# PROCEEDINGS

## SOCIETY OF SPORTS SCIENCES

## ABSTRACTS OF PAPERS PRESENTED AT

## LOUGHBOROUGH UNIVERSITY OF TECHNOLOGY

## SATURDAY, 3rd APRIL, 1982

### THE INFLUENCE OF SHORT-TERM TRAINING ON THE MAXIMUM OXYGEN UPTAKE AND ENDURANCE CAPACITY OF MALE AND FEMALE SUBJECTS

C. Williams and M. G. L. Nute

*Dept. of Physical Education and Sports Science, University of Technology, Loughborough*

Maximum oxygen uptake ($\dot{V}O_2$ max) is commonly used as an indicator of fitness in general and endurance capacity in particular. Furthermore, $\dot{V}O_2$ max has often been the only criterion used to assess the efficacy of various training programmes. Available evidence suggests that while training may produce only modest improvements in $\dot{V}O_2$ max they are accompanied by large improvements in endurance capacity (Williams, 1981). Therefore the aim of the present study was to re-examine the relationship between the improvements in $\dot{V}O_2$ max and endurance capacity which occur with training.

Sixteen physical education students (10 female and 6 male) trained 3 times a week for 6 weeks on a treadmill at a speed equivalent to 90% of their pre-training $\dot{V}O_2$ max. In addition to the $\dot{V}O_2$ max tests, respiratory and metabolic responses to an endurance test were determined before, during and after the 6 weeks of training. The endurance test involved continuous running at speeds equivalent to 60%, 70% and 80% $\dot{V}O_2$ max for 4 minutes at each speed, and then at 90% $\dot{V}O_2$ max for as long as possible. Expired air and blood samples were collected after 4 minutes running at each speed and also at exhaustion. The overall improvements in $\dot{V}O_2$ max and endurance capacity for the females were 4.5% and 178% (Table I) whereas the values for the males were 3.7% and 223% respectively. These results suggest that $\dot{V}O_2$ max is an insensitive indicator of the training-induced improvements in endurance capacity of active male and female subjects.

**Reference**

Williams, C., 1981. J.biosoc.Sci., Suppl. 7: 103-112.

**TABLE I**

**A summary of the results of the female subjects (values are mean ± SD)**

| $\dot{V}O_2$ max Test (7 mph) | Pre (0 wks) | Mid (3 wks) | Post (6 wks) |
|---|---|---|---|
| Run Time (min) | 7.22 ± 2.11 | 8.33 ± 1.60* | 8.85 ± 1.71†** |
| $\dot{V}O_2$ max (ml.kg.$^{-1}$ min.$^{-1}$) | 48.9 ± 5.2 | 50.0 ± 5.0 | 51.0 ± 5.2†** |
| $\dot{V}E$ (L.min.$^{-1}$) | 84.4 ± 9.4 | 91.1 ± 10.9* | 89.8 ± 8.6 |
| HR max (bpm) | 194 ± 8 | 190 ± 8 | 188 ± 6** |
| **Endurance Test** | | | |
| Run Time (min) | 8.59 ± 4.61 | 22.31 ± 10.46* | 23.88 ± 15.59** |
| % $\dot{V}O_2$ max | 88.2 ± 2.1 | 85.5 ± 2.8 | 84.6 ± 4.2 |
| HR (bpm) at ETI | 192 ± 6 | 184 ± 9 | 187 ± 7** |
| $\dot{V}E$ (L.min.$^{-1}$) at ETI | 74.5 ± 10.2 | 71.2 ± 12.6 | 69.7 ± 11.9** |

ETI denotes measurements made at the end of the first endurance test and at the equivalent time during the subsequent two endurance tests. *denotes significant differences ($p < 0.05$) pre-mid; †mid-post and **pre-post.

---

### THE INFLUENCE OF TRAINING ON THE METABOLIC RESPONSES TO SUBMAXIMAL EXERCISE

Adrianne E. Hardman

*Dept. of Physical Education and Sports Science, University of Technology, Loughborough*

Improvements in endurance have been attributed in part to a shift from carbohydrate metabolism towards fat metabolism. A recent report (Henriksen et al, 1981) appears to support the proposal that increased oxidation of fat leads to an accumulation of citrate which inhibits phosphofructokinase.

Endurance at 83% $\dot{V}O_2$ max was evaluated as the work time to exhaustion on a cycle ergometer. Subjects

**TABLE I**

**(Mean ± sem)**

| | Pre-training | | Post-training | |
|---|---|---|---|---|
| | Pre-ex | 5' Post | Pre-ex | 5' Post |
| Blood lactic acid | .48 ± .07 | 4.63 ± .48 | .50 ± .06 | 2.24 ± .41† |
| Plasma citrate | .118 ± .006 | .163 ± .009 | .106 ± .005 | .138 ± .004† |
| Plasma glycerol | .083 ± .019 | .243 ± .031 | .081 ± .017 | .166 ± .017* |
| Plasma FFA | .46 ± .05 | .66 ± .07 | .40 ± .04 | .65 ± .07 |

significantly different pre-post training *$p < 0.05$, †$p < 0.01$