INFLUENCE OF TRAINING STATUS AND RAMP SLOPE ON THE VO2-KINETICS DURING RAMP CYCLE EXERCISE

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It has been observed that the oxygen uptake (VO2) kinetics are influenced by training status in the transition from rest to constant-load cycling exercise1,2. Trained subjects demonstrate a faster VO2 response and a higher gain (amplitude/work rate) compared to untrained controls. The purpose of the present study was to test if similar findings can be observed during another non-steady state condition, i.e. the ramp exercise, and if possible differences related to training status will also be present when different ramp slopes are used.

Eight cyclists and eight controls (physical education students) performed a ramp 25 (25W.min-1) and a ramp 40 (40W.min-1) – protocol until exhaustion on an electromagnetically braked cycle ergometer. Pulmonary gas exchange was measured breath-by-breath by means of a MedGraphics CPX/D. The VO2 was expressed as a function of time and work rate and after determination of the ventilatory threshold (VT), a linear regression \( y = ax + b \) was calculated below the VT, after elimination of the first two minutes of the ramp. Also, the mean response time (MRT) was calculated as the time between the start of the ramp and the intersection of the baseline VO2 and the extrapolation of the VO2/time – regression. The slope of the linear regression of the VO2/work rate – relationship \( (916;VO2/916;W) \), which can be considered as an expression of delta efficiency, and the MRT was compared between the two test groups and the protocols by means of Repeated Measures Anova.

The MRT was significantly (P<0.05) shorter for the cyclists compared to the controls (i.e. 61.0 ± 9.9 s vs. 75.8 ± 14.4 s for ramp 25 and 39.5 ± 11.2 s vs. 48.9 ± 7.1 s for ramp 40, respectively). The trained group also had a significantly higher 916;VO2/916;W in comparison to the controls (i.e. 10.3 ± 0.4 vs. 9.8 ± 0.3 ml.Watt-1.min-1 for ramp 25 and 10.0 ± 0.5 vs. 9.3 ± 0.4 ml.Watt-1.min-1 for ramp 40, respectively). Furthermore, the obtained values were significantly different between the two protocols. Finally, no interaction was observed from the statistical analysis, indicating that both groups changed similarly over the two ramp slopes.

From the present study it can be concluded that training status has an influence on both the MRT and 916;VO2/916;W and that this influence is independent of the used ramp slope. It is uncertain however, to what extent these results can be related to physiological changes rather than protocol dependent factors.

2 Koppo K, Bouckaert J, Jones AM. Effects of training status and exercise intensity on phase II VO2-kinetics.