

Do 3-min all-out test parameters accurately predict competitive cyclist performance in the severe intensity domain?

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Abstract

Background: It is well established that the critical power (CP) and the fixed amount of work performed above the CP (W') predict performance in the severe intensity domain, and that this two parameters can be successfully obtained from a 3-min all-out test (AOT) (Jones et al., 2010: Med Sci Sports Exerc, 42(10), 1876-90). While the CP obtained from the 3-min AOT has been reported to lay on the boundary between the heavy and severe intensity domains in recreationally active individuals (Jones et al., 2010), it has been reported to overestimate this exercise intensity in competitive cyclists (Sperlich et al., 2011: Int J Sports Med, 32(6), 433-7). It could be therefore hypothesized that CP and W' obtained from a 3-min AOT test in competitive cyclists overestimate performance in the severe intensity domain. However, this remains to be verified.

Purpose: To investigate whether performance in the severe intensity domain can be accurately predicted by CP and W' obtained from a 3-min AOT test in competitive cyclists.

Methods: Nine well-trained competitive cyclists (22 ± 3 yrs) visited the laboratory on four different occasions to perform: 1) a preliminary incremental ramp exercise test; 2) a 3-min AOT familiarization trial; 3) an experimental 3-min AOT and 4) a 10-min time trial (TT). The mean power output of the 10-min TT was compared with the power output that would be predicted to lead to exhaustion in 10 min. The predicted value was obtained according to the formula: $P = (W'/TTE) + CP$; where TTE is the predicted time to exhaustion (i.e. 600s), and CP (in W) and W' (in kJ) are the two parameters obtained from the 3-min AOT.

Results: Predicted power output (383 ± 44 W) was significantly higher compared to actual mean power output in the 10-min TT (351 ± 29 W; $P < 0.01$; mean difference: 32.5 ± 25 W). However, actual and predicted performance were correlated ($r = 0.84$; $P < 0.01$). Percentage difference between actual and predicted performance was positively related with the CP ($r = 0.74$; $P < 0.05$). No difference in VO_{2max} values was found between the ramp incremental test (67 ± 9 ml·kg⁻¹·min⁻¹) and the experimental 3-min AOT (66 ± 5 ml·kg⁻¹·min⁻¹), and a significant correlation was found ($r = 0.71$; $P < 0.05$). W' and CP mean values were 14.1 ± 3 kJ and 360 ± 47 W, respectively.

Discussion and conclusions: The CP and the W' obtained from a 3-min AOT overestimate performance in a 10-min TT in competitive cyclists. This indicates that the two parameters do not provide an accurate prediction of performance in the severe intensity domain. This is particularly evident for cyclists with relatively high CP values. The present data suggest caution when using parameters obtained from a 3-min AOT to monitor and prescribe exercise training in competitive cyclists.

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