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Lactate dynamics of mountain bikers in a laboratory performance diagnostic

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Abstract
Background: The physiological demands in mountain bike marathons consist of intensive intermitted intervals. While aerobic and anaerobic parameters were found to be of importance when predicting race performance (Inoue et al., 2012: J Strength Cond Res, 26(6), 1589—1593), gender associated differences may be possible and have been ignored in the previous male-only studies.

Purpose: to analyse lactate dynamics during repeated recuperative and intense intervals using a specific test that was designed to simulate the physiological anaerobic demands of mountain bike competitions.

Methods: Nine ambitious female mountain bikers (age: 38.3 ±6.1 y; weight: 62.2 ±6.6 kg; 169.1 ±8.9 cm) performed a mountain bike specific test trial (see figure 1) on a SRM---Ergometer. The test trial was designed to examine aerobic and anaerobic parameters and started with an incremental test. Beginning at 80 W the resistance was increased by 40 W every 3 minutes until exhaustion (peak power output: PPO). Lactate concentration was measured taking capillary blood samples at the end of each stage to determine the individual anaerobic threshold (IAT) according to Dickhuth et al. (1999: Int J Sports Med, 20(02), 122—127). After the incremental test, cyclists kept pedalling during regeneration periods and three all—out intervals (AO) lasting 10 s, 1 min and 5 min, each with maximum effort. The afforded power output of each AO was measured and all laboratory parameters were scaled by body weight. After the incremental test and between all—outs, cyclists regenerated at a power of 100 W. After performing the laboratory test, within one month (13.3 ±9.6 days) all athletes participated in the same official national mountain bike competition (83 km distance). Pearson's r was used to calculate the correlation of race performance (official racing time) and laboratory parameters.

Results: The race time correlates nearly perfect with the power output of the 1 min—AO (r=—0.90, p=0.001). Moreover, significant correlation was found between IAT and race time (r=—0.80, p=0.010) and PPO (r=—0.79, p=0.011) respectively. Due to the small sample size no significance but large correlation was found between race time and afforded power in the 10 s—AO (r=—0.55, p=0.123) and 5 min—AO (r=—0.61, p=0.078) respectively (see figure 2).

Discussion: To the best of our knowledge, this is the first study which analysed the prediction of race performance of female mountain bikers. Despite the small sample size, the strong correlations of race performance and power output in the 1 min—AO and IAT respectively, particularly demonstrate the importance of analysing besides aerobic also anaerobic parameters. Power output at the IAT correlates similarly to the results of male mountain bikers in Impellizzeri et al. (2005: J Sports Sci, 23(1), 41—47) and slightly stronger than in Müller et al. (2014: Journal of Science and Cycling, 3(2), 85). The anaerobic parameters of male mountain bikers analysed in Inoue et al. (2012) with repeated 30 s Wingate tests, showed a slightly weaker correlation (r=—0.79). Assuming that in our study anaerobic intervals were driven after performing an incremental test, it can be concluded, that parameters to predict race performance in male and female athletes are similar.

Conclusions: Due to the facts that all laboratory parameters correlate at least largely with race time and the laboratory test measures aerobic and anaerobic parameters within approximately one hour, we suggest to use this performance test to predict race performance for ambitioned amateur mountain bikers in daily clinical routine. Further research is needed to give training advice based on the power output for each AO duration and to confirm our results in a larger sample size.

Figure 1. Laboratory test protocol consisting of an incremental test and all out intervals
Figure 2. Correlations between laboratory parameters and race time

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