SLOBOZHANSKYI HERALD OF SCIENCE AND SPORT

UDK 796.012.13:797.12

ISSN (English ed. Online) 2311-6374
2019, Vol. 7 No. 5(73), pp. 12-21
DOI: 10.5281/zenodo.3595087

Functional indicators of the female athlete's body specializing in rowing

Volodymyr ***Bogush***[1]
Sergiy ***Getmantsev***[2]
Konstantin ***Bogatyirev***[1]
Oksana ***Reznichenko***[1]
Volodymyr ***Kosenchuk***[1]
Oleg ***Verteleckiy***[2]
Yuriy ***Kulakov***[2]

[1]*Admiral Makarov National University of Shipbuilding, Mykolaiv, Ukraine*
[2]*V. Sukhomlynskiy Mykolaiv National University, Mykolaiv, Ukraine*

Purpose: *to conduct a comprehensive study of the functional state of female athlete's specializing in rowing, for the subsequent determination of the prospects in this sport.*

Material & Methods: *girls of various age groups and sports qualifications were examined. The functional state of the athletes was studied according to the developed methodology for measuring the effect of the training action, and the sensorimotor reactions to sound and light stimuli, the power of forced inspiration and expiration, the level of muscular-articular sensitivity and coordination of movements were determined. The testing process simulated typical conditions of training and competitive activity.*

Results: *on the basis of comprehensive studies, it is shown that the most important methodological condition for the formation of a rational technique is the interconnection and interdependence of the structure of movements and the development of physical qualities. Correspondence of an athlete's physical preparedness to the level of possession of sports equipment, structure and the degree of perfection of its characteristics determines the technical preparedness in sports. The proposed research methodology and comparative analysis of average values, as well as relative deviations of the functional state indicators of the examined athletes, may indicate the level of sports preparedness of the rowers.*

Conclusions: *the use of the proposed methodology will maximize focus on the individual characteristics and abilities of each particular athlete when choosing a sports specialization, developing a system of multi-year training, determining the rational structure of training and competitive activity.*

Keywords: *pace and accuracy of movements, time of sensorimotor reactions to sound and light stimuli, inspiratory and expiratory flow rates, level of coordination of movements.*

Introduction

Patterns of adaptation of the human body to physical activity is the basis for the rational use of physical exercises for training, aimed at the formation, preservation, strengthening of qualities such as strength, speed, agility, endurance and flexibility, as well as improving the performance of athletes [1; 2].

Under the influence of physical loads at the cellular and tissue levels, there is a restructuring of various organs and systems of the human body, which is based on general biological processes, and their understanding is a prerequisite for the correct assessment of the level of preparedness [3; 4].

The vital activity of any organism determines the reflex principle of its response to stimuli. This occurs with simple and complex reflex acts that form the athlete's movements. The reaction of an organism is defined as a complex cyclic process in which various structural components participate. During the athlete performs any motor actions, various body systems work: nervous, muscle, respiratory, cardiovascular, excretory, endocrine, metabolism changes. So, each movement of an athlete is the result of combining a large number of different morphological elements (bones, joint-ligamentous apparatus, muscles), organs and systems of the body, aimed at achieving the necessary motor effect [5; 6].

Adaptation of the central regulatory system is implemented in the automation of movements, that is, in the performance of well-fixed motor actions without conscious control from the nerve centers, is a manifestation of profitability. During training, a pool of conditioned reflexes is constantly accumulating and there is an increase in the capabilities of the central nervous system to instantly create algorithms of motor acts necessary for the effective solution of unexpected motor tasks [7].

Training physical activity, its intensity and volume reflect a quantitative measure of the impact on athletes in the process of training. With the proper use of certain physical exercises, it is necessary to take into account adaptations to them and the effect on the human body. In this regard, it is important to study the physiological basis for the adaptation of the athlete's body to physical activity. The severity of changes in body functions in this case depends, first of all, on the individual characteristics of a person and the level of his fitness. The studied functional indicators of the body of athletes can be correctly analyzed and comprehensively evaluated only in relation to the adaptation process [8].

Physiological reactions can be adapted to certain environmental conditions (physical activity) that have passed the adaptation process, or deadaptation, which are in the process of

adaptation. Therefore, individual adaptation of a person in dynamics is defined as the previous process, in which the main is the appearance of new adaptive reactions based on information about changes in the external environment and the further state, already with the presence of adaptive changes made, stored for a long time, and mechanisms of their active search, on the basis of which reactions organisms appear in response, with the help of regulatory systems are brought to optimal [9; 10].

With an increase in the level of motor preparedness, adaptive reactions become more and more specific, which must be taken into account when choosing means and methods of developing motor abilities. To maintain the achieved level of long-term adaptation, it is necessary to systematically use supporting physical activities. The cessation and a significant decrease in training effects causes the opposite process adaptation – deadaptation, which applies to all aspects of the training of students, including physical [11].

To achieve high sports results, much attention is paid to improving the technical training of athletes, is the most effective means of performing sports exercises in order to achieve the best result. In the process of training, the technical level changes from the elementary technique of a beginner to the perfect technique of a qualified athlete [12].

Purpose of the study: to conduct a comprehensive study of the functional state of female athlete's specializing in rowing, for the subsequent determination of the prospects in this sport.

Material and Methods of the research

Pupils of sports schools of Mykolaiv and the Higher School of Physical Culture, girls specializing in kayaking were examined. Individual indicators were determined in different age groups: 11–12 years old – 25 people, 13–14 years old – 28 people, 15–16 years old – 23 people, total – 76 athletes.

The study of the functional state included a test for measuring the effect of the training action (META), created on the basis of the tapping test, which allows you to determine the complex of kinematic characteristics of movements in an autonomous mode. This technique allows you to study the pace of movements and their accuracy by the sum of the points scored, as well as the accuracy of one movement. The study of movements performed with maximum speed and accuracy was considered in various conditions, sequentially in three time periods: for 15 s, 60 s and 15 s. Such a statement of the problem provided an objective assessment of the pace and accuracy of movements in various conditions: with an optimal functional state in the first period of time, during prolonged work in the second and after a long and maximum pace of work in the third period.

A change in the number of movements in the first period of time indicates a high mobility of nervous processes, the second – about balance, the third – about strength and in total – about the state of the nervous system as a whole. This physiological justification allows the trainer to objectively evaluate the processes occurring in the body, and to purposefully conduct management of training and competitive activities. The methodology for studying the effect of the training effect is published in detail in the "Slobozans`kij naukovo-sportivnij visnik" 2019, No. 3(71), pp. 10-17 [13].

The determination of latent periods of visual-motor and auditory-motor reactions was carried out using an electromyoreflexometer (EMR) according to a standard method. These reactions are an indicator of complex psychophysiological processes that reflect the characteristics of receptor perception, nervous and muscular systems, characterizing the mobility of nervous processes, that is, one of the most important indicators of higher nervous activity.

The level of muscular-articular sensitivity and coordination of movements, as well as the diagnostic capabilities of the principle of repeated reproduction of a given load, were studied by the method of reverse dynamometry (DMrev), which was modified and adapted for the purposes of our study. The ability to develop a skill to reproduce a given load without visual correction of each of ten attempts was determined.

The power of forced inspiration and expiration was measured using a pneumotachometer (PT). The air velocity in $l \cdot s^{-1}$ was estimated at the maximum fixed inhalation and exhalation. 10 attempts were used with an interval of at least 20 s. Determining the maximum air flow during inhalation and exhalation allows you to indirectly evaluate the ability of the respiratory muscles to work intensively. With regular sporting activities, the power of forced inspiration and expiration can significantly increase.

The observation results were processed by methods of variation statistics.

Results of the research

In different age groups, tempo indicators were determined by the number of strokes, the total points scored for all movements, the accuracy of one movement. The results of the study of the functional state of girls aged 11–12 are presented in Table 1. In the first period of the test, measuring the effect of the training action determines the starting speed, we observed: the average rate of movement was 25,7±1,65 beats, the maximum figure was 26 beats, the minimum – 21 beats; the average amount is 202±3,06 points, the maximum is 207 points, the minimum is 170 points; accuracy – 7,86±0,44 points; at the maximum pace and total points – 7,96 points, with minimum values – 8,09 points.

In the second period of the test, it reflects speed at a distance, on average, the pace was 26±1,36 beats, the sum was 211±8,25 points, accuracy was 8,12±0,20 points; at the maximum pace – 27,5 beats, the sum was determined – 221,3 points and accuracy – 8,04 points; the minimum pace was 23,5 strokes, the total was 197 points and the accuracy was 8,38 points.

In the third period of the test, it indicates speed endurance, average values were observed: pace – 27,3±1,36 beats, total – 215±13,96 points, accuracy – 7,88±0,14 points, maximum and minimum indicators, respectively, pace – 29 strokes and 25 strokes, the sum – 235 points and 194 points, accuracy – 8,10 points and 7,76 points.

According to the total result of three periods of the test, characterizing speed abilities as a whole, the average was noted: pace – 26,33±1,417 beats, total – 210,3±3,411 points, ac-

Bogush, V., Getmantsev, S., Bogatyirev, K., Reznichenko, O., Kosenchuk, V., Verteleckiy, O. & Kulakov, Yu. (2019), "Functional indicators of the female athlete's body specializing in rowing", *Slobozhanskyi Herald of Science and Sport*, Vol. 7 No. 5(73), pp. 12-21, doi: 10.5281/zenodo.3595087

Table 1

Survey results (rowing, girls 11–12 years old)

		Indicators	M±m	M_{max}	M_{min}	σ	C
Effect of the training action	First period	Pace (number of beats)	25,7±1,65	26	21	2,87	12,12
		total points	202±3,06	207	170	5,33	2,64
		Accuracy (points)	7,86±0,44	7,96	8,09	0,77	8,81
	Second period	Pace (number of beats)	104±5,44 (26±1,36)	110 (27,5)	94 (23,5)	9,47	9,10
		total points	845±33 (211±8,25)	885 (221,3)	788 (197)	57,4	6,79
		Accuracy (points)	8,12±0,20	8,04	8,38	0,36	4,38
	Third period	Pace (number of beats)	27,3±1,36	29	25	2,37	8,67
		total points	215±13,96	235	194	24,3	11,28
		Accuracy (points)	7,88±0,14	8,10	7,76	0,24	3
	Total	Pace (number of beats)	158±8,5 (26,33±1,417)	165 (27,5)	140 (23,33)	14,79	9,54
		total points	1262±20,47 (210,3±3,411)	1327 (221,2)	1152 (192)	356,2	24,98
		Accuracy (points)	7,99±0,14	8,04	8,22	0,24	2,92
Test	EMR (c)	sound	0,228±0,026	0,272	0,195	0,046	19,98
		light	0,265±0,026	0,291	0,214	0,046	17,21
	PT ($l \cdot s^{-1}$)	inhale	4,33±0,85	5,5	3,0	1,48	34,16
		exhale	3,9±0,51	4,5	3,0	0,89	22,75
	DM rev. (kg)		2,2±0,48	3,0	1,6	0,83	37,65

Remark. *In parentheses are the data reduced to a single temporary indicator of 15 s.*

curacy – 7,99±0,14 points; by maximum values: pace – 27,5 beats, amount – 221,2 points, accuracy – 8,04 points; according to the minimum indicators: tempo – 23,33 hits, total – 192 points, accuracy – 8,22 points.

In the second period, compared with the first, average indicators increased: pace – by 0,3 beats (1,17%), amount – by 9 points (4,46%) and accuracy – by 0,26 points (3,31%); according to the maximum indicators, there was observed: an increase in pace by 1,5 hits (5,77%), amounts by 14,3 points (6,91%), accuracy by 0,08 points (1,01%); the minimum indicators also recorded an increase: pace – by 2,5 beats (11,91%), amounts – by 27 points (15.88%), accuracy – by 0,29 points (3,58%).

In the third period, compared with the first and second, the average indicators increased, respectively, in terms of movement pace by 1,6 beats (6,23%) and 1,3 beats (5,00%), in total – by 13 points (6,44%) and 4 points (1,91%), but the accuracy remained virtually the same – an increase of 0,02 points (0,25%) and a decrease of 0,24 points (3,05% over the second period)) according to the maximum indicators: an increase in pace by 3 beats (11,54%) and 1,5 beats (5,45%), amounts by 28 points (13,53%) and 13,7 points (6,19%) accuracy – by 0,14 points (1,76%) and 0,06 points (0,75%); according to the minimum indicators: an increase in pace by 4 hits (19,05%) and 1,5 beats (6,38%), amounts by 24 points (14,12%) and a decrease by 3 points (1,55%), however, accuracy is low in the third period and less than in the first – by 0,33 points (4,25%) and in the second – by 0,62 points (7,99%).

In the sum of three periods, the average pace is greater than in the first and second periods, by 0,63 beats (2,45%) and 0,33 beats (1,27%), less than in the third, by 0,97 beats (3,68%); the amount is higher than in the first period by 8,3 points (4,11%), less than in the second and third, by 0,7 points (0,33%) and 4,7 points (2,23%), the accuracy is greater than in the first and third periods, by 0,13 points (1,65%) and by 0,11 points (1,39%), less than in the second, by 0,13 points (1,63%).

Deviations from the average values of the maximum and minimum indicators in the first period amounted, respectively, in terms of pace of movement – 0,3 beats (1,17%) and 4,7 beats (22,38%), total – 5 points (2,48%) and 32 points (18,82%); in the second period: in terms of pace – 1,5 beats (5,77%) and 2 beats (10,64%), total – 10,3 points (4,88%) and 14 points (7,11%); in the third period: in terms of pace – 1,7 beats (6,23%) and 2,3 beats (9,20%), total – 20 points (9,30%) and 21 points (10,82%); in total: by pace – 1,17 beats (4,45%) and 3 beats (12,86%), total – 10,9 points (5,18%) and 18,3 points (9,53%). The result of the accuracy of one movement by the maximum indicator in the first period of the test was higher than the average by 0,1 points (1,27%) and the minimum – also higher than the average by 0,23 points (2,93%); in the second period, at the maximum pace and total points – accuracy is less than average by 0,08 points (0,99%), the minimum pace and total points – accuracy is higher than average by 0,26 points (3,20%); in the third period, the accuracy of the maximum value is higher than the average by 0,22 points (2,79%) and the minimum is less than the average by 0,12 points (1,55%); the total maximum and minimum indicators are more than average, respectively, by 0,05 points (0,63%) and 0,23 points (2,88%).

In the test for determining sensorimotor reactions in girls 11–12 years old, specializing in rowing, the average response time to a sound stimulus is 0,228±0,026 s, the best indicator is 0,195 s, the average response time is 0,033 s (16,92%), and the worst is 0,272 s, s more than average on 0,044 (19,29%); per light signal: average indicator – 0,265±0,026 s, better – 0,214 s, less than average by 0,051 s, worst – 0,291 s, more than average by 0,26 s (9,81%).

The average rate of air flow on inspiration is 4,33±0,85 $l \cdot s^{-1}$, the maximum is 5,5 $l \cdot s^{-1}$, 1,17 $l \cdot s^{-1}$ (27,02%) more than the

average minimal – 3,0 l·s^{-1}, less than average by 1,33 l·s^{-1} (44,33%); on exhalation: on average – 3,9±0,51 l·s^{-1}, maximum – 4,5 l·s^{-1}, more than average by 0,6 l·s^{-1} (15.38%), minimum – 3,0 l·s^{-1}, less than average 1,9 l·s^{-1} (30,00%).

When determining the accuracy of reproduction of a given muscle effort, the average error was 2,2±0,48 kg (14,67%), the maximum – 3 kg (20,00%), the minimum – 1,6 kg (10,67%).

The results of testing the functional state of athletes 13–14 years old are presented in table 2. In the first period of the test, measuring the effect of the training impact, the average indicators were as follows: pace – 28±1,24 beats, maximum 32 strokes, minimum 23 beats; amount – 227±1,47 points, maximum – 248 points, minimum – 179 points; accuracy – 8,11 points, with a maximum pace and total points – accuracy of 7,75 points, minimum – 7,78 points, an increase in pace by 5 beats (21,74%) and 1,8 beats (5,66%), respectively , the amount – by 30 points (16,76%) and 25,5 points (13,89%), accuracy decreased by 0,32 points (4,29%) and increased by 0,54 points (7,81%).

In terms of the sum of three periods and average indicators, the pace was more than in the first period, by 2,37 beats (8,46%), less than in the second and third, by 0,13 beats (0,43%) and 1,83 beats (6,03%); the amount is more than in the first period by 8,8 points (3,88%), less than in the second and third, by 1 point (0,42%) and 5,2 points (2,21%), accuracy is less than in the first – by 0,34 points (4,38%), more than in the second and third periods, by 0,01 points (0,13%) and by 0,29 points (3,88%).

In terms of maximum values, the pace and the sum of points is greater than in the first period by 3,33 beats (10,41%) and 22 points (8,87%), the pace is practically the same with the second period and the amount is 5,8 points less 2,15%), the pace is reduced in relation to the third period by 2,67 beats (7,56%), the total score is the same, the accuracy is less than in the first and second by 0.11 points (1,44%) and 0,13 points (1,71%) more than in the third, 0,56 points (7,91%).

In terms of minimum indicators, the pace and the total score is greater than in the first period, by 3,17 beats (13,78%) and by 8 points (4,47%), with the second period they are practically the same, less than in the third, the pace – 1,83 beats (6,99%) and the amount – 22 points (11,76%), accuracy is less than in the first and third periods, by 0,63 points (8,81%) and by 0,31 point (4,34%), more than the second, by 0,23 points (3,23%).

In the second period of the test, the average values were noted at the level: pace – 30,5±1,73 beats, the sum – 236,8±9,43 points, accuracy – 7,76±0,96 points; maximum: pace – 35,5 beats, total – 275,8 points, accuracy – 7,77 points; minimum: pace – 26,5 beats, total – 183,5 points, accuracy – 6,92 points.

In the third period, average indicators: pace – 32,2±1,92 beats, total – 241±11,5 points, accuracy – 7,48±0,33 points; at the maximum pace – 38 beats, the sum – 269 points, accuracy – 7,08 points; minimum pace – 28 beats; total – 209 points; accuracy – 7,46 points.

According to the sum of three periods, the average values are: tempo – 30,37±1,69 beats, total – 235,8±1,77 points, accuracy – 7,77±0,211 points; at the maximum pace – 35,33 beats, the total – 270 points, accuracy – 7,64 points; at a minimum pace – 26,17 beats, the sum is 187 points, accuracy – 7,15 points.

When comparing the results of the study of the second period with the first in terms of average indicators, it was determined that the pace was higher by 2,5 beats (8,93%), the amount was higher by 9,8 points, the accuracy was lower by 0,35 points (4,51%); at maximum – the rate increased by 3,5 beats (10,94%), the amount – by 27,8 points (11,21%), accuracy –

Table 2

Survey results (rowing, girls 13–14 years old)

		Indicators	M±m	M $_{max}$	M $_{min}$	σ	C
Effect of the training action	First period	Pace (number of beats)	28±1,24	32	23	3,86	2,78
		total points	227±1,47	248	179	21,2	3,15
		Accuracy (points)	8,11±0,34	7,75	7,78	0,77	9,42
	Second period	Pace (number of beats)	122±6,92 (30,5±1,73)	142 (35,5)	106 (26,5)	15,4	13,9
		total points	947±37,72 (236,8±9,43)	1103 (275,8)	734 (183,5)	158,4	16,7
		Accuracy (points)	7,76±0,96	7,77	6,92	0,215	2,75
	Third period	Pace (number of beats)	32,2±1,92	38	28	4,29	13,3
		total points	241±11,5	269	209	25,8	10,7
		Accuracy (points)	7,48±0,33	7,08	7,46	0,73	9,73
	Total	Pace (number of beats)	182,2±10,14 (30,37±1,69)	212 (35,33)	157 (26,17)	31,4	21,27
		total points	1415±10,62 (235,8±1,77)	1620 (270)	1122 (187)	237,8	16,85
		Accuracy (points)	7,77±0,211	7,64	7,15	0,472	6,05
Test	EMR (c)	sound	0,227±0,022	0,286	0,170	0,049	21,93
		light	0,270±0,016	0,312	0,231	0,035	12,87
	PT (l·s^{-1})	inhale	4,1±0,326	4,7	3,0	0,73	17,8
		exhale	4,6±0,249	5,3	4,0	0,56	12,13
	DM rev. (kg)			3,3	1,6	0,73	32,57

Remark. *In parentheses are the data reduced to a single temporary indicator of 15 s.*

Bogush, V., Getmantsev, S., Bogatyirev, K., Reznichenko, O., Kosenchuk, V., Verteleckiy, O. & Kulakov, Yu. (2019), "Functional indicators of the female athlete's body specializing in rowing", *Slobozhanskyi Herald of Science and Sport*, Vol. 7 No. 5(73), pp. 12-21, doi: 10.5281/zenodo.3595087

by 0,02 points (0,26%).

In the third period, compared with the first and second, on average, the pace increased by 4,2 beats (15,00%) and 1,7 beats (5,57%), the amount increased by 14 points (6,17%) and 4,2 points (1,77%), accuracy decreased by 0,63 points (8,42%) and 0,28 points (3,74%); maximum rates increased by 6 beats (18,75%) and 2,5 beats (7,04%), the amount – by 21 points (8,47%) and decreased by 6,8 points (2,53%), accuracy decreased by 0,67 points (9,46%) and 0,69 points (9,75%); the minimum tempo increased by 5 beats (21,74%) and 1,8 beats (5,66%), the amount – by 30 points (16,76%) and 25,5 points (13,89%), the accuracy decreased by 0,32 points (4,29%) and increased by 0,54 points (7,81%).

In terms of the sum of three periods and average indicators, the pace was more than in the first period, by 2,37 beats (8,46%), less than in the second and third, by 0,13 beats (0,43%) and 1,83 beats (6,03%); the amount is more than in the first period by 8,8 points (3.88%), less than in the second and third, by 1 point (0,42%) and 5,2 points (2,21%), accuracy is less than in the first one by 0,34 points (4,38%), more than in the second and third periods, by 0,01 points (0,13%) and 0,29 points (3,88%).

Regarding the maximum values – the pace and the total score is 3,33 more beats (10,41%) and 22 points (8,87%) more than in the first period, almost the same pace and a lower amount by 5,8 compared to the second period point (2,15%), in relation to the third period – the pace is 2,67 times less (7,56%), the sum of points is the same, the accuracy is less than in the first and second, by 0,11 points (1,44%) and 0,13 points (1,71%) more than in the third, by 0,56 points (7,91%).

According to the minimum indicators – the pace and the total score is greater than in the first period, by 3,17 beats (13,78%) and by 8 points (4,47%), with the second period they are practically the same, less than in the third, the pace – by 1,83 beats (6,99%) and the amount – by 22 points (11,76%), accuracy is less than in the first and third periods by 0,63 points (8,81%) and by 0,31 points (4,34%), 0,23 points more than in the second (3,32%).

Deviations from the average indicators of the maximum and minimum values, respectively, were more or less: in the first period – by the rate of 4 beats (14,29%) and 5 beats (21,74%), the total – 21 points (9,25%) and 48 points (26,82%); in the second period – at the pace of 5 beats (16,39%) and 4 beats (15,09%), the total – 39 points (16,47%) and 53,3 points (29,05%); in the third period – at a rate of 5,8 beats (18,01%) and 4,2 beats (15,00%), the total – 28 points (11,62%) and 32 points (15,31%); in total over three periods – the rate of 4,96 beats (16,33%) and 4,2 beats (16,05%), the total – 34,2 points (14,51%) and 48,8 points (26,09%).

The accuracy of one movement at the maximum and minimum rates of pace and the amount of points scored in the first period was less than the average by 0,36 points (4,65%) and 0,33 points (4,24%), respectively; in the second period – in fact, it is more by 0,01 points (0,13%) and less by 0,84 points (12,14%); in the third period – less by 0,4 points (5,65%) and 0,02 points (0,27%); for three periods – less by 0,13 points (1,70%) and 0,62 points (8,67%).

The difference between the average values in the sum of the maximum and minimum indicators for the pace was observed in the first period – 36,03%, in the second – 31,48%, in the third – 33,01%, in total – 32,38%; the total score is identical – 36,07%; 45,52%; 26,43; 40,60%, accuracy of one movement, respectively – 8,89%; 12,27%; 5,92%; 10.39%. At high pace and total points, the accuracy of one movement is less than average results, but not significantly, with minimal indicators – the accuracy of movements was determined practically at the level, as well as at high pace and total points.

The response rate of athletes 13–14 years old, specializing in rowing, to a sound stimulus was determined on average as 0,227±0,022 s, the best result was 0,170 s, the average speed was 0,057 s (33,53%) and the worst 0,286 s, more than average – by 0,059 s (25,99%); for a light stimulus, the average indicator is 0,270±0,016 s, better – 0,231 s, less than average – by 0,039 s (16.88%), worse – 0,312 s, more than average – by 0,042 s (15,56%). The deviation from the average value was 59.52% for the sound signal and 32,44% for the light signal; by the difference between the maximum and minimum indicators for sound – 7,54%, for light – 1,32%.

The inspiratory air flow rate is on average 4,1±0,326 $l \cdot s^{-1}$, maximum – 4,7 $l \cdot s^{-1}$ more than the average by 0,6 $l \cdot s^{-1}$ (14,63%), minimum – 3,0 $l \cdot s^{-1}$, less than average – 1,1 $l \cdot s^{-1}$ (36,67%); on exhalation, on average – 4,6±0,249 $l \cdot s^{-1}$, maximum – 5,3 $l \cdot s^{-1}$, more than average 0,7 $l \cdot s^{-1}$ (15,22%), minimum – 4,0 $l \cdot s^{-1}$, less than the average by 0,6 $l \cdot s^{-1}$ (15,00%), deviations from the average: on inspiration – 51,30% and expiration – 30,22% and the difference on inspiration – 22,04% and expiration – 0,22%.

An error in the accuracy of reproducing a given muscle effort was observed on average 2,24±0,33 kg (14,93%), the minimum – 1,6 kg, the average – 0,64 kg (10,67%), the maximum – 3,3 kg 1,06 kg more than average (22,00%); the deviation from the average was 32,67%, the difference between the maximum and minimum errors in the reverse dynamometry test was 11,33%.

The indicators of the test measuring the effect of the training action in girls 15–16 years old, specializing in kayaking, are presented in Table 3.

In the first period of the test, it determines the starting speed, the average values were at the level: pace of movements – 30±0,89 beats, total – 234±8,32 points, accuracy – 7,87±0,22 points; maximum indicators: pace – 36 beats, total – 290 points, accuracy – 8,06 points, more than average, respectively, by 6 beats (20,00%), 56 points (23,93%), 0,19 points (2,41%); minimum indicators: pace – 24 beats, total – 196 points, less than average – by 6 beats (25,00%), 38 points (19,39%), but accuracy – 8,16 points, which is 0,29 more than average point (3,68%).

In the second period of the test, it shows the ability to maintain speed at a distance, the average indicators were: pace – 31,25±0,89 beats, total – 235,75±8,78 points, accuracy – 7,57±0,24 points; maximum indicators: pace – 36,25 beats, total – 280,5 points, accuracy – 7,74 points, which is 5 points (16,00%) more than average, respectively, 44,75 points (18,98%), 0,17 points (2,25%); minimum indicators: pace – 24,25 beats, total – 187,25 points, less than average by 7 hits (28,87%), but accuracy – 7,72 points – more than average by 0,15 points (1,98%).

Table 3

Survey results (rowing, girls 15–16 years old)

		Indicators	M±m	M_{max}	M_{min}	σ	C
Effect of the training action	First period	Pace (number of beats)	30±0,892	36	24	3,46	11,53
		total points	234±8,32	290	196	32,28	13,79
		Accuracy (points)	7,87±0,22	8,06	8,16	0,865	10,99
	Second period	Pace (number of beats)	125±3,56 (31,25±0,89)	145 (36,25)	97 (24,25)	13,83	11,07
		total points	943±35,13 (235,75±8,783)	1122 (280,5)	749 (187,25)	136,3	14,46
		Accuracy (points)	7,57±0,238	7,74	7,72	0,922	12,16
	Third period	Pace (number of beats)	31±0,966	37	24	3,75	12,09
		total points	230±8,245	291	182	31,99	13,91
		Accuracy (points)	6,68±0,245	7,86	7,58	0,951	14,24
	Total	Pace (number of beats)	186±2,80 (31±0,467)	218 (36,33)	145 (24,17)	19,88	10,63
		total points	1407±45,67 (234,5±7,612)	1703 (283,33)	1127 (187,83)	177,2	12,62
		Accuracy (points)	7,56±0,201	7,79	7,77	0,778	10,37
Test	EMR (c)	sound	0,178±0,039	0,205	0,152	0,015	8,43
		light	0,216±0,072	0,279	0,181	1,028	13,08
	PT	inhale	4,6±0,089	5,2	4,0	0,346	7,5
	($l \cdot s^{-1}$)	exhale	4,4±0,156	5,4	3,3	0,603	13,75
		DM rev. (kg)	1,16±0,24	2,67	0,23	0,76	65,49

Remark. *In parentheses are the data reduced to a single temporary indicator of 15 s.*

In the third period of the test, it indicates speed endurance, on average: pace – 31±0,96 beats, total – 230±8,25 points, accuracy – 6,68 points; maximum: pace – 37 beats, total – 291 points, accuracy – 7,86 points, which is 6 points (19,35%) more than average, respectively 61 points (26,52%), 1,18 points (17,66%); minimum: pace – 24 beats, total – 182 points, which is 7 points less than average (29,17%), 48 points (26,37%), but accuracy – 7,58 points – 0,9% more than average point (13,47%).

According to the total indicator of the test of measuring the effect of the training action, it reflects speed abilities in general, average results: pace – 31±0,46 beats, total – 234,5±7,61 points, accuracy – 7,56±0,20 points, maximum indicators: pace – 36,33 beats, total – 283,33 points, accuracy – 7,79 points, which is more than average, respectively, by 5,33 beats (17,19%), 48,73 points (20,82%), 0,23 points (3,04%); minimum indicators: pace – 24,17 beats, total – 187,83 points, which is less than the average by 6,83 beats (28,26%), 46,67 points (24,85%), accuracy – 7,77 points, which is 0,21 points more than average (2,78%).

When comparing the indicators in the second period with the first, the average pace and the total score increased slightly – by 1,25 beats (4,17%) and 1.75 points (0,75%), but the accuracy of one movement decreased by 0,3 points (3,96%); at maximum – the pace actually remained at the same level, an increase of 0,25 beats (0,69%), the total score decreased by 9,5 points (3.39%) and accuracy decreased by 0,32 points (4,13%); at the minimum – the pace has not actually changed, an increase of 0,25 beats (1,04%), the amount decreased by 8,75 points (4,67%), accuracy decreased by 0,44 points (5,69%).

In the third period, compared with the first and second, the changes were insignificant in average values – the rate increased by 1 beats (3,33%) and decreased by 0,25 beats (0,81%), the amount decreased by 4 points (1,74 %) and 5,75 points (2,50%), accuracy decreased by 1,19 points (7,81%) and 0,89 points (13,32%); on the maximum – the rate increased by 1 beats (2,78%) and 0,75 beats (2,07%), the amount did not change compared to the first period and was less by 10.5 points in the second (3,74%), accuracy decreased by 0,2 points (2,54%) and increased by the second period by 0,12 points (1,55%); at the minimum – the rate is the same in all periods, the amount is less by 14 points (7,69%) and 5,25 points (2,88%), accuracy decreased by 0,58 points (7,65%) and by 0,14 points (1,85%).

The total result showed that on average the pace did not actually change, the sum with the first and second periods is the same, the difference with the third is 4,5 points (1,96%), the accuracy is 0,31 points less than in the first (4,10%), the same as the second, more than the third, by 0,88 points (13,17%); by maximum indicators – the rate is the same in all periods of the test, the amount is more than 2,83 points (1,01%) than in the second period and 6,67 points (2,35%) less than in the first and third periods and by 7,67 points (2,71%), accuracy is greater than in the second, by 0,05 points (0,65%), less than in the first and third periods, by 0,27 points (3,47%) and 0,07 points (0,89%); at the minimum – the rate is the same in all periods of the test, the amount is less than the first by 8,17 points (4,63%), the same as the second, more than the third by 5,83 points (3,20%), accuracy is greater than in the second and third periods by 0,05 points (0,65%) and 0,19 points (2,51%), less than in the first, by 0,39 points (5,02%).

The difference between the average indicators in the sum of the maximum and minimum values was: in the first period in terms of rate – 45,00%, total points – 43,32%, accuracy – 6,09%; in the second: by rate – 44,87%, total points – 47,85%, accuracy – 4,23%; in the third period: by pace – 48,52%, total points – 52,89%, accuracy – 31,13%, total behind the pace – 45,45%, total points – 45,67%, accuracy – 5,82% . At the maximum pace and total points, the accuracy of the

Bogush, V., Getmantsev, S., Bogatyirev, K., Reznichenko, O., Kosenchuk, V., Verteleckiy, O. & Kulakov, Yu. (2019), "Functional indicators of the female athlete's body specializing in rowing", *Slobozhanskyi Herald of Science and Sport*, Vol. 7 No. 5(73), pp. 12-21, doi: 10.5281/zenodo.3595087

movements was greater than the average in all periods of the test, while the minimum rates and the sum of the points, the accuracy of the movements was also greater than the average results.

The speed of sensorimotor reactions in athletes aged 15–16 to a sound stimulus was determined by the values: average – 0,178±0,039 s, better – 0,152 s, which is less than average by 0,026 s (17,11%), worse – 0,205 s, more than average by 0,027 s (15,17%); for light stimulus: average indicator – 0,216±0,072 s, better – 0,181 s, which is less than average by 0,035 s (19,34%), worst – 0,279 s, which is higher than average by 0,063 s (29,17%); the deviation from the average value amounted to a total of 32,28% for the sound signal, 48,51% for the light signal, the difference between the maximum and minimum indicators for sound – 1,94%, for light – 9,83%.

When conducting pneumotachometry, the average air flow rate was observed on inspiration 4,6±0,089 $l \cdot s^{-1}$, maximum 5,2 $l\ s^{-1}$, more than the average value by 0,6 $l \cdot s^{-1}$ (13,04%) , minimum – 4,0 $l \cdot s^{-1}$, less than the average by 0,6 $l \cdot s^{-1}$ (15,00%); on exhalation – 4,4±0,156 $l \cdot s^{-1}$, maximum – 5,4 $l\ s^{-1}$, more than average by 1 $l \cdot s^{-1}$ (22,73%), minimum – 3,3 $l \cdot s^{-1}$, 1,1 $l \cdot s^{-1}$ (33.33%) less than the average, deviations from the average on inspiration – 28,04%, expiration – 56,06% and the difference on inspiration – 1,96% and expiration – 10,60%.

The average error in reproducing a given muscular effort in the reverse dynamometry test was determined to be 1,16±0,24 kg (7,73%), the minimum – 0,23 kg (1,53%), 0,93 kg less than the average (1,53%), the maximum – 2,67 kg, 1,51 kg (10,07%) more than the average, deviations from the average value were 11,60%, the difference between the maximum and minimum errors was 8,54%.

When comparing the results of the survey, according to our methodology for measuring the effect of a training action, electromyoreflexometry, pneumotachometry, and reverse dynamometry of the functional state of girls of different ages from 11 to 16 years old, specializing in kayaking, the following data were obtained, reflecting the psychophysiological age characteristics, which are determined skill level of the examined athletes.

In the first period of the test, which determines the possibility of a quick start to work, the average indicators – the pace of movement for girls 11–12 years old (first group), was 2,3 times less than 13–14-year-olds (second group) (8,95%) and in 15–16-year-olds (third group) by 4,3 beats (16.73%); the amount of points scored for all movements also increased by 25 points (12,38%) and 32 points (15,84%); the accuracy of movements in the first and third groups was almost the same, the difference was 0,01 points (0,13%) and in the first – less than in the second, by 0,25 points (3,18%). In terms of maximum values, the rate increased from the first group to the second by 6 beats (23,08%) and the third – by 10 beats (38,46%), the amount changed similarly – increased by 41 points (19,81%) and by 83 points (40,09%), the accuracy of movements in the first group was higher than in the second, by 0,21 points (2,71%) and less than in the third, by 0,1 points (1,26%); at the minimum – the rate increased identically by 2 beats (9,52%) and 3 beats (14,29%), the amount – by 9 points (5,29%) and 26 points (15,29%), the accuracy decreased from the first group to the second by 0,31 points (3,98%) and increased to three by 0,07 points (0,87%).

Thus, with increasing age, the average rate and amount of points increase, but the accuracy of movements in 13–14 years is higher than in other age periods; relative to the maximum and minimum indicators, the pace and amount also increase, but the accuracy of movements in 13–14 years is less.

In the second period of the test, it determines the ability to maintain speed at a distance, the average values – the pace in the first group was 4,5 beats (17,31%) less than in the second and 5,25 beats in the third (20,19 %); the amount increased similarly by 25,8 points (12,23%) and by 24,75 points (11,73%), the difference between the second and third groups is insignificant – 1,05 points (0,45%); accuracy of movements also decreased by 0,36 points (4,64%) and 0,55 points (7,27%). In terms of maximum values, the rate increased from the first group to the second by 8 beats (29,09%) and the third by 8,75 beats (31,82%), the amount increased similarly by 54,5 points (24,63%) and 59,2 points (26,75%), accuracy decreased by 0,27 points (3,47%) and 0,3 points (3,88%); at the minimum – the rate increased to the second group by 3 beats (12,77%) and the third by 0,75 beats (3,19%), the amount decreased similarly – 13,5 points (7,36%) and 9,75 points (5,21%), accuracy decreased by 1,46 points (21,09%) and by 0,66 points (8,55%).

With increasing age, the average rate of movements and the sum of points increase, and the accuracy of one movement decreases, the maximum and minimum indicators change identically. At 13–14 years, the minimum pace is greater than at an older age, but the total score and accuracy is less.

In the third period of the test, it determines speed endurance, on average, athletes in the first group had a slower pace of movement than in the second, by 4,9 beats (17,95%) and in the third – by 3,7 beats (13,55%), the amount of points changed similarly – by 26 points (12,09%) and 15 points (6,98%), the accuracy of movements, on the contrary, decreased in the first group – in the second group by 0,4 points (5,35%) and in the third – by 1,2 points (17,96%).

The maximum rate of movement compared with the first group – in the second it was 9 more hits (31,03%) and in the third by 8 beats (27,59%), the amount increased identically by 34 points (14,47%) and 56 points (23,83%), but the accuracy decreased by 1,02 points (14,41%) and 0,24 points (3,05%).

Relative to the minimum indicator – in relation to the first group, the second pace was 3 more beats (12,00%), the sum – 15 points (7,73%); and at the third pace, it is less by 1 beats (4,17%), and the amount is 12 points (6,59%), the accuracy of movements decreased by 0,3 points (4,02%) and by 0,18 points (2,37%).

In the group of 13–14-year-old athletes, an average high pace and the amount of points scored for a given time were observed with high accuracy of movements; at the highest rates of pace and total points, low accuracy was noted; at the minimum – the athletes of this group determined a high pace, the sum of points and the accuracy of movements in comparison with rowers of other groups.

According to the total result of the test of measuring the effect of the training effect, which characterizes speed abilities as a whole, in the group of 11–12-year-old athletes, the aver-

age values were low pace of movement and the sum of points and the highest accuracy of one motor action, in girls 13–14 years old, rowing on kayaks, the pace increased by 4,04 beats (15,34%) and the amount by 25,5 points (12,13%), and accuracy decreased by 0,22 points (2,83%); in 15–16 years, the pace also increased – by 4,67 beats (17,74%) and the amount – by 24,2 points (11,51%), and the accuracy was still reduced by 0,43 points (5,69%).

The indicators between the second and third groups are practically the same – the pace is higher in the third – by 0,63 beats (2,07%), the amount and accuracy is lower in the third – by 1,30 points (0,55%) and 0,21 points (2,78%).

According to the maximum values in the second and third groups, the pace increased compared to the first – by 7,83 beats (28,47%) and by 8,83 beats (32,11%), the sum – by 48,8 points (22,06%) and by 62,13 points (28,09%), accuracy decreased by 0,4 points (5,24%) and 0,25 points (3,21%); when comparing the third group of the second, the difference was minimal, the pace increased by 1 beats (2,83%), the amount by 13,33 points (4,94%), the accuracy by 0,15 points (1,96%).

According to the minimum indicators – the pace in the younger group was lower than that of the older ones – by 2,84 beats (12,17%) and 0,84 beats (3,61%), respectively, the sum was 5 points more (2,67%) and 4,17 points (2,22%), accuracy – higher by 1,07 points (14,97%) and 0,45 points (5,79%); when comparing the second group with the third one, they noted that the pace is more by 2 beats (8,27%), the total score is actually the same, less by 0,83 points (0,44%), the accuracy is less by 0,62 points (8,67%).

The average rate and pace in 13–14-year-old athletes is practically the same with 15–16-year-olds and more than in 11–12-year-olds, however, the accuracy of movements is higher in the younger group, identical results were observed for the maximum and minimum values.

The study of sensorimotor reactions showed that the average response time to the stimulus in the first and second groups was practically the same for a sound signal, but slightly better in the second – by 0,001 s (0,44%), in the third group the reaction time decreased by 0,05 s (28,09%); according to the best indicator, the reaction time from the younger group to the senior decreased, respectively, by 0,025 s (14,71%) and by 0,043 s (28,29%), in the third it was less than in the second – by 0,018 s (11,84 %); worst-case scenario, the worst response time in 13–14-year-old athletes and more than in 11–12-year-olds, by 0,014 s (5,15%) and in 15–16-year-olds by 0,081 s (39,51%).

The average response time to a light signal in the first group is better than in the second, by 0,005 s (1,89%) and worse than in the third, by 0,049 s (22,69%); according to the best indicator, the minimum time in the third group is less than that of the athletes of the first group by 0,033 s (18,23%) and the second group – by 0,05 s (27,62%); at worst, identical results were observed, the response time in 15–16-year-old athletes was less than in 11–12-year-olds by 0,012 s (4,31%) and 13–14-year-olds by 0,033 s (11,83%).

A study of sensorimotor reactions to sound and light stimuli by average, maximum and minimum values found that low and unstable indicators in athletes 13–14 years old, better in 15–16 year old rowers.

The average airflow rate on inspiration in the first group is 0,23 $l \cdot s^{-1}$ (5,61%) more than in the second group and 0,27 $l \cdot s^{-1}$ less than in the third (6,24%), and in the third more than in the second, by 0,5 $l \cdot s^{-1}$ (12,19%); by the maximum – in 11–12 year olds more than in 13–14 year olds, by 0,8 $l \cdot s^{-1}$ (17,02%) and 15–16-year-olds by 0,3 $l \cdot s^{-1}$ (5,77%), and in the latter more than in 13–14-year-olds by 0,5 $l \cdot s^{-1}$ (10,64%); minimal – the results in the first and second groups are the same and less than in the third on 1,0 $l \cdot s^{-1}$ (33,33%).

The values of pneumotachometry on expiration are on average less in the first group than in the second, by 0,7 $l \cdot s^{-1}$ (17,95%) and in the third – by 0,5 $l \cdot s^{-1}$ (12,82%); for the maximum result – in the first group less than 0,8 $l \cdot s^{-1}$ (17,78%) in the second group and 0,9 $l \cdot s^{-1}$ (20,00%) in the third; the minimum – in the first group less than in the second by 1,0 $l \cdot s^{-1}$ (33,33%) and in the third by 0,3 $l \cdot s^{-1}$ (10,00%).

The average air velocity on inspiration and at the maximum indices is the lowest among 13–14 year old athletes and the highest among 15–16 year olds, while exhaling 13–14 year old rowers showed the best results.

Indicators of reverse dynamometry determined that the average error in performing muscle effort in the first and second groups was almost the same, but slightly higher in 13–14-year-old athletes than in 11–12-year-olds by 0,04 kg (0,26%). A minor error in 15–16 year olds is less than in the first group by 1,04 kg (6,94%) and in the second by 1,08 kg (7,20%); the maximum error in all groups was almost the same – from 2,67 kg to 3,3 kg, but in 13–14-year-olds it was more than 0,3 kg (2%) in 11–12-year-olds and in 15–16 year olds per 0,63 kg (4,20%); the minimum error ranged from 0,23 kg (1,53%) in the third group to 1,6 kg (10,6%) in the first and second groups.

The results of the study of the accuracy of muscle effort showed that athletes of 13–14 years of age performed the test with the largest error on average, maximum and minimum indices than athletes of 11–12 years old and 15–16 years old.

Conclusions / Discussion

The most important methodological condition for the formation of a rational technique is the interconnection and interdependence of the structure of movements and the development of physical qualities. Correspondence of an athlete's physical preparedness to the level of possession of sports equipment, the structure and degree of perfection of its characteristics determines the technical preparedness in sports.

When adapting to excessive physical loads for a given organism, a general biological pattern is realized: all adaptive reactions of an organism to unusual environmental factors have only relative expediency, that is, even persistence, long-term adaptation to physical loads has its own functional or structural price, which is a possible, but not necessary condition. The most rational way to prevent adaptation disorders is to use a properly built regime of training, rest and nutrition, hardening, increasing resistance to stress and harmonious physical and mental development of an athlete's personality [1; 12].

Bogush, V., Getmantsev, S., Bogatyirev, K., Reznichenko, O., Kosenchuk, V., Verteleckiy, O. & Kulakov, Yu. (2019), "Functional indicators of the female athlete's body specializing in rowing", *Slobozhanskyi Herald of Science and Sport*, Vol. 7 No. 5(73), pp. 12-21, doi: 10.5281/zenodo.3595087

For the regulation of most human movements, the simplest reflex arc is not enough. The various motor structures of the central nervous system should constantly receive information from the corresponding receptors about the position, speed, acceleration of movement of individual parts of the motor system. All this provides the formation of feedback, which significantly increases the accuracy of movements. In addition, purposeful, conscious movements are performed, the commands for which arise in the cerebral cortex. To meet its needs in a constantly changing environment, the body needs to set certain tasks and achieve the intended result in its behavioral activities. For this, a group of nerve centers is formed in the central nervous system, which is a functional system [6; 8].

With intense physical exertion and systematic exercise, the functional state of the nervous system and neuromuscular system improves. This allows athletes to master complex motor skills, develop speed, ensure coordination of movements, coordination of the muscles (synergists, agonists and antagonists), dynamic stabilization of movements, which are manifested by precise motor acts, timely execution of movements with maximum saving of time and effort.

The physiological reactions of the formation of a specific functional system are the main components of the adaptation process, and the general biological pattern of such adaptive changes applies to any human activity. In achieving sustainable and perfect adaptation, the restructuring of regulatory adaptive mechanisms and the mobilization of physiological reserves, as well as the sequence of their appearance at different functional levels, are of great importance. At first, normal physiological reactions arise, and only then, stress reactions of adaptation mechanisms require significant energy costs using the reserve capabilities of the body, which ultimately leads to the formation of a special functional adaptation system that provides specific human activity.

Such a functional system in athletes represents a newly formed relationship of nerve centers, hormonal, autonomic, and executive organs, which is necessary to solve the problems of adapting the body to physical activity. The morpho-functional basis of such a system is the formation of systemic structural changes in the body in response to muscle work, manifested in the creation of new intercentral relationships, increased activity of respiratory enzymes, hypertrophy of the heart muscle and skeletal muscles, an increase in the number of mitochondria, enhanced hormonal and autonomic systems.

Thus, the formation of a functional adaptive system with the involvement of various morphological and functional structures of the body forms the fundamental basis for long-term adaptation to physical activity and is realized by increasing the efficiency of various organs and systems and the body as a whole.

Frequent use of loads associated with the violation of the optimal balance between needs and their satisfaction, as a result of the development of fatigue, can have a negative impact on the formation of long-term adaptation, is directly dependent on the preferred orientation of the applied training load and, consequently, the development of motor abilities.

The study of the functional state is an integral part of the features of preparing athletes for competitive activity, more fully mobilizing the body's reserves and optimizing adaptation processes.

Excessive increase in the amount of training work can lead to overstrain of functional systems, injuries, shortening the time of performance at a high sports level through great physical and mental stress, and reducing the adaptive capabilities of the body.

Large amounts of physical activity in childhood and adolescence, especially those that do not correspond to future specialization, can affect the achievement of high sports results.

Using the proposed methodology will maximize focus on the individual characteristics and abilities of each particular athlete when choosing a sports specialization, developing a system of multi-year training, determining the rational structure of training and competitive activity.

Prospects for further research. The total capacity of functional systems characterizing the amount of human health determines its viability and performance, and for athletes it also determines professional viability and the ability to achieve high sports results, which will allow us to study the increasing value of body reserves when environmental conditions change, in extreme and extreme situations life, especially with intense sports activities.

Conflict of interests. The authors declare that no conflict of interest.
Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Platonov, V.N. (2013), *Periodizatsiya sportivnoy trenirovki. Obshaya teoriya i ee prakticheskoe primenenie* [Periodization of sports training. General theory and its practical application], Olymp. lit., Kiev. (in Russ.)
2. Landa, B.Kh. (2017), *Diagnostika fizicheskogo sostoyaniya: obuchayushchie metodika i tekhnologiya* [Diagnosis of physical condition: teaching methods and technology], Moscow. (in Russ.)
3. Seluyanov, V.N. (2003), "Biological patterns in the planning of physical training for athletes", *Teoriya i praktika fizicheskoy kultury*, No. 7, pp. 29-33. (in Russ.)
4. Kondratiev, V.O., Vakulenko, L.I., Bidohina, L.P., Riznyk, A.V. & Savchenko, A.V. (2014), *Otsinka fizychnoho rozvytku ditei riznoho viku* [Assessment of physical development of children of different ages], Dnipropetrovsk. (in Ukr.)
5. Gunina, L., & Cheredny`chenko, O. (2012), "Assessment of the combined effect of nontraining facilities on the indicators of special working capacity and homeostasis parameters of qualified rowers", *Teoriia i metodyka fizychnoho vykhovannia i sportu*, No. 2, pp. 103-107. (in Ukr.)
6. Taymazov, V.A. & Golub, Ya.V. (2004), *Psikhofiziologicheskoe sostoyanie sportsmena. Metody otsenki i korrektsii* [Psychophysiological state of the athlete. Methods of assessment and correction], Olimp SPb, SPb. (in Russ.)
7. Turevskiy, I.M. (2009), "Extreme conditions as a factor in the adaptation of young athletes to the motor", *Materials of the First International*

Scientific and Practical Conference: Gifted in Sporting and Extreme Activities, Moscow, pp. 80. (in Russ.)
8. Rovnyi, A.S. (2015), "Features of the functional activity of kinesthetic and visual sensory systems in athletes of various specializations", *Slobozans`kij naukovo-sportivnij visnik*, No. 1 (45), pp. 104-108, dx.doi.org/10.15391/snsv. 2015-1.020.
9. Sheyko, L.V. (2018), "Dynamics of indicators of the functional state of the cardiovascular and respiratory systems of women under the influence of swimming", *Slobozans`kij naukovo-sportivnij visnik*, No. 1(63), pp. 121-125, doi: 10.15391/snsv.2018-1.022. (in Russ.)
10. Politko, O. (2018), "Model characteristics of physical development and special physical preparedness of swimmers 12–15 years old", *Slobozans'kiy naucovo-sportivniy visnik*, No. 2 (64), pp. 45-49, doi:10.15391/snsv.2018-2.009. (in Russ.)
11. Kamaiev, O.I. (2017), "Structural features and characteristics of the process of training an athlete as a system object", *Slobozans'kiy naucovo-sportivniy visnik*, No. 1 (57), pp. 41-48, doi.: 10.15391/snsv.2017-1.007. (in Russ.)
12. Shinkoruk, O.A. (2013), *Teoriya i metodika pidgotovky sportsmeniv: upravlinnya, kontrol`, vidbir, modeluvannya ta prognoz v olimpijs`komu sporti* [The theory and methods of training athletes: management, control, selection, modeling and forecasting in the Olympic sport], Poligraf ekspres, Kiev. (in Ukr.)
13. Bogush, V., Getmantsev, S., Bogatyirev, K., Tarasova, G., Kulakov, Yu. & Yatsunskjy, Ye. (2019), "Functional state of the rowers on kayaks at the stage of special basic training", *Slobozans'kij naukovo-sportivnij visnik*, No. 3 (71), pp. 10-17, doi:10.15391/ snsv.2019-3.002. (in Russ.)

Received: 23.08.2019.
Published: 31.10.2019.

Information about the Authors

Volodymyr Bogush: *PhD (Medicine); Admiral Makarov National University of Shipbuilding: Geroev of Ukraine str. 9, Mykolaiv, 54025, Ukraine.*
ORCID.ORG/0000-0002-7178-6165
E-mail: toops@ukr.net

Sergiy Getmantsev: *PhD (Biology); V. Sukhomlynskiy Mykolaiv National University: Nikolskaya str. 24, Mykolaiv, 54030, Ukraine.*
ORCID.ORG/0000-0003-1829-9832
E-mail: s.v.getmantsev@rambler.ru

Konstantin Bogatyirev: *Doctor of Science, Professor; Admiral Makarov National University of Shipbuilding: Geroiv of Ukraine str. 9, Mykolaiv, 54025, Ukraine.*
ORCID.ORG/0000-0003-0963-8417
E-mail: toops@ukr.net

Oksana Reznichenko: *Admiral Makarov National University of Shipbuilding: Geroev of Ukraine str. 9, Mykolaiv, 54025, Ukraine.*
ORCID.ORG/0000-0003-4388-2982
E-mail: toops@ukr.net

Volodymyr Kosenchuk: *Admiral Makarov National University of Shipbuilding: Geroev of Ukraine str. 9, Mykolaiv, 54025, Ukraine.*
ORCID.ORG/0000-0001-9235-3409
E-mail: kosenchuk_1980@ukr.net

Oleg Verteleckiy: *V. Sukhomlynskiy Mykolaiv National University: Nikolskaya str. 24, Mykolaiv, 54030, Ukraine.*
ORCID.ORG/0000-0003-3282-8774
E-mail: olegiv76@gmail.com

Yuriy Kulakov: *V. Sukhomlynskiy Mykolaiv National University: Nikolskaya str. 24, Mykolaiv, 54030, Ukraine*
ORCID.ORG/0000-0002-3651-0438
E-mail: KulakoV_MNU@ ukr.net

Bogush, V., Getmantsev, S., Bogatyirev, K., Reznichenko, O., Kosenchuk, V., Verteleckiy, O. & Kulakov, Yu. (2019), "Functional indicators of the female athlete's body specializing in rowing", *Slobozhanskyi Herald of Science and Sport*, Vol. 7 No. 5(73), pp. 12-21, doi: 10.5281/zenodo.3595087