

WINGATE ANAEROBIC TEST: DOES THE OPTIMAL LOAD DEPEND ON TRAINING HISTORY?

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Introduction

The Wingate anaerobic test (WAnT) has been widely used for the assessment of human anaerobic power. The test has been comprehensively evaluated (Bar-Or O, 1987), but the knowledge of optimal loading for various populations still remains unclear. The maximum dynamic output (MDO) hypothesis (Jaric and Markovic, 2009) predicts that the muscular system of the lower limbs could adjust to provide the maximum power and momentum against particular external load. Therefore, in the present study we hypothesized that WAnT would require different optimal loading in individuals with different history of athletic training and/or physical activity.

Methods

Forty healthy male subjects were divided into 4 groups: strength trained (elite bodybuilders; BB, n = 10), speed trained (elite karate competitors; KA, n = 10), physically active (PA, n=10) and sedentary individuals (SE, n=10). All subjects were tested through the standard WAnT protocol on a mechanically braked cycle ergometer (834 E, Monark). Eight different loads relative to the subjects' body weight (i.e., 5 - 12 % of BW) were applied in a randomized order. The obtained data were plotted for each individual subject and a second order polynomial regression was employed to assess the changes in peak power associated with changes in loading conditions. The peaks and correlation coefficients of the regression curves were taken for statistical analysis.

Results

All four groups revealed significant relationships between the recorded peak power and the external load, as assessed through the applied polynomial regression [$R^2(\text{BB}) = 0.82$; $R^2(\text{KA}) = 0.86$; $R^2(\text{PA}) = 0.77$; $R^2(\text{SE}) = 0.78$]. The mean (SD) optimal load averaged across the groups for BB, KA, PA and SE were 9.66 (0.63) % of BW, 9.22 (0.47) % of BW, 8.65 (1.04) % of BW and 7.99 (1.06) % of BW, respectively. The applied one-way ANOVA revealed $F(3,40) = 7.36$ ($p < 0.001$) revealing significant differences between BB and SE ($p < 0.001$), as well as between KA and SE ($p < 0.05$).

Discussion

The obtained findings support the hypothesized effect of training history/physical fitness on the optimal loading conditions that provide the maximum power output. This supports the MDO hypothesis and provides additional evidence of the long-term adaptation of the muscular system to the acting external loading. From the practical aspect, however, the obtained findings suggest that the mechanical conditions for conducting standard power and maximum performance tests should be population specific.

Acknowledgments

The study was supported in part by a grant from Serbian Research Council (#145082).

References

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Keywords:

TOPIC: TRAINING AND TESTING

PRESENTATION FORM: ORAL

SESSION ART: THEMATIC