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Treadmill cycling trial in diagnostics endurance preparation of MTB cyclists before Olympic Games or World Championship

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Abstract

Background: The evaluation of endurance preparation of MTB cyclists in conditions corresponding to the specificity of routes of World Championship (WCh) and Olympic Games (OG) is very difficult. Treadmill cycling trials are used in order to make working conditions similar to the conditions of a race (Miller et al. 2014 J. Sci. Cycling 3(2) 85). The choice of an optimal tactics to be used on the whole distance is conditioned by information about the effectiveness of energetic sources in the course of an MTB cyclist's interval effort of 90-135 min, in which aerobic metabolism is the dominant one. (Impellizzeri, Marcora 2007 J.Sport Med. 37(1): 59-71)

Purpose: The aim of the research was to create a trial protocol run on a treadmill corresponding to the profile of a MTB route during OG or WCh as well as to evaluate the changes of a cyclist's physiological indicators in the course of preparation to the most important sports event in the season.

Methods: A female cyclists of the Polish National Team MTB XCO (28 years, 168 cm, 52 kg), a world champion who ranked second in Olympic games and an European champion, took part in the research. On the basis of the analysis of the race route in an pre-Olympic trial and the measurement of the profile of the route a trial protocol was created for treadmill Saturn (Cosmed, Germany). During effort VO2, O2/HR (K4b2, Cosmed Italy), heart rate (Polar Vantage, Finland) and blood lactate concentration (Biosen C-line, EKF Germany) were measured. The research was conducted in the preparatory and competition period. The participant made effort in time corresponding to a full MTB race, performing a round of the same profile four times. The trial constructed in this way enabled to analyze the changes of physiological changes depending on a training period and period of effort (a round).

Results: Table 1 presents the description of values recorded in the preparatory and competition period during the trial. In the competition period a significant rise in the effectiveness of work was observed. Work of the same intensity were performed at a lower energetic cost. Whereas the average VO2 value was lowered during the first two rounds by 14-15%, in the third and fourth rounds this difference amounted to 20 and 28%. Such a description of changes in the second part of the route resulted from the stabilization of the average VO2 value at the level of 50-56 mlxkg-1xmin-1 in the whole distance in the competition period. In the preparatory period a significant increase in the value of this parameter in the third and fourth round of the trial (after effort of 50 min.) was observed. Heart rate was characterized by a decrease of value by udxmin-1 in the starting period. At the same time this is the parameter which has a stable value in the course of effort. A decrease in the value of O_2/HR when there were stable differences between HR values resulted from the decrease of oxygen consumption, which in the third and fourth round caused the decrease of this parameter by almost 25% in comparison to values recorded in an earlier period. Blood lactate concentration (LA) measured after distances of the greatest steepness of slope (uphill) maintained the same stable differences (2-2.5 mmol/l) between the preparatory and competition period in rounds 1-3. The greatest difference in LA was measures in the fourth round – it amounted to 5 mmol/l.

Disussion: The values and direction of changes in parameters indicated an increase in the cyclist's endurance in the analyzed training period by increasing the effectiveness of aerobic and anaerobic effectiveness (a decrease of VO2 and LA while maintaining the intensity of work). The obtained training effect enabled to change the training loads parameter in the direction of increasing the effectiveness of work in individual route sections. Modelling training loads is at first limited to the selected round or sections. Then subsequent sections are connected with each other.

Conclusion: It has been proven that the diagnostics of an MTB cyclist's training on a treadmill in laboratory conditions and its usage programming an MTB training:

- Determining the scope of the intensity of training loads directed at developing aerobic and anaerobic endurance,
- Determining the volume of training loads which affect effectively various areas of a cyclist's preparation,
- Determining the value of effort parameters (force, speed) which can be used in the course of a sports competition.

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Table 1. Profile of values recorded during treadmill MTB trial in preparation and competition periods before World Championship

Round model trial	Training period	Parameters				
		VO_2 $mlxkg^{-1}xmin^{-1}$	HR $bpxmin^{-1}$	O_2/HR $mlxbp^{-1}$	ΣVO_2 l	ΣHR bp
1	preparation	56,38	160	20,16	87,39	4178
	competition	49,66	145	19,2	74,54	3781
2	preparation	59,07	169	20,43	92,46	4404
	competition	52,38	155	18,84	79,47	4050
3	preparation	66,42	171	22,06	100,68	4453
	competition	53,26	155	19,05	80,64	4088
4	preparation	69,12	168	22,98	104,61	4403
	competition	53,88	157	19,19	81,94	4092

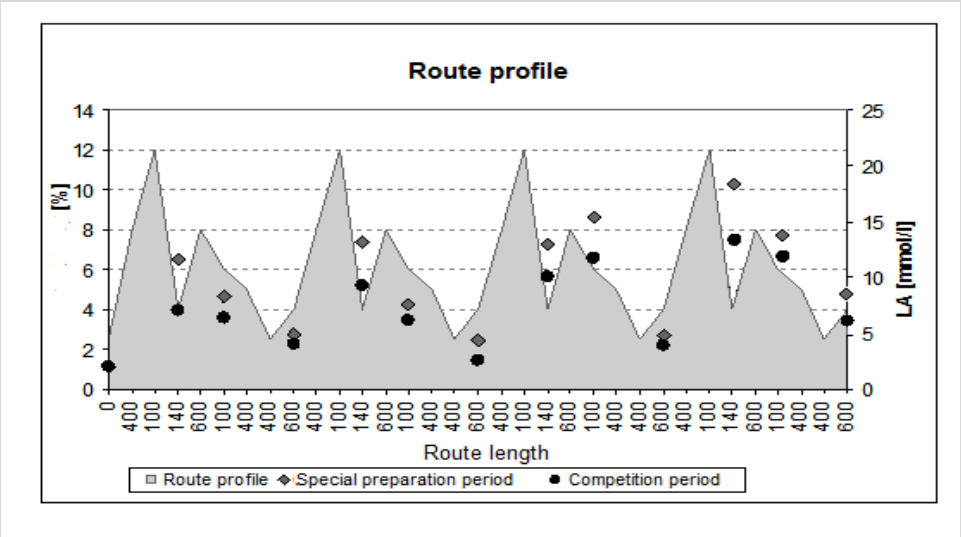

Figure 1. Dynamics of blood lactate (LA) concentration during treadmill MTB trial

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