

Conference Abstract

A Critical Analysis of the Maximal Rate of Lactate Accumulation and Estimated Maximal Lactate Steady State in Cycling

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Abstract

Introduction: The utilization of parameters such as the maximal rate of blood lactate (La) accumulation (VLa_{max}) and calculated power output at maximal lactate steady state (cP-MLSS) is common in training settings for athletes. These metrics are used for tailoring individualized training programs, assessing training adaptations, and evaluating performance capacity. This study aimed to investigate the reliability of VLa_{max} and cP-MLSS, attempting to provide practical insights into their application within training contexts. Additionally, cP-MLSS was compared with the second La thresholds determined by experts ($LT_{2-expert}$), being an accurate and often used threshold concept.

Methods: 13 physically active male participants (Length: 182 ± 4 cm; body mass: 76.3 ± 5.8 kg) completed a step incremental protocol to determine VO_{2max} (60.5 ± 5.8 mL·min⁻¹·kg⁻¹) and $LT_{2-expert}$. Additionally, a 15-s isokinetic sprint test was conducted on four separate occasions to determine VLa_{max} . cP-MLSS was calculated using a mathematical model based on VLa_{max} , VO_{2max} and body mass. Intra-class correlations (ICC) and coefficients of variation (CV%) were used to assess reliability. A paired sample T-test was used to compare cP-MLSS (mean value of the 4 test days) and $LT_{2-Expert}$.

Results: We found good reliability for VLa_{max} (ICC = 0.80) and excellent reliability for cP-MLSS (ICC = 0.99). Moreover, $LT_{2-expert}$ (277 ± 41 W) and cP-MLSS (282 ± 2 W) were not significantly different. However, comparison revealed relatively wide limits of agreement (-39 W to 29 W).

Conclusions: In conclusion, our study highlights the reliability of VLa_{max} and cP-MLSS measures, offering insights into their potential utility in training and exercise testing. While both measures showed promise, challenges persist, particularly in standardizing testing procedures for VLa_{max} determination. Additionally, the comparison with $LT_{2-expert}$ demonstrated comparable results on a group level but large errors were found on the individual level. Further research and refinement is needed in order for cP-MLSS to be used as valid parameters in training and performance contexts.

Keywords: Metabolism, Glycolysis, Validity, Threshold, MLSS.

