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Title of the paper: **THE DISTANCE-TIME RELATIONSHIP AND OXYGEN UPTAKE KINETICS IN SWIMMING**

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Introduction

Critical velocity (CV) calculated as the slope of the distance–time (d-t) relationship, represents an important parameter of aerobic function. The y-intercept derived from this relationship is defined as a finite stock of reserve power available pre-exercise, usually termed anaerobic work capacity or D´, and associated to the distance that can be completed resorting to anaerobic metabolism (Jones et al. 2010). Athletes with a relatively high anaerobic capacity will tend to have slower oxygen uptake (VO2) kinetics than long-distance specialists (Jones & Burnley, 2009). The aim of this study was to examine the relationship between CV, D´ and VO2 kinetics in swimming.

Methods

Ten trained competitive male swimmers performed maximal 200 and 400 m front crawl swims (S200, S400). CV was calculated as the slope of distance-time relationship (Sd–t) from these maximal trials. D´ resulted from the linear coefficient (y-intercept) of the d–t model. 50 m competitive front crawl swimming performance was recorded for analysis (S50). Maximal aerobic velocity (MAV) was estimated from mean swimming velocity of the 400 m. The maximal oxygen uptake (VO2max) was determined through an incremental step test comprising 5 x 250 and 1 x 200-m stages and VO2 kinetics parameters were determined from two 500 m constant intensity swimming exercise bouts, at 87.5% and 92.5% of MAV. Both the incremental and the 500-m tests were performed using aquatrainer swimming snorkel® for breath-by-breath data collection, (K4b2, Cosmed, Italy).

Results

CV (1.41 ± 0.06 m.s-1) was significantly lower than MAV (1.45 ± 0.04 m.s-1). VO2max (3806.2 ± 462.9 ml.min-1) was not significantly different from VO2 at 92.5 % MAV (3695.9 ± 385.9 ml.min-1). CV was negatively correlated to the time constant of the primary phase (taup) at 87.5% MAV (19.5 ± 8.9-sec) and 92.5% MAV (17.4 ± 6.7-sec)

(respectively $r = -0.72$ and -0.64, $p < 0.05$). The amplitude of the primary phase (Ap) at 87.5% MAV (3090.4 ± 456.8 ml.min-1) was negatively correlated to S50 (26.8 ± 0.9-sec) ($r = -0.66$, $p < 0.05$). D´ (19.9 ± 7.0 m) presented no correlations to VO2 kinetics parameters but was negatively correlated to S50 ($r = -0.67$, $p < 0.05$).

Discussion

Our results are in line with those of Reis et al. (2012), which support the notion that the primary phase of VO2 kinetics is an important determinant of aerobic swimming performance. The relation between CV and VO2 kinetics parameter highlights the pertinence of VO2 data collection in swimming for physiological profiling and training optimization.

References

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