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Original Article

Correction of functional preparedness of rowers at the stage of maximal realization of individual capabilities

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Abstract:

The results of researches of the organization, devoted to study, of high qualification rower's structure functional training which is taking place at a stage of the maximal realization of individual opportunities and the factors, causing its formation are protected. It shown, that the rower's structure functional training at a stage of the maximal realization of individual opportunities is formed on the basis of interaction of functional systems of maintenance muscles activity, is a dynamic organization and is under construction proceeding from requirement for the further sports perfection. The conducting role in formation of structurally functional organization of special efficiency belongs to the complex, generated during long-term training, of biological properties structured in rigid systems: «aerobic-anaerobic capacity», «mobility-stability», «capacity-profitability». The mathematical models reflecting interaction of submitted systems and their influence on special efficiency rowers are developed.

Key words: modeling, functional training, special efficiency, functional system.

Introduction

The management of training and competitive activities of the qualified athletes in conditions of the intense growth of results in modern sports is effective only if it is based on the results of research of the biological basis of adaptive transformation and performance of athlete's body (Briskin, 2011, 2016; Choszcz, 2012; Galan, 2017; Melnyk, 2017). It would be efficient to perform such research using a systematic approach, which in the classical sense implies the involvement of as much data as possible to explain a specific phenomenon. A quantitative systematic approach that considers the biological dynamical systems from the standpoint of management and widely uses the mathematical methods and modern potentials of the computer equipment for modeling the processes of the physiological functions, allows us to obtain a schematic, abstracted from the minor details subject of the process of adapting the athlete body functions to the training and competitive loads (Kropta, 2003; Guo, 2007; Galan, 2016; Gorshova, 2017).

Specific features of sport equipment that require a strictly defined response of the physiological systems in different conditions of muscle activity in various sports do not allow us to accurately define the level of specific performance using a certain set of functional parameters, even in similar sports disciplines (types, directions) (Priymakov, 2003; Kropta, 2003; Kerr, 2008; Bohuslavska, 2017). Modeling various aspects of athletes' preparedness taking into account the features of sports specialization is an actual task, since it allows to better understand the mechanisms of body adaptation to the chosen training and competitive activity.

The capabilities of the cardiopulmonary system of the body, which determine the energy of competitive activities and the level of implementation of functional potential in sports with a cyclic movement structure play an important role in the modern training reserves (Sanders, 1992; Kropta, 2003, 2004; Bohuslavska, 2017).

All this requires the use of the systematic approach to the modeling of functional preparedness with the inclusion of the somatic, vegetative and regulatory components of motor activity of athletes-rowers in the assessment. The study of models of the functional preparedness structure of rowers and the determination of factors that ensure its formation at the stage of maximum realization of individual capabilities will enable to objectify the approaches to the adequate selection of criteria for managing the preparation of the rowers.

Materials and methods

The methodology of the study was based on the systematic approach, which involves consideration of the whole object from the point of view of the interaction of its components, whose common activity is aimed at achieving a useful adaptive result.

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The organizational basis of the study was the performance of the biological and pedagogical analysis aimed at identifying the key features of the formation of the functional preparedness structure of the rowers at the stage of maximum realization of their individual capabilities. To solve the set tasks, the methods of theoretical analysis and integration of the data from the special literature, observation of the training and competitive activities of highly qualified rowers, pedagogical experiment, which included testing of the specific performance of highly qualified athletes and monitoring of the cardiopulmonary system were used. Methods of logical and statistical analysis of data, methods of mathematical modeling were also used.

Thirty-five subjects, members of the National Ukrainian Rowing Team, aged 24–32, with the following qualifications: Honored Master of Sports – 4, Master of Sports of the International Level – 11 and Master of Sports – 20 athletes took part in the study.

Results

Structural and functional organization of preparedness of the qualified rowers is a complex of functional properties of the system of energy supply of muscle activity which have close internal interactions and strict hierarchy. The basis of this complex is the system of “aerobic-anaerobic power”. The effectiveness criteria of such system are the parameters that demonstrate not only the upper limit of the activity reserves of one or another function – the maximum oxygen consumption (VO_{2max}), intensity of oxygen consumption (VO_2/m), maximal accumulated oxygen deficit ($MAOD_1$), maximum heart rate (HR_{max}), maximal respiratory minute volume (VE_{max}) etc., but also the implementation of the potential accumulated in the process of long-term training – the mean power working capacity at distance of 2000 m (W_{2000}), maximal lactate concentration (La_{max}), level of aerobic potential realization (APR).

In order to determine the relationship between the components of the aerobic and anaerobic capabilities of the rowers with the parameters of specific performance, a multiple correlation analysis of these parameters was carried out (Table 1). The performed analysis proved the presence of multiple correlations of various components of energy potentials with the specific performance.

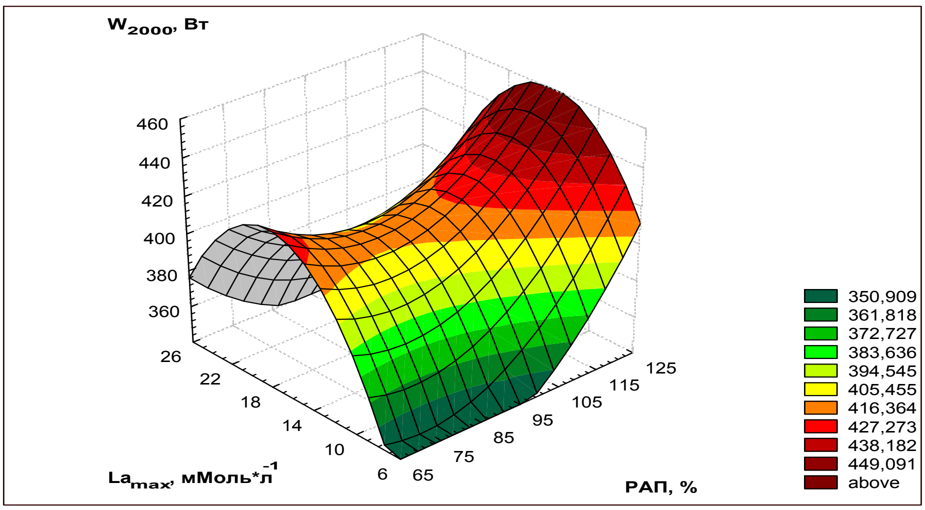
The specific performance evaluated by W_{2000} parameter is reliably related with the characteristics of both aerobic and anaerobic productivity. The specific performance evaluated by the time to cover a competitive distance (t2000) is even more closely correlated with the parameters of the activity of mechanisms of energy supply to the body. This indicates that there is rather large contribution of the anaerobic and aerobic mechanisms to ensure the specific performance of highly qualified rowers. At the same time, the nature of the functional potential implementation depends on bioenergy relations to a large extent.

Table 1. Correlation of specific performance of rowers with the parameters of “aerobic-anaerobic power” system

№	La_{max}	$MAOD_1$	$W_{max}10$	$W_{max}60$	VE_{max}	VO_{2max}	VO_2/m
$W_{кр}$	-0.04	0.13	0.19	0.3	0.54	0.71	0.57
W_{10000}	0.85	-0.9	0.42	0.66	0.67	0.72	0.68
t_{2000}	-0.72	-0.39	-0.75	-0.91	-0.73	-0.77	-0.82
W_{2000}	0.53	-0.24	0.44	0.59	0.47	0.17	0.32

Note: the significant correlations are marked with font. For the studied sample of rowers r_{rp} = 0.40 with p<0.05 and r_{rp} = 0.51 with p<0.01.

This statement is reflected in the obtained model of the correlation of the specific performance of the rowers with the parameters of implementation of the aerobic potential and maximum anaerobic glycolytic power (Fig. 1).



W; mMol*l^{-1}; APR

Fig. 1. Model of correlation of specific performance of highly qualified rowers, level of implementation of the aerobic and anaerobic lactic productivity

It is essential that the specific performance of the rowers, associated both with the implementation of aerobic productivity ($r=0.491$; $p>0.01$), and with anaerobic glycolytic capability ($r=0.374$; $p>0.05$), has no significant limitations on the implementation of aerobic potential, bit it is substantially determined by the level of implementation of anaerobic productivity (by La_{max}). The optimal range of the anaerobic glycolytic mechanism implementation in the competitive conditions of qualified rowers is localized within 14-19 $mMol \cdot l^{-1}$. This allows determining the model range of the implementation of anaerobic lactic power.

The examined rowers had the same high values of anaerobic lactate capabilities, as those registered using the same methods in the qualified athletes of other sports (Briskin, 2016; Gorshova, 2017). Therefore, it can be concluded that anaerobic productivity is one of the key components to achieve the high sports results in rowing.

The great significance of aerobic productivity relative to the contribution of anaerobic one in the structure of the functional capabilities of the rowers is explained by the fact that when assessing the role of this integral component of functional preparedness, its multifactor internal structure is taken into consideration. In particular, the assessment includes a number of parameters that reflect the power of respiratory and circulatory systems. The assessment of the aerobic productivity considers the universal role of these systems in supplying the body with oxygen and in the "purification" of the muscles and the whole body from metabolites, the main of which are the metabolites of anaerobic processes. Therefore, with a wider interpretation of this component of the functional preparedness, its significance in the system of evaluation criteria of specific performance of the rowers significantly increases. This explains a relatively smaller proportion of anaerobic productivity. When determining the factor structure of the specific performance of the rowers, the parameters of aerobic and anaerobic energy supply have become the basis of the main factor. The total contribution of this factor, designated by us as "power of the energy system", in the dispersion of the specific performance was 24 %.

Realization of the functional potential is closely connected with the system interactions of the complex of parameters of the system "mobility-stability", where the main evaluation role is played by the parameters of kinetics of the cardiopulmonary system – speed of heart rate response expansion (T_{50} HR), oxygen consumption (T_{50} VO_2); its stability – time of work at VO_2 plateau (t-plateau VO_2), functional stability coefficient by HR (FSC); efficiency – threshold of anaerobic metabolism (TANM HR), watt-pulse (W/ HR).

Such factors as the mobility and efficiency of the cardiopulmonary system in the overall determination of the specific performance in the rowers have accounted for 13.7 % and 13.2 %, respectively. Given the specificity of the mobility manifestations in the rowing, the proportion of this factor is relatively high. At the same time, among the parameters of mobility and efficiency, the largest individual differences have been observed in the studied group of rowers. This determines the high significance of these factors in identifying the individual features of the functional preparedness structure. Therefore, we tend to consider the optimization of the kinetics of the gas transport function of the rowers, which are at the final stages of long-term athletic perfection, as one of the mechanisms for increasing the implementation of the functional potential of athletes. Since the high mobility and sensitivity of the aerobic processes are not a necessary element of success in rowing, the training effects should be aimed at forming such interactions between some sides of the gas exchange, in which the change in the activity intensity of one of the respiratory or circulatory parameters has an immediate effect on the dynamics of others parameters. This would significantly improve the efficiency of the functional response of the cardiopulmonary system while ensuring the specific performance of the rowers.

Correlation analysis, as well as the study of the contribution of the selected factors to ensure the specific performance of the rowers have shown that the degree of implementation of anaerobic and aerobic productivity provides a predominant orientation of adaptation of the cardiopulmonary system to the increase of mobility or stability – parameters of the "structure of response" to the competitive load. The efficiency component has some resulting role. The "structure of response" in this case means the combined dynamics of changes in the functions of energy supply of muscle activity – duration of training, time of maintenance of stationary load states in the competitive conditions in the rowers. That is, the "aerobic-anaerobic power" system in the highly qualified rowers is the basis for the formation of "mobility-stability" system in order to achieve the optimal adaptive body response to the competitive load.

The analysis of the structure of functional preparedness of high-class rowers, taking into account that it is formed based on the individual combination of key components that determine the level of specific performance, it creates the fundamentally new opportunities for managing the functional preparation of rowers, which are at the final stages of multi-year training.

The interaction of aerobic and anaerobic mechanisms of energy supply in the process of competitive activities of qualified rowers ensures a certain level of implementation of each of them and, as a result, changed level of lactate content, oxygen consumption, CO_2 release. Such changes directly ensure the prevalence of various adequate stimuli of the cardiopulmonary system (hypercapnia, acidotic, hypoxic), their ratio change in the increasing fatigue leads to the restricted level of implementation of athlete aerobic potential. Thus, the effectiveness of the respiratory and circulatory systems of rowers can be determined by the ratio of aerobic and anaerobic productivity in the process of competitive activity. The coefficient of variation of the most parameters of anaerobic energy supply exceeds the statistically acceptable limits. Thus, the coefficient of variation (CV, %)

of the recorded values of the highest lactate concentration is 26.17 % in the group of qualified rowers and 20.44 % in the group of team leader rowers, the variability of the parameters $MAOD_1$ – 16.07 % and 12.24 %, the oxygen deficit – 30.24 % and 9.0 %, respectively. The obtained data indicate the possibility of allocating individual groups of rowers with the marked differences in anaerobic productivity parameters.

The practical implementation of this provision was associated with using the methods of multiple regression and factor analysis. The provided model characteristics of functional preparedness of athletes with the following La_{max} blood concentration at the 3^{rd} minute of the restoration period — 8.38±0.60 $mMol \cdot l^{-1}$, 14.88±0.45 $mMol \cdot l^{-1}$ and 19.9±0.5 $mMol \cdot l^{-1}$ (Table 2) — show different directions of formation of the functional preparedness structure when adapting the rowers to the loads of special nature.

The level of implementation of the functional capabilities of the cardiopulmonary system in rowers, in whom La_{max} blood concentration at the 3^{rd} minute of the recovery period is 8.38±0.60 $mMol \cdot l^{-1}$, is lowered compared with other groups. Their insufficient level of implementation of the anaerobic glycolytic mechanism of energy supply is associated with a decreased ability to realize the aerobic potential. The aerobic potential realization (APR) in a special test on an ergometer in this group is 83.59 %, with the APR model level for highly qualified rowers — 95.8 %. At the same time, athletes of this group have sufficient functional potential to achieve high results in sport.

Table 2. The model characteristics of functional preparedness of rowers at the stage of maximum realization of individual capabilities

Parameter, units of measurement	*La_{max}=8.38±0.6*			La_{max}=14.88±0.45			La_{max}=19.9±0.5		
	$\bar{x}$	δ	±m	$\bar{x}$	δ	±m	$\bar{x}$	δ	±m
Height, cm	191.4	8.47	3.79	193.53	4.42	1.14	193.0	5.70	1.40
Weight, kg	85.40	5.98	2.68	88.59	6.49	1.68	87.40	7.50	1.90
Power of energy system									
La_{max}, $mMol \cdot l^{-1}$	8.38	1.34	0.60	14.88	1.76	0.45	19.90	1.90	0.50
$MAOD_1$, ml	39.8	8.77	3.92	42.13	6.53	1.69	39.20	6.30	1.60
O_2-diff, l	7.26	2.54	1.14	8.19	1.98	0.51	8.20	2.70	0.70
RQ_{max}, RU	1.33	0.10	0.04	1.12	0.21	0.06	1.20	0.20	0.10
$W_{max}10$, W	622.8	47.43	21.21	792.95	140.68	36.32	808.30	160.30	40.10
$W_{max}60$, W	527.0	52.26	23.37	651.13	89.27	23.05	659.70	98.10	245.00
VE_{max}, $l \cdot min^{-1}$	160.16	21.57	9.65	188.94	16.83	4.35	179.70	15.50	3.90
VO_{2max}, $ml \cdot min^{-1}$	4802.2	685.89	307.63	5740.33	919.77	237.48	5591.20	598.70	149.70
VO_2/m, $ml \cdot min^{-1} \cdot kg^{-1}$	56.06	4.96	2.22	64.94	9.37	2.42	63.40	5.90	1.50
"plateau" VO_2, $ml \cdot min^{-1}$	53.64	4.4	1.10	57.94	1.43	0.09	58.2	2.6	0.16
Hb, $mMol \cdot l^{-1}$	14.38	0.87	0.39	15.50	1.35	0.35	15.60	0.60	0.10
HR_{max}, $beats \cdot min^{-1}$	200.6	7.96	3.56	198.47	18.56	4.79	196.00	11.00	2.70
VO_2/ HR_{max}, $ml \cdot beats^{-1} \cdot min^{-1}$	26.72	3.45	1.54	32.08	4.95	1.28	30.90	4.00	1.00
$W_{кр}$, W	313.8	42.98	19.22	380.84	61.75	15.94	375.60	62.50	15.60
W_{2000}, W	368.53	3.88	1.73	413.15	25.15	6.49	406.70	20.10	5.00
Efficiency of respiratory system									
$АП_{HR}$, $beats \cdot min^{-1}$	160.6	15.09	6.75	157.06	9.13	2.36	163.30	8.50	2.10
АП, W	211.4	51.10	22.85	276.53	97.92	25.28	306.00	98.70	27.70
$TANM_{HR}$, $beats \cdot min^{-1}$	175.4	14.08	6.30	178.29	6.08	1.57	179.80	6.40	1.60
TANM, W	271.6	46.70	20.89	319.82	60.51	15.62	333.80	64.70	6.20
$W/HR_{ст}$, $W \cdot beats^{-1} \cdot min^{-1}$	1.73	0.11	0.05	2.02	0.30	0.08	1.90	0.30	0.10
Kinetics of respiratory system									
T_{50} VE, sec	79.6	9.36	2.34	60	3.36	0.21	62	5.5	0.34
T_{50} VO_2/m, sec	55.4	4.94	1.24	37.01	5.92	0.37	36.1	5.8	0.36
T_{50} HR, sec	32.2	5.17	1.29	26.13	7.05	0.44	19.7	7.7	0.48
$T_{50}PACO_2$, sec	45.25	4.02	1.01	38.33	2.25	0.14	37.1	6.7	0.42
Δ HR, $beats \cdot min^{-1}$	16.2	2.17	0.54	13.75	3.28	0.21	14.8	3.5	0.22
t -plateau VO_2, sec	172	6.48	1.62	193.33	3.3	0.21	183.8	4.2	0.26
FSC, RU	24.31	2.31	0.58	26.71	7.61	0.48	24.6	1.8	0.11

The presented models of the correlation of the specific performance of rowers with the different levels of implementation of anaerobic glycolytic capabilities show that two main directions of vegetative system adaptation that allow sportsmen to achieve high sports results (Table 3).

Table 3. Models of correlation of specific performance in rowers with the parameters of functional preparedness structure

Model	R, (p
Time to cover competitive distance = $0.16 \times T_{50}$ HR $+9.06 \times$height$+6.65 \times RF_{max} + 0.59 \times HR_{ст} + 1.72 \times T_{50} \dot{V}E - 66.94 \times Hb - 0.09 \times VCO_{2max} - 2.06 \times T_{50} PACO_2 - 719.22$.	0.939 (<0.001)
Time to cover competitive distance = $0.80 \times W_{кр} + 9.12 \times W/HR + 17.15 \times O_2$ diff$+0.59 \times$t-plateau $VO_2 + 2.35 \times T_{50} PACO_2 +$ 15×height$-13.01 \times \Delta HR_{ст} - 80.66 \times F_E CO_2 - 695.85$.	0.928 (<0.001)

The high sports result of the rowers, in whom the lactic acid blood concentration at the third minute of recovery is 14.88±0.45 $mMol \cdot l^{-1}$ depends to a large extent on the functional mobility of the respiratory system, sensitivity to CO_2, and the capacity of the gas transport component of the respiratory system. The result of the rowers that have La_{max} blood concentration up to 19.9±0.5 $mMol \cdot l^{-1}$ mainly depends on the stability of the respiratory and circulatory processes in a competitive environment.

The formation of homogeneous groups by the parameter of arterial lactate allowed us to identify the physiological factors that determine the specific performance of the rowers. Management of the high levels of acidemia, which limits the performance, is mainly attributive to the increase in the speed and power of compensatory respiratory and circulatory responses. In addition, the contribution of the mobility factor to the total dispersion is the greatest (26.1 %), which demonstrates the role of the respiratory system kinetics in the elimination of acidemia changes in the parameters of the internal environment in the intense muscular activity of the rowers. Increased specific performance is associated with the decreased level of La ($r= -0.61$, $p<0.01$), pulse value of work ($r= -0.52$, $p<0.05$), increased speed of respiration expansion ($r= 0.69$, $p<0.01$) and circulation ($r= 0.71$, $p<0.01$).

The alternative adaptation mechanism is to increase the stability of the cardiopulmonary system to the action of high levels of acidosis. Thus, the increased La values in the specific performance of rowers largely depend on the level of anaerobic ($r= 0.77$, $p<0.01$) and aerobic ($r= -0.92$, $p<0.01$) power, respiratory resistance ($r= -0.31$, $p>0.05$), and the decreased values depend on the rate of systemic response to hypoxic ($r= -0.74$, $p<0.01$) and hypercapnia ($r= -0.73$, $p<0.01$) changes in homeostasis.

Discussion

Theoretical generalizations and new solutions for modeling the functional preparedness of the qualified rowers on the basis of systematic study of the structure of functional capabilities are given. Thus, the identified key factors and parameters of the structure of the functional preparedness of rowers are the model characteristics of their preparedness level, and developed mathematical models can be used to characterize the functional state, modeling its various variants in achieving the programmed result when selecting the athletes and predicting the results at the stage of maximal realization of individual capabilities.

The analysis of scientific and methodological literature shows that the functional preparedness of highly qualified rowers during training and competitive loads is ensured by the formation of specific interactions of system of energy supply of muscle activity. The issues of intra- and inter-system interconnections of the components of the functional preparedness of rowers, which reliably reflect the features of their adaptation to training and competitive activities, remain understudied.

The data of the correlation analysis demonstrate that the organization of the structure of the functional preparedness of the rowers at the stage of maximum realization of individual capabilities is a complex of functional properties of the system of energy supply of muscular activity that ate closely correlated.

The basis of the structure of functional preparedness is the system of the "aerobic-anaerobic power". The criteria of the effectiveness of such system at this stage of preparation are the parameters that demonstrate the realization of the accumulated during the long-term training potential of energy systems, which are closely interrelated with the time to cover the competitive distance: W_{2000} ($r= -0.69$; $p<0.01$), $W_{max}10$ ($r= -0.75$; $p<0.01$), $W_{max}60$ ($r= -0.75$; $p<0.01$), La_{max} ($r= -0.90$; $p<0.01$), APR ($r= -0.49$; $p<0.01$).

The leading role of the "aerobic-anaerobic power" system in the highly qualified rowers in the formation of the "mobility-stability system is shown; this system ensures the optimal dynamics of the adaptive response of energy supply mechanisms to the loads of the limiting intensity – duration of training, time of maintenance of stationary load states in conditions of competitive activity of rowers. Close system interactions are established between realization of anaerobic glycolytic mechanism of energy supply and parameters of the "mobility-stability" system: T_{50} HR ($r= -0.31$; $p>0.05$), t-plateau VO_2 ($r=0.48$; $p<0.01$), T_{50} VO_2 ($r= -0.38$; $p>0.05$), FSC ($r=0.43$; $p<0.01$).

The results of factor analysis of the obtained data show that the formation of the structure of functional preparedness of the rowers at the stage of maximum realization of individual capabilities is determined by a group of factors, the prevailing factor among them is the power of system of body energy supply – 24 % of the total dispersion. In addition, the other factors include: mobility of the cardiopulmonary system – 13.7 % of the total dispersion; efficiency of the cardiopulmonary system – 13.2 %; oxygen capacity of the respiratory system – 11.3 %; implementation of anaerobic potential – 9.7 %.

The developed model of the correlation of the specific performance of the rowers with the parameters of the implementation of the aerobic and anaerobic potential shows that the specific performance of the rowers is associated both with the manifestation of aerobic productivity (r=0.491; p<0.05), and with anaerobic glycolytic capability (r=0.374; p>0.05), no significant restrictions on the implementation of aerobic potential, but is substantially determined by the level of implementation of anaerobic productivity. The model level of implementation of the anaerobic glycolysis in the conditions of competitive activity of qualified rowers is localized within 14-19 $mMol \cdot l^{-1}$.

Thus, the conducted research has made it possible for the first time to study the interaction patterns of the key processes of energy supply of muscle activity of the qualified rowers in the setting of loads of a special nature; find out the features of the formation of structure of functional preparedness, its effect on the specific performance of rowers at the stage of maximum realization of individual capabilities; identify the intra- and inter-system interconnections between different sides of the functional capabilities of respiration and circulation, which are formed on the basis of adaptation to the training and competitive activities of qualified rowers; determine the optimal correlation of the components of structure of the functional capabilities of the cardiopulmonary system of qualified rowers; develop the models of structure of functional preparedness of rowers at the stage of maximum realization of individual capabilities.

The practical significance of the obtained results is the quality improvement of the medical and biological support of the training process of the qualified rowers; use of the research results in the planning and organization of the process of preparation of rowers at the stage of maximum realization of individual capabilities; prediction of the long-term dynamics of functional preparedness of qualified rowers; use of the obtained models for the specialization and individualization of sports training of qualified rowers, as well as the selection and orientation of the rowers at the final stages of sport perfection.

Conclusions

1. The variability of the factor structure of the functional capabilities of the rowers is determined, which is related to the level of implementation of anaerobic glycolytic capabilities. The specific performance of the rowers with the blood concentration of lactic acid 4.88±0.45 $mMol \cdot l^{-1}$ is formed under the influence of the factors of the respiratory system functional mobility (26.1 %), capacity of the gas transport component of the cardiorespiratory system (21.9 %), reserve capabilities of the respiratory system (18.8%), sensitivity to CO2 (16.9 %). Performance of the rowers with blood La_{max} concentration up to 19.9±0.5 mMol·l-1 is in its turn determined by the factors of power of aerobic (30.4 %) and anaerobic (19.6 %) energy supply mechanisms and the stability of the aerobic function (20.7 %).

2. Increasing the specific performance of rowers at the stage of maximum realization of individual capabilities is largely determined by the degree of implementation of the anaerobic productivity in the process of competitive activity. MAOD1 decreases from 40.76±1.06 $ml \cdot kg^{-1}$ to 33.5±1.83 $ml \cdot kg^{-1}$, with La_{max} increasing from 16.28±0.69 $mMol \cdot l^{-1}$ to 18.18±1.66 $mMol \cdot l^{-1}$.

3. Results of multiple correlation and factor analysis show that the increased level of the specific performance of the qualified rowers with the key aerobic mechanism of compensation of energy demand (blood La_{max} is 14.88±0.45 $mMol \cdot l^{-1}$) are related to the decreased level of implementation of anaerobic productivity (r= -0.61, p<0.01), pulse value of work (r= -0.52, p<0.05) and increased speed of respiration expansion (r= 0.69, p<0.01) and circulation (r= 0.71, p<0.01).

4. The key role of increasing the resistance to the effect of high levels of acidosis in the adaptation of the rowers with a high contribution of anaerobic glycolytic mechanism in maintaining the specific performance (blood La_{max} is 19.9±0.5 $mMol \cdot l^{-1}$). Thus, when La values are increased, the specific performance of rowers largely depends on the level of anaerobic (r= 0.77, p<0.01) and aerobic (r= -0.92, p<0.01) power, stability (r= -0.31, p>0.05) of the respiratory system, on the decreased rate of systemic response to hypoxic (r= -0.74. p<0.01) and hypercapnia (r= -0.73, p<0.01) changes in homeostasis.

5. The model characteristics and their parameters that can be the reference values for managing the functional preparation of the rowers at the stage of maximum realization of individual capabilities are determined. The obtained regression equations allowed carrying out an estimation of the functional condition of the rowers and modeling its different variants to achieve a programmed result at the stage of maximum realization of individual capabilities.

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