

23rd annual ECSS Congress Dublin/Ireland, July 4-7 2018

A New Repeated Ramp Cycle Test to Assess the Reconstitution of W' Following Full Depletion

Chorley, A.

University of Chester

INTRODUCTION:

Within the framework of the critical power (CP) model, the expenditure and reconstitution of work above CP (W') allows a cyclist to perform repeated supramaximal efforts. Whilst models of W' reconstitution exist, they are based on intermittent exercise protocols and do not account for individual characteristics other than CP. To date there are no test protocols for assessing the W' reconstitution characteristics of individual cyclists. The purpose of this study was to examine the reliability of a new repeated ramp test (RRT) protocol for assessing the partial reconstitution of W' following full depletion and to assess the fit of an existing W' bal model (Skiba et al 2012).

METHODS:

After habituation and baseline testing of CP, 20 healthy active adults, consisting of trained cyclists ($n = 9$; age 43 ± 15 years; VO_{2max} 61.9 ± 8.5 mL/kg/min) and untrained ($n = 11$; age 36 ± 15 years; VO_{2max} 52.4 ± 5.8 mL/kg /min) performed two RRT on a cycle ergometer separated by 2-4 days. The RRT consisted of a 5-min warm-up at 100 W followed by three repeated ramps (20 W/min) to exhaustion, interspersed with 2-min recoveries at 50 W. W' reconstitution during each recovery was calculated as the work done above CP in the subsequent ramp. Gas exchange data was collected throughout and blood lactate concentrations were taken at the end of each ramp phase.

RESULTS:

Inter-trial relative reliability of W' reconstitution was evaluated by intraclass correlation coefficients (ICC) for the group (0.859), trained (0.940) and untrained (0.768) sub-sets. Absolute reliability was evaluated with typical error (TE) and coefficient of variation (CV) for the group (TE 559 J; CV 9.2%), trained (TE 301 J; CV 4.7%), and untrained (TE 720 J; CV 12.4%). Intra-trial differences of W' reconstitution between the 2-min recovery periods were significant ($p < 0.05$), despite no differences ($p > 0.05$) in the measurements of VO_2 or blood lactate. The observed minimal detectable changes of 475 J (1st recovery) and 368 J (2nd recovery) can be used to monitor changes in the rate of W' reconstitution in individual trained cyclists. Predicted values of W' from the W' bal model significantly ($p < 0.05$) underestimated remaining W' at the end of each recovery period despite overestimating W' at the end of each depletion.

CONCLUSION:

In conclusion the RRT is both reliable for discriminating between individuals based on the high ICCs, and for assessing the efficacy of longitudinal or intervention studies (training or acute) due to the low TE & CV values, particularly for trained cyclists. CV values are lower than traditional W' studies due to the reduced impact of the variability of CP in the test design. The differences in intra-trial recoveries demonstrate a fatiguing effect on W' reconstitution which is not accounted for in the W' bal model, which does not provide a good fit for the RRT involving full depletion of W' .

References

Skiba, PF, Chidnok, W, Vanhatalo, A, et al (2012). Med Sci Sports Exerc, 44, 1526-1532.

Topic: Training and Testing

Presentation form: Mini-Oral

European Database of Sport Science (EDSS)

Supported by SporTools GmbH



27077