Science & Cycling
29-30 June 2016, Caen, France

The effects of block training periodization on pacing during 20-km cycling time trial

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Background: Several studies have been proposed to accumulate consecutive days (5 to 14 days) of high intensity interval training (HIT) to rapidly enhance physiological indexes, alpine sky performance and cycling performance. The consecutive training stimuli also called block training periodization (BL) typically result in a large physiological overload and possibly a drop in performance in the following days due to incomplete recovery between sessions. When followed by an appropriate recovery period the BL can promote the body overcompensates and raises the level of performance above the levels already achieved by the training that had been done.

Purpose: The aim of this study was to determine the effects of BL periodization on pacing during 20-km cycling time trial.

Methods: Twenty trained male cyclists volunteered to participate in this study (weight, 75.7 ± 7.4 kg; height; 178 ± 5 cm; age 35 ± 10 yrs; VO_2max, 4.6 ± 0.5 $L \cdot min^{-1}$). Cyclists were randomly assigned to one of two conditions; control group (C; n = 10) and block-training group (BL; n = 10). The first week the BL performed seven consecutive days of HIT followed by the second and third weeks, which cyclists complete the normal training. The study design included one TT before the HIT and two TT after seven and fourteen days cyclists finished the HIT. All testing were conducted on an electronically braked cycle ergometer Velotron. Participants were able to view their progress over the course on a computer monitor and were provided with information on distance completed and gear selected; all other information was blinded to remove any potential pacing effect. Cyclists completed 10 sets of maximal sprints lasting 15, 30 and 45 s and the work to rest ratio was 1:5. The sprints were performed at maximal effort and recovery intervals at a self-selected intensity below 30-40% of maximal aerobic power as a form of active recovery.

Results: The main findings of this study are presented in Table 1 and Figure 1. Power output displayed a significant higher start since the beginning through the half of the TT ($P<0.05$) and

power output was characterized by a significant higher end spurt in the final 2 km in the BL after two weeks of the end of training (P<0.05). In addition, after two weeks of the end of overload period the distribution of cadence was significantly lower throughout the TT (P<0.01).

Table 1. Measures from the pre and post time trial test in the block training group.

	TT	TT TT1	TT2	TT – TT1 ES	TT – TT1 *p* value	TT – TT2 ES	TT – TT2 *p* value	TT1 – TT2 ES	TT1 – TT2 *p* value
Time (min)	38.4 ± 2.2	37.4 ± 2.1*	36.8 ± 1.8**	- 0.45	0.03	- 0.78	0.002	- 0.31	0.07
Power output (W)	277 ± 26	288 ± 28*	296 ± 25**	0.41	0.04	0.75	0.003	0.30	0.07
Cadence (rpm)	94 ± 9	90 ± 5*	88 ± 5**	- 0.57	0.03	- 0.86	0.01	- 0.40	0.06
Heart rate (bpm)	166 ± 8	168 ± 10	168 ± 10	0.23	0.16	0.22	0.16	0.00	0.47

TT: time trial; ES: Effect size. * $p < 0.05$; ** $p < 0.01$.

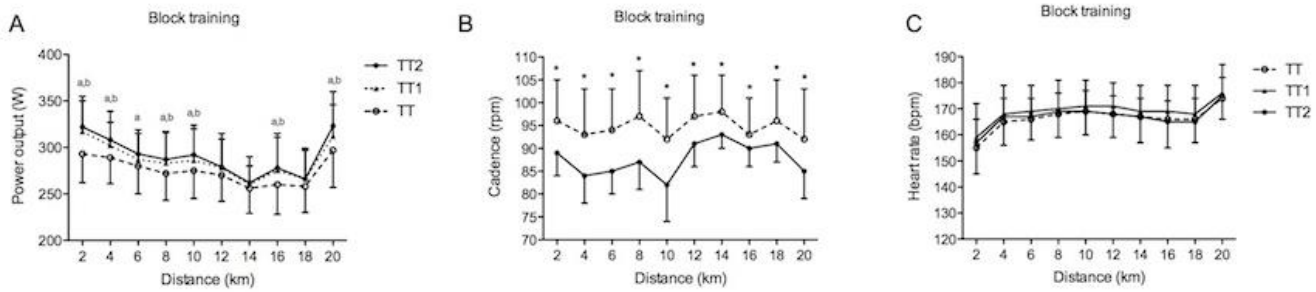

Figure 1. Power output, cadence and heart rate distribution during 20-km cycling hilly TT of the block training group.

Discussion: A likely reason for the changes in performance and consequently on distribution of power is probably due to the physiological effects of the training rather than any potential effects of pacing strategy (i.e. fast, even, low start) since cyclists were instructed to perform a self-selected maximal TT in both groups. Also neuromuscular adaptations after a short period of HIT probably increased the capability of the cyclists to produce more force resulting in less velocity in freely chosen cadence and consequently higher power output over the course during the TT.

Conclusion: Therefore, a short period of consecutive days of intense training enhances cycling performance and changes power output in the beginning end final part of the TT in trained cyclists.