BOOK OF ABSTRACTS Open Access

Comparison of two different training interventions on laboratory parameters and race performance in competitive young XCO athletes: a randomized controlled trial.

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Introduction

The mountain bike discipline Cross Country Olympic (XCO) is characterized by intermitted intervals. These high intensity demands have further extended lately as race duration has been shortened, race profiles have become more irregular and technical demands of the courses continuously increase[1;2]. Recent data on adolescent competitive XCO athletes show that 3-min intervals at 120% of the individual anaerobic threshold (IAT) and shorter intervals of approx. 20 seconds at 240% IAT are particularly frequent in XCO2. These and previous findings highlight the importance of anaerobic capacities on race performance[3]. As a consequence, the current training catalogue for XCO athletes was adapted to account for these specific race characteristics[4]. It is inspired by the power-based training levels and further differentiates the high intensity training zones to account for the short and medium term high loads of XCO races [2;4;5]. These physiological demands should also be mapped in the context of performance testing. In this regard, the importance of short intensity intervals such as the 1-min All-out-time-trial (1-min AOTT) has been demonstrated[6]. Based on the aforementioned premises the aim of this project was to compare the effectiveness of two different 4-week training protocols on laboratory parameters and race performance. One of the protocols was especially designed to foster high intensity intervals.

Methods

22 competitive XCO bikers (Table 1) performed a previously developed mountain bike specific test trial 6 (see Figure 1) on a Cyclus2- Ergometer and completed a simulated XCO race each prior (t0) and after (t1) a 4-week training intervention. The XCO race took place on a slightly modified official UCI-race track (Albstadt, Germany). To account for age and sex differences of the given sample, races were conducted separately for (a) female athletes and male athletes younger than 17y with 4 laps and (b) all other male athletes (6 laps). Athletes were randomly assigned to one of the two training interventions: (1) polarized high intensity training protocol (PT); (2) aerobic endurance training protocol (AET). Three weeks of the progressively designed training were followed by a one week tapering phase. The simplified training schedule of the older male athletes is depicted in Table 2. Training zone 5 (Z5) was defined as 115% of the mean power output of the 5-min AOTT, Z2 was defined as 60% of the 4mmol threshold of the incremental test. The training stress score[5] for the 4-week phase was kept similar for both interventions. All athletes completed an additional core training once a week. Total training load differed between adolescent (U17) and female athletes on the one hand and the men's classes U19, U23 and Elite on the other hand. All athletes' bikes were equipped with SRM crank sets to allow a direct control of training intensities. Descriptive results are presented as the median (minimum, maximum). Relative

Table 1: Athletes characteristics at baseline.

Median (Min, Max)	Men	Women
Age	17 (15, 30)	17 (15, 20)
BMI	21 (18, 24)	21 (19, 22)
4mmol IT [W/kg]	4.2 (3.4, 4.4)	3.3 (2.8, 4.3)
PPO IT [W/kg]	5.2 (4.7, 5.6)	4.5 (3.8, 4.9)
n U17	5	2
n U19, U23, Elite	11	4

differences t1-t0 [W/kg] for IAT, 4mmol LT, PPO, 10s-AOTT, 30s-AOTT, 60s-AOTT, 300s-AOTT and race performance PO_mean (mean power per lap) were calculated. Between-group effects were tested using the Mann-Whitney-U-Test because of non-normality of data distribution.

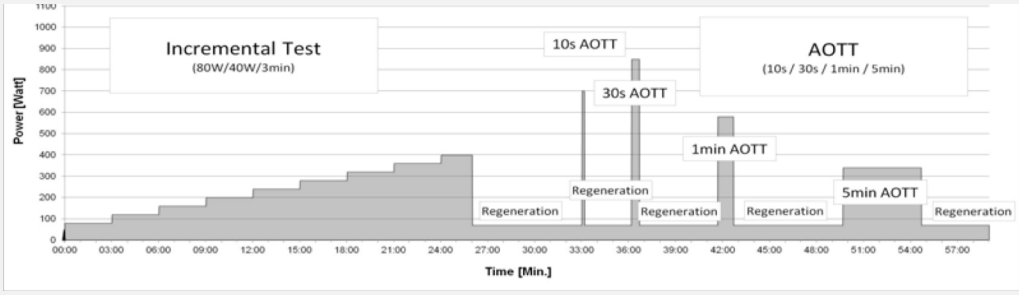

Figure 1. Laboratory test protocol consisting of an incremental test (IT) and all-out time trials (AOTT)

Results

Box plots are displayed in Figure 2. Results of the study could not demonstrate any statistically significant differences between PT and AET (p = 0.107 - 0.974).

Discussion

It is remarkable that the 30s- and 1-min AOTTs which are designed to map short term intervals fail to

Table 2. Training schedule for the men's classes U19, U23 and Elite. s/w=sessions a week.

	t0	week 1	s/w	week 2	s/w	week 3	s/w	week 4	s/w	t1
PT	test & race	Z5 (2*10*30s)	3	Z5 (3*10*30s)	3	Z5 (3*10*30s)	2	Z5	0	race & test
		Z2 (2h)	1	Z2 (2h)	2	Z2 (2h)	3	Z2 (2h)	1	
AET	test & race	Z5	0	Z5	0	Z5	0	Z5	0	race & test
		Z2 (2-3h)	4	Z2 (2-3.5h)	4	Z2 (1.5-5h)	5	Z2 (2h)	1	

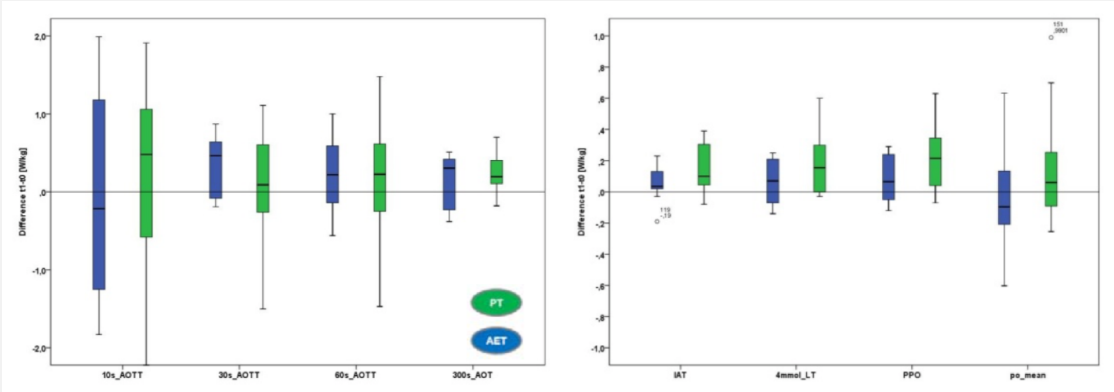

Figure 2. Boxplots of differences t1-t0 for all variables of interest.

demonstrate any effect of the PT intervention. The PT protocol may therefore do not sufficiently distinguish between training zones. Other measures such as IAT, 4mmol LT and PPO show a small but consistent trend towards a beneficial effect of the HIT program. For these measures, medium differences between groups account for approx. 0.1 W/kg that is similar to approx. 2-3% of the total performance according to baseline values. Lack of statistically significant differences for these measures may be attributed to a type-2-error. Further studies should therefore investigate longer lasting and more polarized training protocols in larger populations of XCO athletes.

References

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Key words: XCO, performance, high intensity training, powermeter, all-out-time-trial

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