Ways of technical training perfection in rowing on kayaks

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Abstract

Purpose: to find out the ways of rower's movements perfection.

Material: in the research 114 qualified rowers participated.

Results: it was found that every rover has the zones of optimal and critical temp. With linear increasing of rowing temp there happens non-linear change of boat's speed; of working parameters and efficiency of rower's movements. The highest values of rowers' efficiency coefficient were registered in zone of intensity of 70-80% from maximal. With temp's increasing to maximal boat's speed stabilizes and efficiency coefficient sharply reduces. At the end of distance we registered confident worsening of rowers' main coordination elements under influence of rising tiredness.

Conclusions: in the process of motor qualities' training it is necessary to ensure: increase working temp up to critical; restore optimal correlation of technical parameters with every new level of temp.

Keywords: rowing, kayak, motor technique, bio-mechanic, fatigue.

Introduction

Individual approach to elite athletes' training process can be realized only on the base of interconnection of the used means and structural organization of organism's functions. All these shall correspond to athletes' special fitness as well as to meet the laws of adaptation reconstructions of organism's functions and structures. Variable environmental changes' influence is also of great importance.

The main reason of need in usage of technique's individual variants is adaptive variability of organism's systems in respect to changing conditions of external and internal medium. Variability of movements is influenced by the following factors: specific features of body composition [2, 5, 26], specific features of nervous system [4, 23, 10], topography of muscular strength [14, 18, 20], and motor experience [3, 6, 28]. Variability of movements' structure is influenced by work intensity, degree and character of fatigue. Many authors point at different movements' technique at different speeds of athletes' movement [1, 15, 24]. There are a lot of researches, devoted to specific features of technique's reconstruction under influence of fatigue. With it, fatigue is regarded as a specific filter, which does not permit for athlete to fulfill extra movements and can help to more accurately mark out individual errors and technique's specific features [13, 19, 30].

Changing of movements' technique in different working conditions requires athlete's individual adaptation to main competition distance. Besides, it is necessary to have individual selection of training means and methods, depending on athlete's biological structure and characteristics. It is witnessed by results of a number of authors' works [5, 21, 27].

When determining the reasons and orientation of movements' structure, it is necessary to consider that variability can be conditioned also by sportsmanship [9, 16, 19], adaptive variability, depending on working conditions [7, 8, 21], specific features of sport apparatuses and a number of other factors [17, 29].

We assumed that with maximal mobilization of physical potentials, equal resulting motor effect can be ensured by different changes of movement structure's indicators. It depends on athletes' individual potentials and fitness; external factors and special aspects of physical loads' interaction. Consideration of such factors in training process will permit to make objective diagnostic of athletes' technical fitness as well as to noticeably improve effectiveness of formation of motor actions' structure.

In methodic literature on rowing on kayaks technical training is described rather in detail [15, 22, 31]. However, there are no data about laws of dynamic structure's and main elements of movements system' mastering. There is also deficit of objective information about laws of coordination structure's development. It results in controversies in methodic approaches and views on prospects of perfection of rowers' movements.

The purpose of the research: to find out the ways of rower's movements perfection.

Material and methods

Participants: in the research 114 qualified rowers participated. They were 33 masters of sports, 43 candidate masters of sports; 22 athletes of 1st sport category and 16 athletes of 2nd sport category.

Organization of the research: Coordination structure of rowers' movements was experimentally studied in natural and laboratory conditions.

In our work we used complex method of bio-mechanical researches in laboratory and natural conditions. We studied the following: dynamic of kinematic and dynamic characteristics of forces, applied to oar by a rower; pressure on kayak seat; goniograms of torso work; accelerograms of hands' movements by frontal and vertical axes; instant speed of boat; bio-electrical activity of torso, arms, back and abdomen muscles. Analyzing electric myograms, we determined: amplitude and frequency of bio-potentials' oscillations; rhythm structure of bio-electrical activity; integrated bio-electrical activity of muscles in absolute and relative units. Besides, we calculated indicators of effectiveness and efficiency of motor activity; determined variability of the studied movements' characteristics [23].

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Statistical analysis: in processing of experimental data we calculated the following: mean values of indicators and their errors (X±m); difference and confidence of differences (t, p); dispersion – variant around average value (σ, CV); correlation between the studied indicators (r).

Complex pedagogic, bio-mechanical and biological studies were conducted in compliance with legislation of Ukraine on health protection, Helsinki declaration 2000, directive №86/609 of European community on people's participation in medical-biological researches.

Results

Analysis of results permitted to mark out movements' different variants, used by rowers, by all parameters of technique. The fulfilled correlation of rowers' movements' technique and their sportsmanship showed ambiguous results. Analysis of interconnection of rowers' movements' technique and their qualification (see table 1) showed that achievement of *master of sports'* results is facilitated by the following: a) peak of efforts on oar in the middle of stroke; b) sinusoid character of goniogram in unsupported phase; c) pressure on seat without releasing of weight; d) uniform turn of torso in supported phase; e) start of torso turn up to the moment of catching of water. The result of *second sport category rowers* high sport result depends on the following indicators: a) frequency of strokes with weakening of effort in the middle of stroke; b) stoppage of torso turn in unsupported phase; c) water catching before torso turning starts; d) release of athlete's weight from seat at the moment of water catching or unstable pressure on seat; e) non-uniform or equally accelerated torso turn in supported phase.

There are some variants of technique, which do not have confident interconnection with athlete's qualification: a) efforts' distribution on oar with peak in first third part of stroke and without expressed peak of effort; b) torso work with additional turn in unsupported phase; c) synchronous start of torso turn and water catching; d) slowed torso turn in supported phase of cycle. The mentioned indicators are individual and transitive variants.

Qualitative parameters of technique are expressed in certain quantitative values. Transformation of motor system's quality is resulted from accumulation of

Table 1. Distribution of interconnections between variants of technique's parameters and rowers' qualification

Parameters	Variants	II category	I category	Candidates master of sports	Masters of sports
Form of efforts' distribution on oar	With peak in first third part of stroke	0	0	0	0
	With peak in second third part of stroke	-	0	+	+
	With peak in the last third part of stroke	0	0	0	0
	Without expressed peak of effort	0	0	0	0
	With two peaks of efforts	+	0	0	-
Torso work in unsupported phase	With stoppage in unsupported phase	+	+	0	-
	With additional turn in unsupported phase	0	0	0	0
	Sinusoidal form	-	-	0	+
Torso's interaction with oar at the beginning of stroke	Synchronous start of torso turn and water catching	0	0	0	0
	Torso starts turn before water catching	-	0	+	+
	Torso starts turn after water catching	+	0	0	-
Pressure on seat	Without releasing of weight	-	0	0	+
	With weight releasing at the moment of water catching	+	0	0	0
	With not stable pressure	+	+	0	0
Torso work in supported phase	Accelerated turn	0	0	0	-
	Slowed turn	0	0	0	0
	Uniform turn	-	-	0	+
	Non uniform turn	+	0	0	_

Legend: + positive interconnection; – negative interconnection; 0 absence of interconnection.

quantitative changes. Three levels of registered parameters are marked out. The first level is efficiency of movements, which is determined by boat's speed at distance. The second level includes parameters of oar's work in water. The third level implies kinematic parameters of technique.

Boat's speed of elite athletes depends on five parameters of second level: a) rowing temp; b) maximal effort; c) force impulse ($P<0.001$); d) rowing rhythm ($P<0.05$); e) character of forces acting on oar, which are determined by distribution of pressure on seat in cycle ($P<0.001$). In third level parameters, which directly influence on boat's speed, are marked out. They are: a) amplitude of torso turn in cycle and in supported phase; b) mean speed of torso turn in supported phase; c) the moment of torso turn's start in respect to water catching; d) amplitude of torso acceleration before stroke; e) speed of torso turn at the moment of water catching; f) period of being in extreme position in unsupported phase; ($P<0.001$); g) acceleration of hand by vertical axis at the moment of water catching; j) angle of torso bending ($P<0.05$). All listed above parameters correlate with boat's speed positively. Exclusions were the following: period of torso's being in extreme position after stroke and angle of torso bending. They also influence on parameters of oar's work. We found a number of third level characteristics, which do not influence on boat's speed. They are: a) the value of additional torso turning after stroke; b) relation of amplitude of torso's working turn to total amplitude of turn in cycle; c) stroke amplitude; d) acceleration of hand by frontal axis at the moment of water catching. The influence on oar's working parameters at the beginning of movement.

Testing of differences of the mentioned parameters between three groups of athletes of different fitness showed insufficiency of most of them ($P>0.05$) in groups of first sport category rowers and masters of sports. When comparing the determined characteristics in groups of first sport category rowers and members of combined teams we received confident difference of the most of indicators.

As criteria of technical skillfulness we determined the parameters of technique, which meet the following requirements: a) they are leading in the structure of movements; b) they determine the wholeness of building of technique's phase structure; c) they are interconnected with boat's speed at distance; d) they progress with growing sportsmanship. These parameters include: a) total amplitude of torso turn; b) the moment of torso turn's beginning in respect to water catching; c) the speed of torso turn at the moment of water catching; d) the period of torso being in extreme position in unsupported phase of cycle; e) the speed of torso turn during stroke; f) the character of oar's work in water.

Analysis of work's intensity influence on technique permitted to find that every rower has zones of optimal and critical temps. With linear rising of rowing temp there happens non-linear change of boat's speed, parameters of work and efficiency of rower's movements. The highest efficiency coefficients in elite rowers were registered in intensity zone of 70-80% from maximal. With temp's increasing up to maximal we registered stabilization of boat's speed and sharp reduction of efficiency coefficient. The registered changes of boat's speed and movements' efficiency coincide with reconstructions of movements' structure. In zone of critical temp we registered significant worsening of absolute values of rower's coordination's leading elements that results in reduction of structure's efficiency and limits maximal speed.

Analysis of fatigue's influence on rower's coordination showed that at the end of distance there also happens confident worsening of rower's coordination's leading elements under influence of growing fatigue.

Discussion

The conducted studies of laws of movements' control in rowing on kayaks permitted to insert some corrections in traditional methodic or rowers' technical training at different stages of sport perfection. For targeted reconstruction of rower's movements' structure it is necessary to master its leading elements in the following sequence: 1) training to work with keeping straight sitting posture; 2) training to start torso turn before catching water; 3) training to work without torso stoppage in extreme position; 4) training to horizontal distribution of efforts in stroke (stroking without weigh release from seat); 5) training to uniform efforts' distribution in stroke without weakening in the middle of stroke; 6) increase of torso working amplitude. Mastering of every element facilitates movements' optimization and makes easier the training of next element, sometimes making it simply unnecessary [1, 8, 31].

In rowers' training it is necessary to specially pay attention to the stage of training of movements' optimal structure up to distance temp [3, 7, 12]. Our studies showed that in prevailing majority of rowers work's efficiency reduces and movements' structure disrupted with increasing of temp higher than optimal. The rowers of low and average qualification (up to candidate master of sports) cover 500 meters' distance in temp higher than optimal. In this connection, in motor qualities' training it is necessary to increase the temp up to critical [2, 6, 25]. Besides, it is necessary to restore optimal correlation of technical parameters in the mentioned above sequence at every new level of temp.

Most of elite athletes cover distance at optimal temp [4, 11, 22]. For them the main task is increasing of level of optimal temp. The basis of temp is perfection of movements' structure as per determined criteria at high speed values [5, 15, 30].

Conclusions

1. We found the main technical parameters, influencing on sport result: a) total amplitude of torso turn; b) the moment of torso turn's start in respect to water catching; c) speed of torso turn in the moment of water catching; d) period of torso being in extreme position in unsupported phase of cycle; e) speed of torso turn during stroke; f) character of oar's work in water, determined by pressure on seat.

2. At the end of distance, under influence of increasing fatigue we registered worsening of leading elements of rowers' coordination.

3. In the process of motor qualities' training it is necessary: a) increase temp up to critical; b) restoration of technical parameters' optimal correlation at every new stage of working temp.

Conflict of interests

The author declares that there is no conflict of interests.

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