ORIGINAL RESEARCH PAPER

ANALYSIS OF PRECOMPETITIVE PREPARATION OF THE ELITE ROWERS TOWARDS EUROPEAN CHAMPIONSHIP

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Abstract

The goal of the research was to analyze the content of double scull elite rowers' pre-competition mezocycle and to assess the efficiency of aerobic capacity training. The training content of European champions of double scull during pre-competition mezocycle was analyzed. The mezocycle was composed of four microcycles: introductory microcycle of aerobic and creatine-phosphate power and endurance training, microcycle of aerobic critical power, endurance training, and pre-competition parts. In the introductory part, the intensity of aerobic training work was very close to anaerobic threshold limit (ATL), i.e. La=2-3mmol/l and combined with muscle mass training exercises. In the second microcycle, aerobic training intensity was at ATL±5%, La=3-6mmol/l and combined with creatine-phosphate power training exercises. In the third microcycle, work intensity between ATL and critical intensity limit (CIL), La=4-9mmol/l, was dominating. In the fourth pre-competition microcycle, working volume was reduced by 30% with different intensity, La=3-14mmol/l, and with improvement of rowing pace from start and technique. Researches were performed with gas analyzer „Oxycon Mobile" and concept „Concept 2". We have revealed that aerobic capacity was growing during study period. VO_2max *in athlete M. was growing from 62.3 up to 65.3ml/min/kg, in athlete R. – from 61.3 up to 65.2ml/min/kg. This research of ours has revealed that elite rowers, during pre-competition mesocycle when working close to ATL and between ATL and CIL and less working on glycolytic zone, have significantly increased their aerobic capacity that compose approximately 80% of sport performance.*

Key words: *rowers, aerobic capacity, training.*

Introduction

Sport result in rowing is determined by many external and internal factors. Distance passing duration takes for 6 – 8 min. Work intensity of such duration on maximum exertion significantly exceeds the intensity of anaerobic threshold limit (ATL) and comes to the critical intensity limit (CIL) (VO_2 max) of work intensity (Skernevičius, 1997; Astrand et al., 2003; Wilmore, Costill, Kenney, 2008). In rowers of 2000 m event approximately 75 – 80% of energy is produced in aerobic reactions (Secher, Volianitis, 2009; Steinacker et al., 1998). The capacity of aerobic reactions is determined by two main factors: muscles ability to consume oxygen and organism systems ability to deliver oxygen, energetic materials, and nutrients into muscles (Milašius, 2005).

Loads in rowers' trainings, when working on aerobic capacity increase, are oriented towards ATL increase and aerobic reactions activeness at CIL. Those cells that are fatigued during trainings do strengthen during recovery because of supercompensation phenomena and other unburdened cells may weaken or even vanish (Merson, 1986). This influences specificity of training loads. Thus, it is very relevant to study training process of elite rowers as well as intensity and duration of applied physical loads aimed to improve aerobic capacity. During distance passing, work intensity changes and at the end of event glycolytic reactions become considerably active. This activity is also very important (De Compos Mello et al., 2009; Smith, Hopkins, 2011).

The goal of the research was to analyze the content of double scull elite rowers' pre-competition mezocycle and to assess the efficiency of aerobic capacity training.

Material and methods

The analysis was executed in competition period in 2012, the fourth year of four-year Olympic cycle, and one mezocycle where the main task was to develop $VO_{2\ max}$ aerobic capacity had been studied. The training process of double scull European champions had been researched. Rowers' aerobic capacity was established with gas analyzer Oxycon Mobile 781023-052-5.2 and on rowing ergometer „Concept II“ before the beginning of mezocycle and after its ending. Indices at critical intensity limit (CIL) (VO_2 max) and at ATL were recorded. Indices of lung ventilation (PL) (l/min), hard rate (HR bt/min), executed work power (W), and O_2 economical consumption were established either. ATL was calculated under O_2 consumption percentage from VO_2 max.

Mezocycle was formed of four microcycles that lasted for seven days each. During the first microcycle (week), six trainings were executed (one training per day) and one day was given for recovery. During the second microcycle, ten trainings were executed. During the third microcycle – ten trainings, as well. And during the fourth microcycle, nine trainings were given and two days were left for recovery.

Lactate blood concentration was established during trainings and after tests with concept and gas analyzer.

Work intensity zones were divided under lactate (La) blood concentration indices that indicated work intensity limits: aerobic threshold La=2mmol/l, anaerobic threshold La=4mmol/l, and O_2 critical intensity limit, when consuming at maximum, La concentration is 10 – 16mmol/l and is individual to each athlete. Zone 1 – La up to 2mmol/l, Zone 2 – La 2,1 – 4 mmol/l, Zone 3 – La 4.1 – 8 mmol/l, Zone 4 – La 8.1 and more.

Table 1

Distribution of executed physical loads under zones in separate microcycles

Zones	1	2	3	4	In total
FIRST MICROCYCLE					
Duration min.	80	270	60	-	410
Km	10	36	9	-	55
%	17.85	64.43	17.28	-	
SECOND MICROCYCLE					
Duration min.	110	360	90	-	560
Km	20	84	12	-	116
%	17.24	72.41	10.34	-	
THIRD MICROCYCLE					
Duration min.	200	160	110	60	510
Km	38	37	20	12	107
%	32.20	31.37	20.33	16.15	
FOURTH MICROCYCLE					
Duration min.	200	140	120	50	510
Km	37	25	20	10	92
%	40.22	27.17	21.74	10.87	
IN TOTAL					
Duration min.	590	930	360	110	1990
Km	105	182	61	22	370
%	28.38	49.19	16.49	5.95	

Results

When analyzing during mezocycle executed physical load in the training process of aerobic capacity, we can see that for this purpose 1990 minutes and 370km were given. The most work was performed in Zone 2, the amount 49.19% of kilometers and La blood concentration had not exceed ATL. Rowers also did work hard in Zone 1 as La concentration did not exceed 2mmol/l. In Zone 3, when glycolytic reactions became very active, 360min was work for rowing 61km and this formed 16.49%. In Zone 4, when work intensity became very close to CIL and O_2 consumption was close to maximal powers, organism environment became acidic and so rowers made 22km and this formed 5.95% of executed work. Such load intensity appeared neither in the first, nor in the second microcycle. If taking into account these two microcycles, they had Zone 2 dominating where 64.43% and 72.41% took the part of in totally executed work. Work volume had doubled in size in Zone 3 of the third and fourth microcycles and work was combined in Zone 4 up to 10.87 and 16.15%.

Tests with gas analyzer executed beforehand mezocycle revealed that indices of O_2 consumption at CIL and ATL were very similar in both rowers (Tab. 2) but HR indices differed significantly. HR data survey helped to individualize work intensity.

Table 2

Indices of rowers' aerobic capacity at critical intensity and anaerobic threshold limits

Research	Athlete	Critical intensity limit							Anaerobic threshold limit								La mmol/1
		LV 1/min	HR bt/min	VO_2 1/min	VO_2 ml/min/kg	OP ml/bt	W	O_2 lW/m	LV 1/min	HR bt/min	VO_2 1/min	VO_2 ml/min/kg	OP ml/bt	O_2%of VO_2 max	W	O_2 lW/ml	
1	R. M	198	192	6.10	62.3	31.8	500	12.20	133	177	5.10	51.8	28.7	83.6	380	13.42	10.8
	S. R.	214	186	6.62	61.3	35.4	520	12.26	146	161	5.34	49.5	33.2	80.6	400	12.71	9.8
2	R. M	179	197	6.94	65.3	32.5	520	12.30	148	174	5.90	60.0	33.9	92.1	410	14.05	14.0
	S. R.	211	180	7.10	65.2	39.4	540	13.10	140	166	6.14	56.3	37.0	86.4	420	14.62	16.1

Captions: LV - (VE) – lung ventilation; HR – hard rate; OP - (O_2 HR) – oxygen pulse; La - lactate

Data of the second research indicated that VO_2 max and power of executed work at CIL increased significantly in both rowers during mezocycle. ATL as well as VO_2 and work power increased significantly; H indices varied but continued growing under both intensity limits. La blood concentration tested after the second research was significantly higher and this shows activeness of increased glycolytic reactions.

Discussion

The presumption can be formulated that, if rowing competition format distances, aerobic reactions form 75 – 80% of energy (Hagerman, 1984; Steinacker et al., 1998) so, during trainings, the same percentage of time should be given for activation of these reaction without considerable organism acidizing. Considering the fact that glycolytic reactions at the end of distance became very active (Smith, Hopkins, 2011), approximately 20% of total work during mezocycle should be appointed during competition period. The research revealed that such separate-zone planning of work intensity under the basis of La blood concentration leads to individualize physical loads for double scull rowers (Volker, 2011). Tests with gas analyzer as well lead individually to go by HR indices when assessing work intensiveness.

The study revealed that rational distribution of physical loads in separate zones when executing conditionally small physical loads has positive influence on elite rowers' aerobic capacity training.

Conclusions

1. When planning training process for elite rowers of double scull event, physical load should be divided into zones under lactate blood concentration, CIL, and ATL and HR indices should be adapted individually to each athlete.

2. The research has revealed that, during mezocycle of rowers' competition period, when training aerobic capacity, it is effective for a half of time (49.19%) to spend on working between the limits of aerobic and anaerobic thresholds, in hybrid aerobic-glycolytic zone and, if La 4 – 8 mol/l, to spend considerably less time (16.49%) and when working closely to CIL and La exceeds 8mmol/l – approximately 6% (5.95) of time.

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Submitted: June 10, 2013
Accepted: November 27, 2013