING AND TIME SPENT IN TARGET HEART RATE ZONE

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University of Kansas, Lawrence, KS

Previous studies have reported some variability in changes VO_2max, despite the studies reporting exercise at the same percentage of target heart rate (THR). Training studies rarely report the actua time subjects spend in the THR zone. Therefore, the purpose of this study was to determine the amount of time subjects spend in their THR during an exercise session and the percent of the sessions they spend at least 60% of the exercise time in their THR zone. Six, young (x_{age}=21 years) previously sedentary, moderately obese (X=35.5 ± 8.1% fat) men (n=3) and women (n=3) participated in a progressive exercise program. The physical characteristics of the subjects were height (173.01 ± 11.39 cm), weight (88.86 ± 20.80 kg) and VO_2max (35.7 ± 7.2 ml•kg^{-1}•min^{-1}). The program progressed as follows: 30 minutes, 3d•wk^{-1} for the first three weeks, 35 minutes, 4d•wk^{-1} for the next four weeks and finally 40 minutes, 5d•wk^{-1}. During the first two weeks of the program the subjects exercised at 60% of THR, then progressed to 70% of THR for the remaining ten weeks. Heart rates were obtained at one-minute intervals using the Polar Accurex Plus™ heart rate monitors throughout the entire bout of exercise over the initial twelve weeks of the study. Each exercise session was supervised and the subjects were encouraged to exercise in their THR zone. The HR data obtained from the monitors was then downloaded into an Excel spreadsheet and then analyzed using SAS. The minute-by-minute data revealed that the subject spent 60% (first month), 63% (second month), and 60% (third month) in their THR zone. The data was then further analyzed to investigate the number of exercise sessions that the subjects spent greater than 60% of the exercise session in their THR zone. The analysis revealed that during the first, second and third months the subjects spent 60% (first month), 73% (second month), and 65% (third month) in their THR zone. When these two methods are compared it appears that the per session analysis resulted in greater time spent in the THR zone when compared to the minute-by-minute analysis. These results indicate that during a progressive training program subjects spent 61% of each session in THR zone and 66% of the exercise sessions during a twelve-week program in their THR zone. From this data we can conclude, that although the protocol is to exercise for the entire session in the THR zone only approximately 60-70% of the exercise session is actually spent in THR zone. It is possible that in previous studies some of the variability in the reported change in VO_2max may be due to subjects only spending a portion of the exercise session in THR zone as compared to the entire session.

THE EFFECT OF CARBOHYDRATE INGESTION DURING RECOVERY ON REPEATED HIGH INTENSITY EXERCISE IN WELL-TRAINED CYCLISTS.

Haub M.D.[1], Potteiger J.A.[2], Jacobsen D.J.[2], Nau K.L.[3], and Salkind N.J.[4]. [1]Department of Geriatrics, University of Arkansas for Medical Sciences, [2]Department of Health, Sport, and Exercise Sciences, University of Kansas; [3]Department of Physical Therapy Education, University of Kansas Medical Center; [4]Department of Psychology and Research in Education, University of Kansas.

There are numerous investigations that have shown that carbohydrate ingestion improves prolonged exercise performance, but there are few that have addressed whether carbohydrate ingestion influences repeated short duration high intensity exercise. Therefore, we investigated the effects of carbohydrate ingestion during recovery from short duration high intensity exercise on subsequent exercise performance in well-trained cyclists. Initially, aerobic power was determined and the subjects (n=7) were familiarized with the 100 kJ test protocol (100KJ-TEST). During treatment sessions, the subjects performed a 100KJ-TEST (RIDE-1), consumed 0.7 g·kg body mass^{-1} of liquid carbohydrate (CHO) or placebo (PLC), rested 60 min, and then performed a second 100KJ-TEST (RIDE-2). Blood samples before (PRE-1) and after (POST-1) RIDE-1, and before (PRE-2) and after (POST-2) RIDE-2 were analyzed for the concentrations of plasma glucose ([PG]), lactate ([La$^-$]), and free fatty acids ([FFA]). No significant differences were observed between treatments in time to complete RIDE-1 (CHO = 283.4 ± 36.6 s; PLC = 283.1 ± 43.5) or RIDE-2 (CHO = 281.6 ± 35.1; PLC = 283.4 ± 42.4). [PG] significantly decreased from POST-1 to PRE-2 for PLC. Significant differences were observed between treatments for [FFA] from POST-1 to PRE-2 and from POST-1 to POST-2. At POST-2, [FFA] was significantly elevated compared to POST-1 for PLC, while for CHO [FFA] significantly increased from PRE-2 to POST-2. [La$^-$] was significantly elevated at POST-1 and POST-2 relative to PRE-1 and PRE-2, but there were no differences between treatments. Carbohydrate ingestion following maximal exercise does not influence subsequent maximal effort exercise, but significantly alters [PG] and [FFA] relative to a placebo condition. Therefore, cyclists do not need to consume carbohydrate beverages during recovery to enhance subsequent short duration high intensity exercise performance.

This investigation was partially funded by the Gatorade Sport Science Institute.

POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

A Comparison of Body Composition Methods Before and After the Effects of Resistance Training in Early Postmenopausal Women.

N. Nabavi, M. Bemben, D. Bemben, and N. Fetters.
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Rapid declines in muscle and bone tissue, as well as age related fat patterning associated with menopausal estrogen deficiency can significantly alter body composition. Therefore, the purpose of this study was to determine if any differences exist in the measurement of body composition between five methods at baseline and after a six month resistance training program. Twenty-five subjects, ranging in age from 41 to 61 years were randomly placed into three groups: High Load (n=10; 80%1RM, 8 reps, 3 sets); Low Load (n=7; 40%1RM, 16 reps, 3 sets); and Control (n=8). Subjects had not been on hormone replacement therapy, all were 1 to 7 years postmenopausal, and the two training groups were matched for total work done. Body fat percentage, fat mass, and fat-free body mass were computed using density from underwater weighing (Siri, 1961), underwater weighing corrected for total body water (Siri, 1961), underwater weighing corrected for bone mineral content (Brozek, 1963), a Four Component Model - water, fat, mineral, and protein (Lohman, 1986), and Dual Energy X-ray Absorptiometry (DEXA, Lunar Model DPX-IQ). Two-way repeated measures ANOVA was used to assess any significant method differences among the body composition variables before and after training. Statistical significance was set at $p \leq 0.05$. At baseline, no significant differences existed between the five methods for measuring fat mass, fat-free body mass, and body fat percent. Additionally, no differences were detected between the body composition methods, within each group, following the six month training program. In conclusion, the theoretical and mathematical assumptions associated with the five different body composition assessment techniques were essentially equivalent in their ability to measure body composition variables for early postmenopausal women regardless of training status.

POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

EFFECTS OF MUSIC-PACED EXERCISE ON RATINGS OF PERCEIVED EXERTION

Huskey, JA, Rhodes, SW, Bowers, LR, Moll, AR, Pujol, TJ, and Langenfeld, ME,
Southeast Missouri State University, Cape Girardeau, MO

Previous research has shown that exercise while listening to music lowers ratings of perceived exertion (RPE). The purpose of the present study was to compare the effects of music-paced exercise to exercise paced by a metronome. The subjects were 16 non-musician college students (8 male & 8 female). Subjects were required to cycle at a pace of 60rpm for two ten-minute bouts, the first at 60% of maximal workload and the second at 80% of maximal workload. The subjects were required to participate in two randomly assigned trials. The control trial, in which the pace was set by a metronome, and the experimental trial, in which the same pace is set by music of the subject's preference. RPE was recorded every two minutes during each bout. Data were analyzed by a MANOVA with repeated measures. Data analysis indicates that RPE was significantly lower during music trials $F_{(1,35)}=7.60$, $p>0.05$. No significant difference was found for the interaction between the trials and bouts of exercise. The results suggest that music-paced exercise allows subjects to perform more work within a single bout.

POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

THE EFFECTS OF CALCIUM-POTASSIUM PYRUVATE INGESTION ON REPEATED EXERCISE PERFORMANCE.

M. W. Hulver and S. H. Case. Human Performance Laboratory, Western Maryland College, Westminster, MD. 21157

Pyruvate is a three carbon metabolite of carbohydrate metabolism When used as a dietary supplement or a partial replacement for carbohydrate in the diet, it has been found to produce strong metabolic effects. Pyruvate has been marketed by supplement manufacturers as a substance that will provide two benefits: enhancement of weight loss while preserving lean body mass, and improvement in submaximal endurance. No published research to date has investigated pyruvate and its performance enhancing capabilities in those activities where energy is produced predominantly from anaerobic energy systems. The purpose of this research was to determine if dietary supplementation with calcium-potassium pyruvate would enhance high intensity, intermittent work. Eighteen subjects (mean age 22.5 ± 2.5 years) ran repeated one minute intervals interspersed with 30 seconds of rest on a motor driven treadmill under two conditions: (1) after 7d of dietary calcium-potassium pyruvate supplementation ($4000mg \cdot d^{-1}$)(SUP), and (2) after 7d of placebo ingestion (maltodextrin, $4000mg \cdot d^{-1}$)(PLC). The speed and grade was equal to that of the final stage of a previously performed graded exercise test. The number of intervals completed until voluntary exhaustion under the two conditions was compared. Blood lactate and glucose were determined pre and post exercise. Data were analyzed using a paired t-test with $P. \leq 0.05$. There were no significant differences between groups for the number of intervals completed (SUPP = 7.6 ± 2.5; PLC = 8.4 ± 2.3), post-exercise lactate (SUP = 11.8 ± 2.6; PLC = 11.8 ± 2.8), and post-exercise glucose (SUPP = 107.9 ± 24 ; PLC = 103. 9 ± 20.3). It is concluded that 7d of dietary supplementation with calcium-potassium pyruvate does not improve repeated exercise performance or alter glucose or lactate concentration during high intensity exercise.

POSTER PRESENTATION: OCTOBER 23; 5:00-6:00P.M.

THE EFFECTS OF ACUTE ALTITUDE EXPOSURE OF 1829 m ON MAXIMAL GRADED EXERCISE PERFORMANCE

C.L. Hart, F.A. Kulling, FACSM, G. Tatum. Oklahoma State University, Stillwater, OK and Oklahoma State University-College of Osteopathic Medicine, Tulsa, OK.

The majority of research on the effects of altitude and hypoxia on exercise performance has concentrated on elevations > 3,000 m above sea level. However, in the U.S. many people participate in physical activity or sports at more moderate or mild altitudes. The purpose of this investigation was to determine the effects of acute mild altitude exposure on maximal exercise performance. Eight males and two females classified as young apparently healthy trained cyclists served as subjects for this study. Each subject performed two randomly assigned maximal graded exercise tests (GXT) in a hypobaric chamber. During the LOW trial the subjects exercised at simulated altitude of 305 m, and during the HIGH trial the subjects exercised at a simulated altitude of 1829 m. The GXT began at a workload of 70 W on a Monark 818E cycle ergometer, and progressed continuously in 3 minute stages at a rate of 70 W/stage until volitional exhaustion or the subjects failed to maintain a 70 rpm pedal cadence. Prior to exercise and during each stage of the GXT heart rate (HR), oxygen saturation (O2SAT), systolic pressure (SP), diastolic pressure (DP), minute ventilation at BTPS (VE), oxygen consumption (VO2), and blood lactate (LA) measures were obtained. Maximal workload and time to exhaustion were also measured during this study. Using paired t tests no significant ($p<0.05$) differences observed between LOW and HIGH trials for any of the physiological variables at rest. However, during maximal exercise there was a significant reduction in exercise time (mean $\pm$ SE: LOW = 14.02 $\pm$ 0.63; HIGH = *12.96 $\pm$ 0.61 min), maximal workload (LOW = 336 $\pm$ 14; HIGH = *308 $\pm$ 19 W), VO2 (LOW = 61.4 $\pm$ 2.4; HIGH = *55.2 $\pm$1.5 ml/kg/min), and O2SAT(LOW = 94 $\pm$ 1; HIGH = *86 $\pm$ 1 %). No significant differences were observed during maximal exercise for HR (LOW = 176 $\pm$ 5; HIGH = 172 $\pm$ 4 bpm), SP (LOW = 189 $\pm$ 7; HIGH = 187 $\pm$ 5 mm Hg), DP (LOW = 74 $\pm$ 2; HIGH = 73 $\pm$ 1 mm Hg), VE (LOW = 166.4 $\pm$ 8.3; HIGH = 168.8 $\pm$ 10.0 l/min), or LA (LOW = 7.5 $\pm$ 0.8; HIGH = 8.3 $\pm$ 1.0 mM). The findings of this study confirm that at acute simulated mild altitude exposure there is a reduced exercise O2SAT resulting in decreased exercise performance and VO2max during graded exercise testing of trained cyclists.

POSTER PRESENTATION: OCTOBER 23; 5:00-6:00P.M.

DIETARY INTAKE AND EATING HABITS OF PEOPLE WITH PHYSICAL DISABILITY.

Allen W. Knehans, James J. Laskin, Susan M. Fuller and Vincent Rousseau. University of Oklahoma Health Sciences Center, Oklahoma City, OK 73190

There is little information regarding what counseling strategies should be employed to improve the effectiveness of nutrition intervention in those with physical disability to reduce risk for chronic degenerative diseases. A first step in providing information in this area is to assess dietary intakes and eating habits of individuals with physical disability to determine the need and extent of intervention necessary, as well as to identify unique barriers to healthy eating. Sixteen healthy subjects, 13 males and 3 females, 19-44 yr old, were recruited. Fourteen subjects were spinal cord injured; two had a congenital defect. All used wheelchairs. Subjects completed a three day food diary after being counseled on proper food record-keeping. Once submitted, subjects were called to clarify any confusing aspects of their food record. Average daily intakes for each subject returning their food record (n=12) were assessed using a computerized database. Interviews using open-ended questions were also conducted to investigate eating behaviors. Interview questions and answers were organized into themes and subthemes using ethnographic analysis (n=16). Daily energy intake was 1809 kcal, consisting of 52% carbohydrate, 15% protein, 33% fat and 12% saturated fat. Cholesterol intake was 232 mg/d. Fiber intake was 10 g/d. Vitamin C, folate, and calcium intakes were 108, 39, and 94% of the RDA, while iron and beta-carotene intakes were 9.3 and 1298 mg/day. Interviews revealed a number of poor eating behaviors; not eating breakfast, minimal intake of fruits/vegetables, and restriction of fluids. Some expressed concern about burning themselves cooking and having limited accessibility to kitchen appliances. Many were dependent upon caretakers for food selection and preparation. Only six had been given any formal instruction in dietary management during their health care visits. All but one of the dietary consultations came during the time of critical care following trauma, leading to poor retention of the nutrition information presented. We suggest nutrition counseling be given to clients with physical disability as a routine component of their ongoing health care to minimize risk for nutrition-related chronic disease. Nutrition counseling should be done when learning nutrition strategies will be maximized. Individual counseling should be emphasized to determine barriers to adopting good eating habits.

POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

The Regulation of Exercise Intensity Using Ratings of Perceived Exertion During Visual Passive Distraction

Gwen Hull and Jeffrey Potteiger, Department of Health, Sport, and Exercise Sciences, University of Kansas

The purpose of this investigation was to determine if visual passive distraction altered the ability to regulate exercise intensity when using ratings of perceived exertion (RPE) during a 30 min treadmill run. Ten trained females performed a graded exercise test on a treadmill to determine maximal aerobic power and RPE (Target RPE), oxygen uptake (VO_2), heart rate (HR), and running velocity (RV) at the 2.5 mmol·L^{-1} blood lactate concentration ([La$^-$]). Subjects then used the Target RPE to regulate exercise intensity during a control condition (Cont), and two treatment runs with passive visual distractions. During the treatment sessions, the subjects ran on the treadmill while viewing a high action (High) or a low action (Low) video with no audio. Subjects were allowed to adjust the treadmill speed throughout the run in order to maintain the Target RPE. However, subjects were not allowed to view the speed setting. There were no significant differences in[La$^-$] among the conditions for the CONT, LOW, HIGH, or GXT ($p<0.05$). No significant differences in VO_2 or RV were found within or among the 30 min treatment runs and the GXT. HR at 5 min of exercise during CONT (158.1 $\pm$ 2.74), LOW (157.8 $\pm$ 2.58), and HIGH (158.6 $\pm$ 2.31) was significantly lower than the GXT (169.4 $\pm$ 2.82). Based on the data collected, visual passive distraction did not alter these female's ability to regulate intensity using RPE during a 30 min treadmill run.

key words: RPE, exercise intensity, lactate threshold, visual passive distraction, running

POSTER PRESENTATION: OCTOBER 23: 5:00-6:00P.M.

EFFECTS OF VARYING CRANK LENGTHS ON EXERCISE VO_2 RESPONSE AND LOWER LIMB KINEMATICS

P. Krebs and L. Noble, FACSM ; Lees Summit, MO; Kansas State University, Manhattan, KS

The energetic response to exercise is dependent, in part, upon the fiber type composition of the exercising muscle and its recruitment pattern. Altered crank lengths produce a change in the magnitude of force application and, theoretically, movement patterns associated with the cycling movement. We hypothesized that altered crank lengths would produce a change in the pedaling kinematics and recruitment pattern of fiber within the exercised muscles and thereby alter the VO_2 response (kinetics and maximum). Seven male cyclists performed incremental and constant load cycle ergometry for measurement of VO_2 max and VO_2 kinetics, respectively. The incremental test consisted of 25 watt/min to symptom-limited VO_2 max. The constant load test was performed at the work rate which elicited 85% VO_2 max during the incremental test and was continued to fatigue. Each cyclist used his own bicycle which was then attached to a Schwinn Velodyne. The three crank lengths used were 165, 170, and 175 mm. The cadence was individualized. Analysis of videotapes taken during the first and last minute of each exercise bout provided pedal frequency (PEDFREQ), hip joint position, and range of motion about the hip (HROM), knee (KROM), and ankle (AROM) joints. Results indicated that: (1) there was a higher VO_2 max at fatigue for the 170 mm crank arms for 5 of the 7 cyclists ($p \leq .02$); (2) the rapid VO_2 kinetics, defined as VO_2 at 3 minutes, was significantly higher while cycling with the 170 mm crank arms; (3) crank length did not affect the slow component response ($p \geq .10$); (4) hip joint range of motion was the only kinematic parameter affected by fatigue, increasing with the onset of fatigue; (5) while AROM was not different for different crank lengths, KROM and HROM were greater for increasing crank lengths; (6) the position of the hip was lower with increasing crank arm lengths at both top dead center (TDC) and bottom dead center (BDC); and (7) the distance between the hip joint and the foot at TDC decreased as the crank length increased while the distance between the hip joint and the foot at BDC was not affected by crank length.

ORAL PRESENTATION: OCTOBER 24: 8:45A.M.

COMPARING LOAD CARRIAGE METABOLIC EXPENDITURE WITH AND WITHOUT THE USE OF HIKING POLES DURING INCLINED WALKING

B. H. Jacobson, T. Wright, B. Dugan, Department of Health and Human Performance, Oklahoma State University, Stillwater, OK

This study compared load carriage energy expenditure with and without the use of commercially manufactured hiking poles. Male volunteers (N=20) ages 20-48 yr.(M = 29.8 yr.) completed two randomly ordered submaximal, load carriage treadmill trials with hiking poles (E) and without hiking poles (C). Hiking pole lengths and load (15 kg internal-frame backpack) were fitted for each subject according to the manufacturers' suggestions. Heart rates ($b \cdot min^{-1}$), minute ventilation ($L \cdot min^{-1}$) oxygen consumption ($ml \cdot kg \cdot min^{-1}$), caloric consumption ($Kcal \cdot min^{-1}$), and rating of perceived exertion (RPE) were recorded during each treadmill bout. At a constant treadmill speed of 1.5 mph the protocol consisted of 1 min. at 10% grade, 2 min. at 15% grade, 2 min. at 20% grade, and 10 min. at 25% grade. Testing sessions were held one week apart. Mean heart rates (E = 144.8 ± 17.1 $b \cdot min^{-1}$; C = 144.0 ± 18.2 $b \cdot min^{-1}$) and mean minute ventilation (E = 51.3 ± 12.2; C = 51.8 ± 12.7 $L \cdot min^{-1}$) were not significantly different. In contrast mean oxygen consumption (E = 26.8 ± 5.4 $ml \cdot kg \cdot min^{-1}$; C = 27.4 ± 5.2 $ml \cdot kg \cdot min^{-1}$), caloric consumption (E = 10.6 ± 2.2 $Kcal \cdot min^{-1}$; C = 10.8 ± 2.2 $Kcal \cdot min^{-1}$) and rating of perceived exertion (E = 13.28 ± 1.2; C = 14.56 ± 1.2) were significantly lower ($P \leq 0.05$) while walking with hiking poles. Analysis of isolated data points yielded no significantly different time points except in for the RPE assessment. Walking with hiking poles was rated significantly less strenuous ($p<.05$) at minute 5 and from minutes 9 to 15 min. These results suggest that during load carriage on moderate grade, the use of hiking poles may provide a greater psychological benefit than that of energy expenditure reduction.

Supported by Cascade Designs® Inc., Leki-Sport USA® Inc., and Gregory Mountain Products Inc.

ORAL PRESENTATION: OCTOBER 24: 9:00A.M.

THE EFFECTS OF WHOLE BODY COOLING ON FORCE PRODUCTION IN THE QUADRICEPS AND HAMSTRINGS.

Comeau,M.J., Potteiger,J.A.
Department of Health, Sport, and Exercise Sciences, University of Kansas

The purpose of this study was to determine the effects of whole body cooling on the force production of the quadriceps and hamstring muscles. Ten college-age male subjects (mean ± SD: age = 21.4 ± 2.2 y, height = 168.5 ± 35.9 cm, body mass = 78.0 ± 6.4 kg, thigh fat volume = 1137.98 ± 441 ml, thigh fat-free volume 3304.36 ± 580.30 ml) participated in this study. Each subject completed a 10-repetition pre-post isokinetic test at $180° \cdot s^{-1}$. Between tests, each subject experienced a 40-min exposure to 20, 15, 10 or 5 °C. Results revealed a significant decrease ($p \leq 0.05$) in the pre- and post-cooling peak and average torque values for the quadriceps and hamstrings at 10 °C. A significant decrease ($p \leq 0.05$) was also measured between the pre- and post-cooling peak and average torque values for only the hamstrings at the 5 °C exposure. In conclusion, force production is significantly decreased when the body experiences whole body cooling at temperatures below 10 °C.

Significant pre-post-torque values for the quadriceps and hamstrings. N=10 (Mean ± SD)

	10 °C	5 °C
Quadriceps		
Pre-cooling peak torque (ft-lb)	88.26 ± 6.38	
Post-cooling peak torque (ft-lb)	83.62 ± 9.49	
Pre-cooling average torque (ft-lb)	80.99 ± 5.85	
Post-cooling average torque (ft-lb)	77.78 ± 8.53	
Hamstrings		
Pre-cooling peak torque (ft-lb)	72.71 ± 13.08	76.47 ± 14.50
Post-cooling peak torque (ft-lb)	65.23 ± 10.89	70.91 ± 14.05
Pre-cooling average torque (ft-lb)	65.51 ± 13.84	66.83 ± 13.53
Post-cooling average torque (ft-lb)	59.27 ± 10.34	63.58 ± 13.25

ORAL PRESENTATION: OCTOBER 24: 9:15A.M.

EFFECTS OF CONTINUOUS VS. INTERMITTENT EXERCISE ON SELF-EFFICACY AND PHYSICAL ACTIVITY ENJOYMENT

[1]S.R. Sears, [1]D.J. Jacobsen, [2]N. Pronk, [1]J.E. Donnelly FACSM.
[1]University of Kansas, Lawrence, [2]Health Partners, Minneapolis

The effects of exercise on psychological variables such as occupational stress, self-efficacy, and physical activity enjoyment are important given their contribution to exercise adoption and maintenance. The purpose of this study was to determine the effects of long-term continuous (CON) versus intermittent (INT) exercise on occupational stress (OS), overall work stress (WS), self-efficacy for exercise (SE), and physical activity enjoyment (PAE). All participants were previously sedentary and moderately obese. Participants in the CON group were 10 females and 5 males (age=50±10yrs, ht=168.0±6.73cm, wt=86.36±10.07kg, %BF=38.8±4.9). Participants in the INT group were 10 females and 2 males (age=49±9yrs, ht=164.2±5.57cm, wt=88.57±14.58kg, %BF=40.5±6.0). The CON group walked on a treadmill 30min, 3d•wk^{-1}, at 60-75% of maximal oxygen consumption, with direct supervision. The INT group walked at home or worksite 15min, 2times•d^{-1}, 5d•wk^{-1}. The INT group was instructed to walk briskly, yet comfortably, and was supervised on a random schedule 2d•wk^{-1}. Psychological assessments were administered at baseline, 9mo, 18mo. Data were analyzed with a 2-factor (GRPxTIME) repeated measures (TIME) ANOVA. No effects of group (CON, INT) or time (baseline, 9mo, 18mo) were found on OS, WS, SE, or PAE. However, item-analyses revealed a significant time effect for SE to "set aside time to exercise" ($p<0.05$). Duncan's post-hoc analysis indicated that SE was significantly lower for CON and INT at 18mo (CON: X=3.66±1.23; INT: X=3.58±0.79) than at either 9mo (CON: X=4.26±0.70; INT: X=4.08±0.98) or baseline (CON: X=4.20±0.77; INT: X=3.91±1.16). SE at 9mo and baseline were not significantly different for either CON or INT. A significant time effect also was found for PAE for the item "I enjoy it/I hate it" ($p<0.05$). Duncan's post-hoc analysis indicated that PAE was significantly higher for CON and INT at 18mo (CON: X=5.86±L06; INT: X=6.08±0.90) and at 9mo (CON: X=5.80±1.26; INT: X=5.83±1.52) than at baseline (CON: X=5.30±1.60; INT: X=4.80±1.87). PAE at 18mo and 9mo were not significantly different for either CON or INT. Thus, over time, participants enjoyed exercising more, but became less confident in their ability to set aside time to do so. These findings may suggest the necessity of relapse prevention interventions (time management, lifestyle rebalancing) even late in the course of exercise adoption. Given the small sample size in this study, further research in a larger sample is warranted.

Supported by AHA-NE 95078375

ORAL PRESENTATION: OCTOBER 24: 9:30A.M.

THE BACK HANDSPRING ON THE BALANCE BEAM: A KINEMATIC COMPARISON OF TWO TECHNIQUES

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The purpose of this investigation was to compare the kinematic parameters pertinent to the performance of a single back handspring (BHS) on the balance beam to a BHS performed as the initial skill in an acrobatic series. Special emphasis was placed upon the take-off portion of the preparatory phase versus the transition phase of the series BHS. Eight female gymnasts from two competitive gymnastics clubs were videotaped performing a single BHS and an acrobatic series commencing with a BHS on the balance beam. Each BHS was manually digitized and subsequently analyzed by the Ariel Performance Analysis System (APAS). Kinematic variables assessed in this investigation included: duration of each phase, horizontal displacement, body segment parameters (trunk, thigh, and shank segment angles; angles of take-off from the preparatory phase and transition phase), horizontal and vertical velocities of the center of mass upon take-off, and total body rotational momentum. Time spent in the first flight and transition phases of the series BHS was significantly less than for the single BHS, as was total time for skill completion ($p<0.05$). The thigh segment angle was larger for the single BHS during the preparatory phase, as was the angle of take-off. Horizontal displacement during the second half of BHS performance was significantly less for the series BHS, indicating the lead foot may be pulled in towards the hands. Additionally, total body rotational momentum was greater for the series BHS during the second half of BHS performance. Significant differences were found for the position of the shank and thigh segments, the angle of take-off, and the horizontal momentum of the center of mass upon take-off from the transition phase of the series BHS as compared to the preparatory phase for this skill. No gymnast exhibited a second flight phase during BHS performance on the balance beam. The findings of this study indicate that subtle differences exist in BHS performance in an acrobatic series and as a single element on the balance beam, with most of the differences occurring during the transition phase. The transition phase, therefore, may be an important factor in the successful completion of an acrobatic series on the balance beam.

The Effects of Carbohydrate Supplementation on Metabolism and Performance During Resistance Exercise

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The effects of carbohydrate (CHO) supplementation on isokinetic leg extension/flexion exercise was examined with eight resistance trained men (mean±SEM, age: 23.7±1.3 y, height: 180.0±3.5 cm, body mass: 94.9± 4.9 kg). Subjects participated in a randomized double blind protocol with testing sessions separated by 7-d. Subjects were given a CHO or placebo (P) while performing 16 sets of 10 repetitions at 120°s^{-1} on a Cybex II Isokinetic Dynamometer. Performance variables measured were: total work, average work, peak torque and average torque. Blood glucose, free fatty acid (FFA), and lactate (La) were measured prior to testing (PRE), after set 8 (MID), and 16 (POST). The CHO treatment elicited significantly more total work (CHO:41.1±3.9 kJ; P: 38.1±3.9 kJ) and average work (CHO:2.6±0.2 kJ; P: 2.4±0.2 kJ). There were no differences between treatments for peak torque of the hamstrings (CHO:91.6±6.5 Nm; P:87.4±8.5 Nm) and quadriceps (CHO:129.7±9.5 Nm; P: 123.0±10.6 Nm). The average torque of the hamstrings (CHO:77.8±5.2 Nm; P: 75.7±8.7 Nm) and quadriceps (CHO:116.9±8.9 Nm; P: 110.0±8.5 Nm) were not statistically different between the treatments. Blood glucose was significantly higher at the POST blood draw in the CHO treatment. No significant differences were observed between the treatments for FFA and La concentrations. However, a general trend of decreasing FFA concentrations were observed in response to the CHO treatment. Both treatments elicited a significant increase in [La] from PRE to MID and PRE to POST blood draws. The data from this investigation indicates that the use of CHO supplementation during resistance exercise may lead to an enhanced performance. This enhancement in performance may be directly related to the elevated blood glucose concentrations associated with CHO supplementation.

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LUNG DIFFUSION CAPACITY IS COMPROMISED DURING GRADED EXERCISE IN HEALTHY ACTIVE WOMEN

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It has recently been reported that many active healthy young women experience significant exercise induced arterial hypoxemia (EIAH) and at a VO2max that is substantially less than those in their active male contemporaries (*Harms et al, J Physiol, 1998*). Due to excessive widening of the A-a O2 difference in those women with EIAH, we hypothesized that lung diffusion was impaired in women during exercise. To test this postulate, 6 physically active women (VO2max: 51.5 ± 5.4ml/kg/min) and 5 men (VO2max: 59.0 ± 5.3ml/kg/min) all with normal resting pulmonary function each completed a graded incremental exercise test to VO2max. Metabolic measurements were determined via a breath by breath automated system (Sensormedics). Lung diffusion capacity (DLCO, corrected for [Hb]) and pulmonary blood flow (Qc; acetylene absorption) were measured at rest and during each exercise stage by the single breath exhalation method. As expected, in the male subjects, DLCO increased linearly with increasing Qc during exercise. However, in our female subjects, DLCO was not related to Qc, did not change from ~70% of VO2max (43.8 ± 2.7 ml/min/mmHg) to maximal exercise (39.2 ± 4.2 ml/min/mmHg), and was significantly lower ($P<0.05$) than in the men. When DLCO was adjusted for alveolar volume (DLCO/VA), differences between genders disappeared at moderate intensity exercise (~70% VO2max) but were significantly less for the women at VO2max. These preliminary data suggest that lung diffusion capacity may be compromised in active women during exercise which may contribute to exercise induced arterial hypoxemia seen in many active women. The mechanism for the impaired DLCO has yet to be determined. *Supported by Parker B. Francis Fellowship and USRG.*

AMERICAN COLLEGE OF SPORTS MEDICINE CENTRAL STATES CHATER 1998 ANNUAL MEETING

The Central States Chapter of American College of Sports Medicine would like to thank the Gatorade Sports Science Speakers Bureau for sponsoring Dr. Oded Bar-Or's lectures at this meeting.

CONFERENCE NOTES

2:00-2:30 pm	Michael Conley, Indiana University Athletic and clinical uses and misuses of oral creatine supplementation
2:30-2:40 pm	Questions/Discussion
2:40-3:00 pm	Afternoon Break
3:00-4:45 pm	Concurrent Sessions
	Science
3:00-3:30 pm	Frank Uryasz and Randall Dick, NCAA Current issues in NCAA drug testing and sport sciences
3:30-4:00 pm	Christopher Lantz, Truman State University The drive for size: characteristics and influences of muscle dysmorphia
4:00-4:30 pm	Graig Harms, Kansas State University Pulmonary system limitations to exercise performance in healthy women
4:30-4:45 pm	Questions/Discussion
	Clinical
3:00-3:30 pm	Mark Williams, Creighton University Exercise training in elderly cardiac patients
3:30-4:00 pm	Wayne Campbell, University of Arkansas Nutrition and exercise considerations in sarcopenia
4:00-4:30 pm	Joseph E. Donnelly, University of Kansas Is exercise effective for weight loss?
4:30-4:45 pm	Questions/Discussion
4:45-5:00 pm	Break
5:00-6:00 pm	Poster Session
6:00-7:00 pm	Social hour

Saturday October 24th

7:00-7:45 am	Continental Breakfast
7:45-8:30 am	Business Meeting - Professional Members Student Meeting - Student Members
8:45-10:15 am	Oral Presentations
8:45-9:00 am	Comparing load carriage metabolic expenditure with and without the use of hiking poles during inclined walking. B.H. Jacobson, T. Wright, and B. Dugan. Oklahoma State University.
9:00-9:15 am	The effects of whole body cooling on force production in the quadriceps and hamstrings. M.J. Comeau and J.A. Potteiger. University of Kansas.

continued on back

9:15-9:30 am	Effects of continuous vs intermittent exercise on self-efficacy and physical activity enjoyment. S.R. Sears, D.J. Jacobsen, N. Pronk, and J.E. Donnelly. University of Kansas
9:30-9:45 am	The back handspring on the balance beam: a kinematic comparison of two techniques. J.R. Mendoza and L. Noble. Kansas State University.
9:45-10:00 am	The effects of carbohydrate supplementation on metabolism and performance during resistance training. G.G. Haff, C.A. Schroeder, A.J. Koch, K.E. Kuphal, M.J. Comeau, and J.A. Potteiger. University of Kansas.
10:00-10:15 am	Lung diffusion capacity is compromised during graded exercise in healthy active women. L.B. Daniels, C.A. Harms, W.I. Marshall, and A.B. Harms. Kansas State University.
10:15-10:30 am	Morning Break
10:30-12:15	Concurrent Sessions
	Science
10:30-11:00 am	Jeffrey C. Randall, Orthopedic Surgery Associates, P.A. Current concepts in ACL injuries
11:00-11:30 am	Michael Conley, Indiana University Resistance training and neuromuscular plasticity.
11:30-12:00 pm	Oded Bar-Or, McMaster University Voluntary dehydration and it's prevention in children who exercise in the heat
12:00-12:15 pm	Questions/Discussion
	Clinical
10:30-11:00 am	Janice Louden, University of Kansas Injuries of the anterior cruciate ligament in the female athlete
11:00-11:30 am	Barry Brown and Colleen Brown, University of Arkansas Fibromyalgia: proposed causes, and the role of nutrition, exercise, stress reduction and drug therapy as intervention strategies
11:30-12:00 pm	Jeffrey Roitman, Research Medical Center ACSM's Clinical Exercise Physiologists Registry
12:00-12:15 pm	Questions/Discussion
12:15-1:45 pm	Awards Luncheon
	Announcements and Presentations
	Oded Bar-Or, McMaster University
	Does enhanced physical activity enhance children's health?