MODELING OF COMPETITIVE DISTANCES QUALIFIED ROWING AND CANOEING (ILLUSTRATED MAN ROWING)

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Annotation. The aim of the study is to identify the best models of the race distance in rowing and canoeing. The study involved 12 highly skilled paddlers. Used heart rate monitors Polar RS800 G3, biochemical analyzer Dr. Lange LP-420. The possibility of individual simulations passage race distance. The factors that affect the distribution of forces on the distance. The optimal model of the passage of the 500 and 1000 meters. It was revealed that the distance of 200 meters has its own characteristics. The necessity of a separate simulation race distance in the non-Olympic rowing distances, length of more than 1000 meters. It is noted that in the competitive microcycle pay particular attention to the prelaunch workout consistent with the mobilization of the two leading mechanisms that ensure optimum energy supply at a distance. Recommended an increase in the volume of training loads in V (4b) intensity zone in the current control to monitor the index of hemoglobin, which should not significantly decrease.
Keywords: modeling, distance, padding, kayak, canoe.

Introduction

Coming from variety of competition courses in kayak and canoe rowing and considering the time of struggle (from 32 seconds at 200 m distance to 2.5 hours and more at marathon distances), the factors, which limit achieving of the highest sport results, will be different in this kind of sports. Also rowing tactic will be different, which, last time, is reduced to nearly exact simulating of competition activity, without right to change schema of course's passing in the process of passing. The last rule can be not spread to passing of preliminary cycle and to long (circular) courses of competitions, where participants can move out of "own water" or track.

It should be noted that recent years the level and scope of special knowledge concerning the problems of simulation of competition activity's structure (including rowing) have significantly increased [1-5]. First of all this period is characterized by scientific-research work in the field of physiology and bio-mechanics of kayak and canoe rowing [6-13]. Practically valuable knowledge was obtained with development of this problem relating to generalizing of results of testing and on the contrary – with revealing of individual peculiarities of simulation, which were connected with individual functional abilities of sportsmen. With it, systemizing of such information, its development up to the level of practical recommendations and implementation into training practice – directly facilitate improvement of training's quality of qualified rowers.

The work has been fulfilled as per scientific topic 2.25 "Monitoring of process of qualified sportsmen's adapting, considering their individual features" of combined plan of scientific & research works in the sphere of physical culture and sports for 2011-2015 (state registration NO. 0111U001732).

Purpose, tasks, material and methods

The purpose of the research is development of simulation methodic of competition course passing by qualified kayak and canoe rowers at "straight" (200, 500, 1000 meters) competition distances.

The methods and organization of the research. We used the methods of current and prompt control of rowers' individual functional state.. The following methods of research were applied: analysis of data of special literature, of competition reports and reports of stage-by-stage complex examinations; timing of testing distances and their separate segments with using of testing and training loads and with the help of stopwatches «Umbro Professional StopWatch»; radio-telemetric pulse metering ands GPS-speed metering at separate trainings and during tests exercises with application of pulse meters Polar RS800 G3; bio-chemistry of blood with the help of bio-chemical analyzer Dr. Lange LP-420 (indicators of blood lactate level) – the level of blood lactate's concentration was determined with testing and during execution of series of training exercises on water; statistic methods of processing of the obtained data with determination of dependence between rowing speed an, blood lactate's concentration and heart beats frequency (HBF), corresponding to this speed; method of sport results' extrapolation on main starts of season with calculation of individual zones of loads' intensity.

Testing of rowers was fulfilled with consideration of differentiated approach concerning sex, age, period of sport life, sport specialization and qualification. Besides, we took in consideration the results of previous testing at stage complex examinations on the base of scientific-research institute. Main results are presented here on example of men's kayak rowing. In men's canoe and women's kayak rowing the results were similar.

The following training tests were used:

- Determination of alactate capacity: rowing гребля 4, 6, 8, 10, 12, 14, 16, 18, 20 seconds – maximally, after 5 minutes of rest with blood sampling in recreation period (1 and 3 minutes);

- Determination of technical result at distances of 1000, 500, 200 maximally, one control passing of every distance in meso cycle of preparation. By the dynamics of results from meso-cycle to meso-cycle in current and previous seasons we carried out sport results extrapolation to main competitions of the year.

doi: 10.6084/m9.figshare.707101

Results of the researches

It is known that in rowing sport result depends on combined and successive using of aerobic and anaerobic recourses (ways of energy supply). With it, unlike arithmetic, where "with alternating of summands the sum is not changed" – with simulating of competition course passing it is important to consider exactly sequence of using of energy supply mechanisms. It is necessary to purposefully influence on kinetics of functional responses, because other processes, limiting achieving of high results, depend on them.

It has been established that sequence of using of energy supplying mechanisms shall be as follows:

200 meters: kreatine-phosphate + glycolytic mechanisms of energy supply (tactical variant of competition distance passing - "retaining");

500 and 1000 meters: kreatine-phosphate + aerobic + glycolytic mechanisms of energy supply (tactical variant of competition distance passing – "even").

With it, in rowing sport practice at the longest distances there happen situations, when at distances of 500 and 1000 meters sportsman or team lose passing after winning the first half of the course. This situation is typical if correct sequence of realizing of aerobic and lactate energy supply mechanisms was distorted.

In spite of the fact that at present general rules of simulation of mixed competition distances' (middle length courses) passing are known, specifying of start acceleration, mean-stationary section of distance and peculiarities of finishing are in competence of coaches and scientists, who work with certain kinds of sports, with certain teams and sportsmen. At most inconsistent distances of 500 and 1000 meters (with high probability of involving of both aerobic and anaerobic energy supply mechanisms in competition exercise) all this, actually, is reduced to simulation of work and speed in zone V (4b, 100% from distance zone) of sportsman or team on the base of information about capacity of kreatine-phosphate energy supply mechanism.

Having information about capacity of kreatine-phosphate energy supply mechanism of a certain sportsman, it is possible to prognosticate about from what second of maximal work lactate's level starts to sharply increase, and it means it is possible to monitor this process (see fig.1).

Having information about speed in zone V (4б) – we can reach even passing of course at speed equal to speed of lactate accumulation meaning its maximal indicators (and refusal of work) just by the moment of finish's passing (see fig.2).

With leaving start zone, short-term reduction of capacity with maintaining of inertia of previously accelerated boat (exhaustion of kreatine-phosphate mechanisms) has the aim to optimize involving of glycolytic processes in competition activity, when blood lactate's concentration is on levels , which stimulate but not inhibit aerobic function (see table 1).

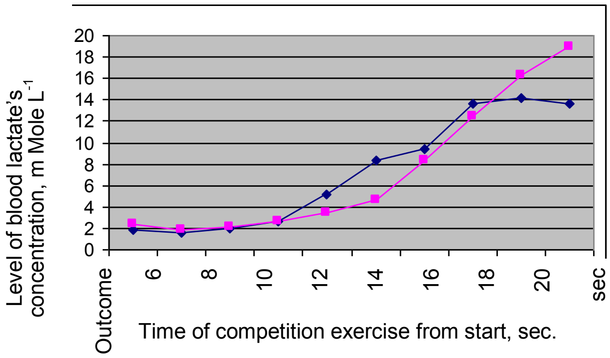

Fig.1 Dynamics of blood lactate's accumulation of two qualified kayak rowers with passing of start segment with maximal possible speed

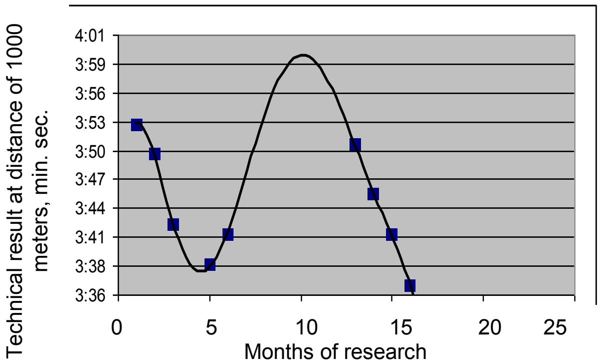

Fig.2. Dynamics of sport result of kayak rower in two annual cycles of training at distance of 1000 meter with extrapolation to future month.

For qualified kayak rowers we developed models of competition activity, which implied calculation of load capacity from start to finish for every separate sportsman or team (see table 2).

At courses of 500 and 1000 meters it resulted in insignificant reduction of speed at the first half of the distance in relation to significant improvement of technical result at the second half. It is known, that competition statistics on dynamics of passing of competition courses by 250 meters' sections has no physiological foundation. For evaluation of competition activity's simulation it is necessary to have evaluation of results at marks 50, 75, 250, 375, 500 meters (for distance of 500 meters) and 50, 100, 250, 500, 750, 1000 (for distance of 1000 meters). With it: in both cases, up to the first mark - the course is passed with maximally possible speed; up to the second mark – ability to maintain inertial speed with obligatory reducing of work-power is evaluated; up to the third mark – ability to gain speed in zone V (4b)m corresponding to average-stationary section of distance, is evaluated. Further, ability to maintain the desired speed is evaluated by its dynamics, without any fluctuations concerning model.

Table 1

The most frequent mistakes, which are made with simulation of passing of competition 500 and 1000 meters' distances by qualified kayak rowers.

Mechanism of energy supply in the order of its using at distances of 500 and 1000 meters	The most frequent mistakes
Kretine-phosphate	- Kreatine-phosphate mechanism is not use to full extent, when 50 meters' section is passed slower than control acceleration at 50 meters; - Start without information about available capacity of kreatine-phosphate mechanism of energy supply, i.e. about admissible time of maximal work from start.
Aerobic	- Absence of breathing cycles with straining on start, when deep breathing appears only as response to increasing of carbon dioxide's concentration in blood with leaving of start zone; - rhythm of breathing does not correspond to rowing locomotion (cycles), i.e. differs from the correct one: stroke from one side – inhale, from the other – exhale.
Glycolytic	- attempt to use glycolytic mechanism of energy supply with leaving start zone that results in significant losses at the second half of distance in comparison with insignificant improvement at the first one; - attempt to sharply finish, which witness about not optimal using of mixed (aerobic + glycolytic) energy supply at average-stationary section of distance.

Table 2

Example of simulation of 1000 meters' distance by qualified rower in single oar kayak

Section of distance	Intensity of work at distance	Zone of intensity	Prevailing energy supply
0-50m	Start section is passed with maximally possible speed	VII	ATP-KP
50-100m	Leaving of start zone. Reduction of power up to threshold of anaerobic exchange (TANE), speed of boat is maintained owing to inertia, gradually reducing to mean-course value in zone 5.	TANE	Aerobic
100-750m	Average-stationary section of distance	V	Aerobic and lactate with speed of lactate's utilization from working muscles during passing of distance being accentuated.
750-1000m	Maintaining of speed at average stationary section of distance with (it is possible but not obligatory) finish acceleration, if it can be preserved up to passing of finish line.	V-VI	Aerobic. Lactate – to less extent, with accent on ability to resist high concentrations of lactate.

Summary

Simulation of passing of competition courses by kayaks and canoes is directly connected with the level of functional abilities of a certain sportsman or team, with peculiarities of development of aerobic and anaerobic (lactate and alactate) mechanisms of energy supply.

Significant quantity qualified sportsmen's losses appears with simulation of 500 and 1000 meters' distances , at which work is fulfilled in mixed modes, when passing from start section to average stationary one and with finishing.

Preparation for simulated passing of competition course shall include in last meso-cycle of special- preparation stage of annual cycle's preparation period the following: general reduction of training loads, optimization of training loads' scope in mixed zone V 94b), with competition speed (100% from course speed). With such exercises speed of lactate accumulation must correspond to the speed of its accumulation at main competition course, with technical result of which being extrapolated to the time of main season competitions. The final level of lactate's concentration in training exercises will depend on duration of exercise (it will always be less than at competitions) and intervals of rest. With application of such training method one must not strive to accumulation of maximal individual levels of lactate owing to prolongation of exercise and reducing of rest intervals. Main mistake of training process is an attempt to carry out plan with decreasing speed lower than 100% from the planned course-speed. In this case speed of lactate's accumulation will be lower than at passing of main competition distance and its frequent using will result in creation of speed barrier.

Such mixed (aerobic-anaerobic) training shall be first of all oriented on improvement of sportsman's speed of lactate's utilization at distance, but not on approaching individual maximal and, in this connection, destructive concentrations of lactate. It is achieved at the cost of correctly selected rest interval and the length of a section (less than competition one).

With increasing of training loads' scope in V (4b) zone of intensity, in current control it is necessary to look after indicator of blood hemoglobin, which must not confidently reduce.

In competition micro-cycle special attention shall be paid to pre-start warming up with successive mobilizing of two leading mechanisms, which provide optimal energy supply at distance:

1. Mobilization of aerobic mechanism of energy supply: work at TANE 1 and technical work at TANE 2 several times (individually) during 1.5-3 minutes.
2. Mobilization of neurogenic stimuli of responses: up to 6 sec – maximal accelerations by the course of boat's movement with very high (more than 3 minutes) rest intervals with the last acceleration; not later than 5 minutes before start.

At distances of 200 meters and "circular" courses (5000 meters and more) simulation of competition activity will have own specific features, which will be connected with prevailing using of anaerobic (in the first case) and aerobic (in the second case) mechanisms of energy supply. These problems will be discussed in other publications.

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Cite this article as: Samuylenko V.E. Modeling of competitive distances qualified rowing and canoeing (illustrated man rowing). *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2013, vol.5, pp. 57-61. doi:10.6084/m9.figshare.707101

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 26.03.2013
Published: 31.05.2013