

CARDIOPULMONARY CONDITIONING BY TOTAL-BODY ERGOMETRY

Introduction - The total body ergometer was innovated as a crew conditioning device for space flight. It consists of two handles translated from the feet to over the head and back again. It is theoretically superior to the bicycle ergometer because it employs 186 agonist and antagonist muscles in the legs, trunk and arms. (The bicycle ergometer employs 20 agonist muscles in the legs.) The total body ergometer, however, is unproven as a crew conditioning device and an experimental comparison is needed to elucidate its potential.

Subjects - The subjects will consists of 12 men, 20-30 years old, who can demonstrate a maximal oxygen consumption on test 1.

Purpose - The purpose of the study is to compare the total body ergometer with the bicycle ergometer as a crew conditioning device.

Method - The experimental factor will be rotated. The subjects will serve as their own controls.

Procedure - The subjects will train 5 weeks, 5 days a week, 0.5 hr a day, one bout, constant work rate, on the bicycle ergometer, then take test 2. After another week of training, they will take test 3. After another week, test 4. Tests 2, 3, and 4 will establish a plateau or a slope for extrapolation to the end of the experiment. A subsequent 5 weeks will be spent training on the total body ergometer, followed by test 6. After another week of training, they will take test 7, which terminates the experiment.

Measurements - Measurements will include T-1824 for blood volume for tests 1, 4 and 7. The maximal oxygen consumption test will be done on the treadmill at 7 mph at discrete loads to confirmed max $\dot{V}O_2$. The test will include monitoring phonoarteriographic blood pressures (1), electrocardiogram, expired volume (spirometer) and expired composition (Haldane). Training exercise will be monitored. Phonoarteriographic blood pressures and heart rate will be measured from minute 20-25 and ^{$\dot{V}O_2$} from minute 26 to 27. Work rate will be measured from von Döbeln devices on the bicycle and total body ergometers (2).

Statistical Analysis - Mean differences will be tested by a simple analysis of variance after a Bartlett test for equal variability. If sets are significantly different, then t tests will be used to test specific differences. For all tests, probability will be set at less than 0.05.

References

1. Mastropaolo, J. A., et al. Validity of Phonoarteriographic Blood Pressures During Rest and Exercise. J. Appl. Physiol. 19(6): 1219-1233, 1964.
2. von Döbeln, W. J. Appl. Physiol. 7:222, 1954.