

Treadmill-based cycling time trial better predicts seasonal cross-country mountain bike performance than traditional parameters in laboratory tests

B Müller^{1,2} ✉ T Steiner¹ T Maier¹ and JP Wehrli¹

Abstract

Specific cross-country mountain bike (MTB) laboratory tests are used to monitor training and performance of elite athletes. To better follow up long-term performance development we designed a new MTB specific treadmill-based cycling time trial. The purpose of this study was to investigate the relationship between different physiological parameters from this new test as well as from traditional laboratory tests and overall MTB performance in the following season.

Thirteen male cyclists (24.1 ± 3.6 y; 175.9 ± 5.1 cm; 68.1 ± 4.0 kg; 606 ± 589 UCI points) of the Swiss National MTB Team completed three laboratory tests to exhaustion within two days. On the first day, the athletes performed two tests on an SRM cycle ergometer: 1) a long graded exercise test (LGXT) (workload increased 30 W/5 min) to determine the lactate threshold (LT1), the Dmod threshold (Bishop et al., 1998: *Medicine & Science in Sports & Exercise*, 30(8), 1270–1275), and peak power output (PPOLGXT); and 2) a short graded exercise test (SGXT) (workload increased 25 W/min) to determine maximal oxygen uptake ($\dot{V}O_{2max}$) and peak power output (PPOSGXT). On the second day, the athletes performed a MTB-specific 24-min time trial (TT) with variable inclination (4 - 10°) on a motorized treadmill (3x4.5 m) using their own bikes. The athletes were instructed to ride at a self-selected maximal pace and the total distance covered in 24 min was used as the performance measure. All performance-based parameters are expressed relative to body mass. The season performance was evaluated using the International Cycling Union (UCI) points. Pearson correlation analysis was applied to determine the relationship between physiological parameters and the UCI points.

The UCI points correlated significantly with TT distance, PPOLGXT and Dmod ($r = 0.83$, $p = 0.001$; $r = 0.76$, $p = 0.003$ and $r = 0.67$, $p = 0.012$). No significant correlation was observed between $\dot{V}O_{2max}$, PPOSGXT and LT1 and the UCI points ($r = 0.41$, $p = 0.144$; $r = 0.49$, $p = 0.077$ and $r = 0.51$, $p = 0.077$).

The current test battery indicates that TT distance is the best correlate of seasonal MTB performance, with TT distance explaining 68% of the observed variance in UCI points. Furthermore, high UCI rankings were also highly correlated with PPOLGXT and the related Dmod during the LGXT. In contrast $\dot{V}O_{2max}$, traditionally regarded as an important determinant of endurance performance (Coyle et al., 1988: *Journal of Applied Physiology*, 64, 2622–2630), and PPOSGXT, did not show a significant correlation with UCI points in this group of athletes. In accordance with these findings, we observed that younger athletes often achieved comparable values as elite athletes in the SGXT, suggesting the performance difference (UCI points) is differentiated only by the distance completed in the treadmill-based cycling TT. It appears that graded exercise tests of a short duration do not adequately represent the duration that a given workload can be sustained.

Therefore for a comprehensive MTB-specific laboratory test battery, we suggest including a MTB-specific time trial with a constant test duration to predict seasonal MTB performance.

✉ Contact email: beat.mueller@baspo.admin.ch (B Müller)

¹ Section for Elite Sports, Swiss Federal Institute of Sport, Magglingen, Switzerland

² Swiss Cycling Federation, Grenchen, Switzerland

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