

No statistical differences were observed in cardiovascular and pressor hormone responses between HAC and LAC groups during resting control and peak LBNP suggesting that  $\dot{V}O_2$  max does not appear to be associated with the physiologic mechanisms of orthostatic tolerance.

## #21

## PREDICTING WORK PERFORMANCE FROM ARM CRANK TO TREADMILL TESTS

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To compare the ability of treadmill (TM versus arm crank (AC) stress testing to predict an individual's capacity for heavy, industrial work, 20 male subjects underwent maximal testing on both devices, then performed a simulated work task (SWT) in our exercise laboratory. The SWT consisted of lifting and transferring 18 Kg sand bags between 2 platforms 76cm high and spaced 1.5m apart. The bags were stacked 5 high and transferred at 16 2/3 bags per minute. The total work consisted of 3 6-minute work periods separated by 1-minute rest intervals to record blood pressure and EKG. Heart rate, blood pressure, RPE, and regional discomfort from 5 sites - hands, arms, back, legs, and breathing - were assessed each work period. Peak heart rate, systolic blood pressure, and RPE on the SWT were 130±23 bpm, 142±20mm Hg, and 11.6±2.3, respectively. AC performance time was more strongly correlated with the relative stress of the SWT than was TM performance time. For example, SWT heart rate versus AC time yielded  $r = -.662$  ( $p < .01$ ), compared to  $r = -.379$  ( $p > .05$ ) versus TM time. The superiority of AC performance over TM performance held true if SWT stress was expressed as a percent of either predicted or measured maximal heart rate. These results suggest that maximal arm crank testing should be used to evaluate capacity for heavy, industrial jobs which require loading/unloading operations.

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## #22

## THE EFFECTS OF CONTROLLED RESPIRATION RATE ON METABOLIC RESPONSES TO SUBMAXIMAL INTERMITTENT EXERCISE

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Six healthy adult males performed two intermittent exercises on a cycle ergometer. Both exercises had a duration of 30 s, an intensity of 210 watts and were repeated 10 times with 30 s rest intervals. The first one had a frequency of 10 breaths/min. (CB) and the second one 30 breaths/min. (NB). Physiological variables were measured during exercise and rest, respectively. Oxygen uptake and pulmonary ventilation in CB showed significantly lower values by 30 % to 40 % during exercise, but higher values (30-40 %) during rest than those in NB. Arterial oxygen pressure and oxygen saturation during exercise showed significantly lower values (35 % and 7 % on average, respectively) in CB than in NB while during rest there was no significant difference. Arterial carbon dioxide pressure and hydrogen ion concentration during exercise were significantly higher in CB than in NB, while those during rest showed no difference between CB and NB. Lactic acid concentration increased and calculated base excess decreased with the repetition of exercise, but showed no differences between CB and NB. The similar levels of metabolic acidosis in arterial blood might be resulted from the inhibition of lactate diffusion from the working muscles. The results might indicate that the moderate exercise with CB, employed in the present study, could improve tolerance to lactic acid as compared to normal exercise.

## #23

## JOINT FUSION REHABILITATION IN HUMANS

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## MEDICINE AND SCIENCE IN SPORTS AND EXERCISE

Two females were studied to determine the feasibility of reinstating motion in joints that appear to be totally fused and/or immobile. The first subject is a 63 year old female with arthritis in the left pollex for seven years. Subject had severe swelling in the interphalangeal joint for three to four years. Dietary questionnaire revealed a high protein, high amount of milk products, and a low complex carbohydrate diet. Subject was treated with microtherm diathermy, manipulation with traction to the affected joints, and underwent a dietary change to an 80% complex carbohydrate, 0% milk and milk products, and 20% animal protein diet. The subject gained 66° flexion in the interphalangeal joint (normal 80°) and 57° flexion in the metacarpophalangeal joint (normal 60°). The swelling has decreased to one-fifth to one-fourth of original. The subject can actively flex in full range of motion with no pain present. The control subject is a 50 year old female with arthritis in the right and left pollices. Control showed no progress. Both subjects started at zero (0) degrees flexion on all affected joints. Significant findings are: some fully fused/immobile joints can be rehabilitated to full or partial motion.

Significant findings resulting from treatments in a clinical atmosphere at Bonebrake Chiropractic Center, Wichita, Ks. 67208

## #24

PREDICTION OF UPPER EXTREMITY  $\dot{V}O_2$  MAX THRU SUBMAXIMAL ARM CRANKING TESTS

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Assessing fitness in lower extremity handicapped persons is difficult because most tests which predict  $\dot{V}O_2$  max require lower extremity work. The purpose of this study was to develop a submaximal test to predict upper extremity (UX)  $\dot{V}O_2$  max. To establish the prediction equations, 52 subjects (4 paraplegics) ranging in age from 15 to 71 years were selected thru the use of a central composite rotatable design. UX  $\dot{V}O_2$  max was calculated from a graded arm cranking test (25W initial load with 12.5W increases every 2 min.) performed on a modified Monarch ergometer. On a succeeding day, each subject also performed 3 six minute submaximal tests at 25W, 50W and 75W. The submaximal tests were done in random order with a 10 minute rest between tests. 3 stepwise multiple regression equations predicting  $\dot{V}O_2$  max in  $l \cdot min^{-1}$  were developed using age, weight in kg (Wt), grip strength in kg (GS), pulse pressure (PP) and the average of the 5th and 6th minute exercise heart rates (HR). @ 25W:  $\dot{V}O_2$  max = 2.3912 - .00803 (age) + .005999 (Wt) + .00795 (GS) + .015519 (PP) - .013728 (HR), ( $R = .73$  SEE = .250) @ 50W:  $\dot{V}O_2$  max = 2.3856 - .007228 (age) + .005251 (Wt) + .00831 (GS) + .017568 (PP) - .01187 (HR), ( $R = .76$ , SEE = .240) @ 75W:  $\dot{V}O_2$  max = 2.6233 - .00831 (age) + .005076 (Wt) + .008048 (GS) + .015827 (PP) - .0106 (HR), ( $R = .75$ , SEE = .245). An additional 25 subjects (3 paraplegics) ranging in age from 15 to 55 years were used to test the validity of these equations. A paired t-test on the mean difference (D) between actual and predicted UX  $\dot{V}O_2$  max showed that all 3 equations had a mean difference which was not statistically different from zero (D25W = -.073 ± .294, D50W = -.049 ± .257, D75W = -.045 ± .258) ( $p < .05$ ). Therefore, it is concluded that these equations can be used to accurately assess the fitness levels of wheel chair bound individuals.

## #25

## CARDIORESPIRATORY RESPONSE TO PROLONGED LEG AND COMBINED ARM AND LEG ERGOMETRY

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Exercise for aerobic fitness and weight control should elicit a high metabolic load without excessive cardiorespiratory (CR) or subjective strain. Since some of the training effect is likely to be local, it is useful to employ both arms and legs in the exercise. Little is known about the metabolic, CR and subjective responses to prolonged arm and leg (A+L) work. 9 men performed 60 min of leg and