UDC 612.766.1+797.123.1

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Rowing sportswomen motor actions formation

Abstract. ***Purpose:*** *To study the formation of motor action sportswomen different ages depending on the level of sportsmanship.* ***Material and methods:*** *girls which are specialized in a boat-racing in age groups 13-14 years inspected, 15-16 years, 17-18 years, in every group was for 20-25 persons, in all 72 sportswomen. Motive actions were probed on the method of measuring of training effect developed by us an action, and also the functional state was determined by methods: measuring of sensorimotor reaction is on sound and light irritants, speed of current of air, exactness of implementation of the set muscular effort.* ***Results:*** *testing showed the dynamics of forming motive, namely technique of mastering of receptions and actions, reliability, presence of errors, efficiency of active voice of consciousness in correct implementation of motion in a biomechanics relation.* ***Conclusions:*** *application of this method in the process of sporting preparation will allow to define quality of mastering of technique of the proper motive actions, forming of abilities, subsequent learning and becoming of more difficult motive skills.*

Keywords: *boat-racing, functional state, rate, exactness, time of single motion.*

Introduction. During sport training necessary motor skills that are the foundation of rational interrelated movements are formed and brought to a certain degree of perfection. To do this, one has to be able to manage relatively simple movements in the main links of the motor system in the formation of a subsequent more complex forms of motor activity, which can be used as means of selective influence on the development of certain physical qualities and abilities [2]. Motor actions features depend on the specifics manifested in their physical qualities and the level of their implementation. Motor skills are generated, updated and changed depending on the degree of physical qualities development [9].

In the course of motor actions development there are certain functional forms of motor control, namely, motor skills and motor skills. If one has any skills is a constant search for adequate ways of doing things. As a result of repetitive motor actions coordination mechanisms are gradually being automated, and that is the main feature of skill, which is characterized by reliable operation, which worsens with fatigue, malaise, and other factors. Skill makes it possible to adapt changing conditions of its implementation to different motor actions, depending on the task and movements technique [6, 7].

Sportsman's skill is largely determined by the motor activity, based on a variety of durable built skills, a large number of which allows for versatile and efficient movements. Implementation of the new motor action takes place on the basis of the necessary minimum of knowledge about his technique, pre-motor experience, and common physical training. In the evolution of motor actions the optimal variant of movement searching takes place under the of consciousness leadership [3]. Movement is not a simple response to the impact of the external environment, but purposeful action, managed during its implementation in cooperation with the external environment and presents an integral structure, differentiating into multiple elements in a wide variety of interaction forms between them [5, 8].

Motion control is carried out at various levels, from the leading cortical, which defines arbitrary actions to background, which governs involuntary movements. In the initial period of complex skills movements development are controlled by cortical systems operating almost independently of proprioceptorics [1]. As a result of the exercises multiple repetitions in their management talamopallidum level is switched on. It is closely connected with tactile organs and proprioceptive sensitivity, movements become more coordinated, accurate, precise, economical, light, plastic. Gradually, the leading role of cortical systems is reduced and coordination of movements management is transferred to the background levels that gradually develop the numerous components of motion, provide the interconnection between them. Various movements are difficult for coordinating, speed, speed and strength. They are caused by various leading and background levels and, consequently, functional management system is formed to every movement [4].

The effectiveness of the movements control is largely determined by sensory corrections, i.e. by changes, made to the movements structure, which are based on feedback [10]. Time, which is required for the operational correction of motor actions varies, depending on many factors. They are technical skills, functional status, the presence of confounding factors, the motor actions complexity, etc. [9].

The work was aimed at studying the motor actions formation of rowing sportswomen`s of different age, depending on the sportsmanship level.

Materials and methods of investigations. Female students of the High School of Physical Education and students of Nikolaev Universities were examined, who specialize in rowing, at the age groups of 13-14 years, 15-16 years, 17-18 years. There were 20-25 persons in each group, a total number was 72 sportswomen. The investigation on motor action was held according to a method for measuring the effect of training action (META) pic. 1.

The device of META consisted electronic unit automatic registration of movements, contacting the rod and 2 targets, made in the form of concentric circles that allow to evaluate the accuracy of movements from 1 to 10 on the periphery in the center of the target, which is located at a distance of 30 cm from each other. Research motor actions carried out by fixing the elbow joint working hands on a horizontal surface, and deemed to be fulfilled in contact with the target rod.

Motor actions considered in different circumstances, running consecutively in three time intervals: 15 sec. (n_1), 60 sec. (n_2) and 15 sec. (n_3). Before researched task was: maximum speed and accuracy to perform the predetermined conditions of the experiment movement, especially on the first and last time periods. This formulation of the problem provides an objective evaluation of the tempo, the accuracy of a single movement of time under different conditions: with fresh forces in the first period of time, during continuous operation in a second time interval, and the third – after a long and a maximum rate of motion for operation.

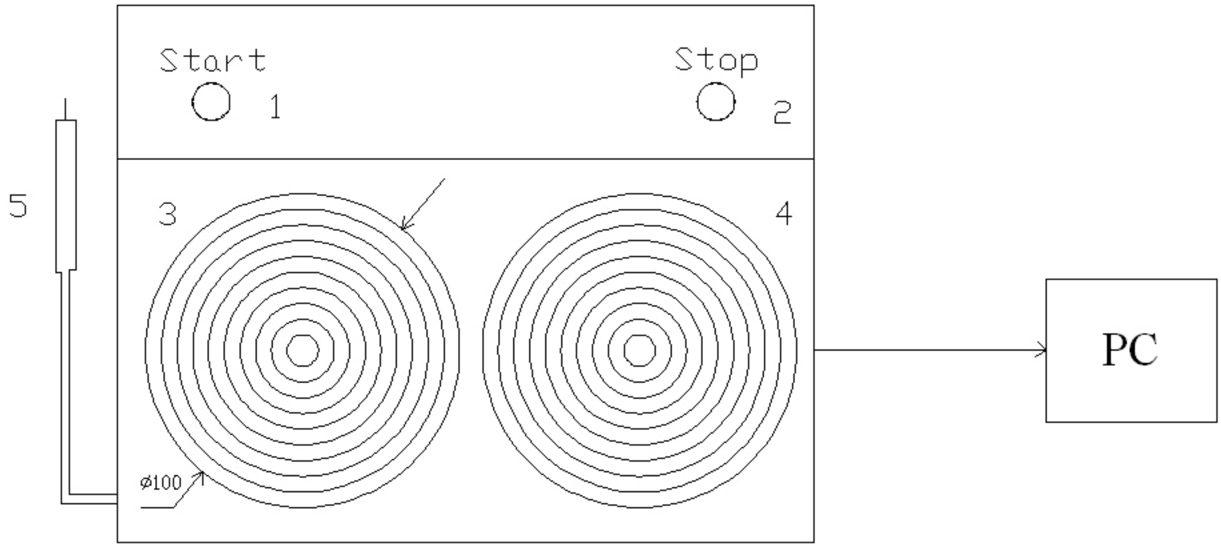

Fig. 1. Schematic of the device measuring the effect of training action (META).
1, 2 – signaling device; 3 – left the target; 4 – the right target; 5 – probe; 6 – a personal computer.

Also functional state of sportswomen was determined with help of techniques: time measurement of sensorimotor responses to auditory and visual stimuli time measurement (EMR – electrical mioreflexometria), the air flow rate (PT – pneumatic tachometry), accuracy of a given muscle force, recorded by dynamometer (DM reversible).

In the course of action, led to motor skill, its most important moments are taken under the consciousness control, in particular, there are three main components in our research, which an sportsman should pay attention to. They are pace, total amount of points, movements accuracy.

The results of research. Following data in the effect of training action measurement in the group 13-14-year-old girls were obtained (Table 1). In the first period the pace of movement was 22,3±0,993 blows with the amount of points – 186,6±8,55 and the accuracy – 8,41±0,371 points, while the maximum values were observed: the pace – 26 blows, the amount of points – 206 with the accuracy of – 9,49 points and minimum ones: the pace – 18 blows, the amount of points – 137 and the accuracy – 6,5 points. In the second period of the test pace was 25,5±1,456 blows with the amount of points – 201,75±3,812 and the accuracy – 7,94±0,442 points, the maximum values correspond to: the pace – 33,75 blows, the amount of points – 217,5, the accuracy – 8,99 points; minimum: the pace – 22 blows, the amount of points – 186,75 and the accuracy – 5,42 points.

In the third period, the effect of training action measurements were determined: the pace – 27,4±0,61 blows, the amount of points – 209,5±8,55, the accuracy – 7,76±0,403 points; maximum values were: the pace – 35 blows, the amount of points – 246, accuracy – 8,77 points; minimum ones: the pace – 22 blows, the amount of points – 177 and the accuracy – 5,53 points.

In three test periods 152±1,06 blows were done on average with the amount of points – 1203±24,2 and the accuracy – 7,97±0,39 points, while there was observed, the maximum result of 196 blows, 1,322 points, 8,71 points, the minimum – 131 blows, 1061 points, 5,85 points, accordingly.

It should be noted that in the second testing period compared to the first one the pace increased on 3 blows, the amount of points on 16, the accuracy of motion was reduced on 0,47 points. In the third period compared to the second one the pace increased on 2 blows, the amount of points on 7, accuracy was reduced on 0,19 points. Pace and amount of points increase is significant, accuracy reduction is located within arithmetic deviation.

The same trend is observed for the maximum and minimum values, but more pronounced for the best result, namely, in the second period compared to the first one the pace increased on 8 blows, the amount of points on 12, the accuracy of motion was reduced on 0,50 points. In the third period, compared with the second one the pace increased on 2 blows, the amount of points on 29, accuracy reduced on 0,22 points.

In reaction time research to a sound stimulus the average value was 0,210±0,044 sec, with fluctuations from 0,199 sec to 0,222 sec; to light stimulus – average mark is 0,259±0,017 sec, with fluctuations from 0,200 sec to 0,340 sec. The air flow rate was equal on sniff 3,1±0,161 l/sec and on exhalation 4,05±0,062 l/sec at maximum sniff result 4,1 l/sec and exhale 4,2 l/sec, and the minimum result on sniff 2,8 l/sec and on exhalation 3,7 l/sec. While determining the accuracy of muscle force dosing error was on average 1,6±0,43 kg, with a maximum error of 4,0 kg and a minimum 0,66 kg.

The maximum and minimum measures of accuracy in the first period were slightly less than the common average value of this group that did not differ from each other – the maximum ammount was 7,92 points and the minimum one was 7,61 points. In the second period at the maximum pace the movements accuracy in the average decreased to 6,44 points, with a minimum pace, that reached 8,48 points. In the third period with a high accuracy pace of movements decreased to 7,02 points, at a low pace rose to 8,04 points. Movements accuracy in three periods at the maximum pace was low (6,74 points), at a minimum pace it was high (8,09 points).

Table 1

Examination results (rowing, female 13-14 years)

Stat. indicators			$\bar{X}\pm m$	$\bar{X}_{max}$	$\bar{X}_{min}$	σ	C
Training action effect measurement	The first period	Pace	22,3±0,993	26	18	2,81	12,59
		Amount	186,6±8,55	206	137	24,21	12,97
		Accuracy	8,41±0,371	9,49	6,5	1,05	12,47
	The second period	Pace	102,5±5,827 (25,5±1,456)	135 (33,75)	88 (22)	16,49	16,09
		Amount	807±15,25 (201,75±3,812)	870 (217,5)	747 (186,75)	43,16	5,34
		Accuracy	7,94±0,442	8,99	5,42	1,25	15,78
	The third period	Pace	27,4±0,61	35	22	4,56	16,64
		Amount	209,5±8,55	246	177	24,2	11,56
		Accuracy	7,76±0,403	8,77	5,53	1,14	14,56
	Total	Pace	152±1,06	196 (32,6)	131 (21,8)	22,8	15,00
		Amount	1203±24,2	1322	1061	68,42	5,72
		Accuracy	7,97±0,39	8,71	5,85	1,00	12,59
Tests	EMR	Sound	0,210±0,044	0,222	0,199	0,099	4,70
		Light	0,259±0,017	0,340	0,200	0,049	18,97
	PT	Sniff	3,1±0,161	4,1	2,8	0,456	14,71
		Exhale	4,05±0,062	4,2	3,7	0,175	3,81
	DMrev.		1,6±0,43	4	0,66	1,17	73,25

Note: *There are the data in brackets given to the universal time 15 seconds indicator, in particular 135: 4 = 33,75 blows.*

Table 2

Examination results (rowing, female 15-16 years)

Stat. indicators			$\bar{X}\pm m$	$\bar{X}_{max}$	$\bar{X}_{min}$	σ	C
Training action effect measurement	First period	Pace	26±1,253	37	19	5,01	19,26
		Amount	214±9,19	306	174	36,77	17,18
		Accuracy	8,33±0,188	9,56	6,86	0,752	9,03
	Second period	Pace	116±2,23 (29±0,557)	128 (32)	92 (23)	8,91	7,68
		Amount	933±20,6 (233±5,15)	1112 (278)	816 (204)	82,2	8,80
		Accuracy	8,2±0,183	8,79	6,16	0,733	8,93
	Third period	Pace	30,5±1,39	44	24	5,57	18,27
		Amount	232±5,57	254	174	22,3	9,61
		Accuracy	7,79±0,346	9,85	4,88	1,384	17,8
	Total	Pace	172±7,52 (28,6±1,253)	244 (40,6)	136 (22,6)	30,11	17,49
		Amount	1380±27,5 (230±4,583)	1542 (257)	1147 (191)	110,0	7,97
		Accuracy	8,12±0,196	8,99	6,17	0,785	9,67
Tests	EMR	Sound	0,198±0,006	0,239	0,152	0,024	12,45
		Light	0,217±0,005	0,247	0,167	0,022	10,31
	PT	Sniff	4,0±0,19	5,2	2,5	0,76	19,0
		Exhale	4,6±0,18	6,0	3,5	0,71	15,43
	DMrev.		1,23±0,268	4	0,16	1,07	86,96

In the group of 15-16-year-old girls, engaged in rowing (Table 2), when tested in the first period was observed the following: the pace – 26±1,253 blows, the amount of points – 214±9,19, the accuracy – 8,33±0,188 points; at the maximum rates: the pace – 37 blows, the amount of points – 306, the accuracy – 9,56 points; minimum values: the pace – 19 blows, the amount of points – 174, the accuracy – 6,86 points.

In the second period the average values were as follows: the pace – 29±0,557 blows, the amount of points – 233±5,15, the accuracy – 8,2±0,183 points; maximum rates: the pace – 32 blows, the amount of points – 278, the accuracy – 8,79 points and minimum: the pace – 23 blows, the amount of points – 204, the accuracy – 6,16 points.

In the third period, the researchs that determine values were equal to: the pace – 30,5±1,39 blows, the amount of points – 232±5,57, the accuracy 7,79±0,346 – points; maximum rates: the pace – 44 blows, the amount of points – 254, the accuracy – 9,85 points; minimum: the pace – 24 blows, the amount of points – 174, the accuracy – 4,88 points.

On average, three periods were defined: the pace – 28,6±1,253 blows, the amount of points – 230±4,583, the accuracy – 8,12±0,196 points; maximum values: the pace – 40,6 blows, the amount of points – 257, the accuracy – 8,99 points; minimum rates: the pace – 22,6 blows, the amount of points – 191, the accuracy – 6,17 points.

Indicators of sensorimotor reactions to sound were equal to 0,198±0,006 sec with a range from 0,152 sec to 0,239 sec; to light – 0,217±0,005 sec at the best result of 0,167 seconds and the low – 0.247 sec.

The air flow rate was on sniff 4,0±0,19 l/sec, the maximum – 5,2 l/sec, the minimum – 2,5 l/sec; on exhale – 4,6±0,18 l/sec, the maximum – 6,0 l/sec, the minimum – 3,5 l/sec.

Error in the reverse dynamometry index was on average 1,23±0,268 kg, the best result – 0,16 kg, bad – 4 kg.

When measuring the effect of training action of 17-18-year-old girls following results were obtained (Table 3). In the first period of testing the pace was 27±1,261 blows, score – 229±10,11, accuracy – 8,66±0,225 points, the maximum rates: the pace – 31 blows, the amount of points – 262, the accuracy – 9,55 points, the minimum: the pace – 22 blows, the amount of points – 190, the accuracy – 7,94 points.

In the second period were as follows: the pace – 30±1,682 blows, the amount of points – 247±8,032, the accuracy – 8,3±0,227 points; the maximum pace – 37 blows, the amount of points – 271, the accuracy – 8,78 points; minimum pace – 25 blows, the amount of points – 213, the accuracy – 7,16 points.

Table 3

Examination results (rowing, female 17-18 years)

Stat. indicators			$\bar{X} \pm m$	$\bar{X}_{max}$	$\bar{X}_{min}$	σ	C
Training action effect measurement	First period	Pace	27±1,261	31	22	3,33	12,35
		Amount	229±10,11	262	190	26,7	11,6
		Accuracy	8,66±0,22	9,55	7,94	0,596	6,88
	Second period	Pace	120±6,73 (30±1,682)	148 (37)	100 (25)	17,77	14,94
		Amount	988±32,13 (247±8,032)	10814 (271)	852 (213)	84,81	8,59
		Accuracy	8,3±0,227	8,78	7,16	0,6	7,22
	Third period	Pace	31,8±1,261	36	27	3,33	10,48
		Amount	252±11,92	294	209	31,48	12,59
		Accuracy	7,9±0,504	9,41	5,81	1,33	16,88
	Total	Pace	178±6,17 (29,6±1,02)	217 (36,2)	173 (28,8)	16,29	9,16
		Amount	1470±35,49 (245±5,915)	1640 (273)	1251 (209)	93,70	6,38
		Accuracy	8,32±0,264	8,94	7,06	0,696	8,36
Tests	EMR	Sound	0,186±0,005	0,198	0,159	0,014	7,53
		Light	0,203±0,011	0,248	0,165	0,030	15,3
	PT	Sniff	4,83±0,224	5,6	4,0	0,592	12,26
		Exhale	4,99±0,211	5,8	4,3	0,556	11,13
	DMrev.		1,0±0,163	1,66	0,5	0,429	42,96

In the third period were determined: the pace – 31,8±1,261 blows, the amount of points – 252±11,92, the accuracy – 7,9±0,504 points, the maximum pace – 36 blows, the amount of points – 294, the accuracy – 9,41 points, minimum pace – 27 blows, the amount of points – 209, the accuracy – 5,81 points.

Summery measures for the three test periods were: the pace – 29,6±1,02 blows, the amount of points – 245±5,915, the accuracy – 8,32±0,264 points at the maximum rates: the pace – 36 blows, the amount of points – 273, the accuracy – 8,94 points and the minimum: the pace – 28,8 blows, the amount of points – 209, the accuracy – 7,06 points.

In studying reaction with the help of electrical mioreflexometer to sound compared with the average value of 0,186±0,005 sec, the minimum value was 0,159 sec, i.e. on 0,027 sec less and maximum 0,198 sec, i.e. on 0,012 seconds more. Sensorimotor reaction to light was on average 0,203±0,011 sec, the minimum time of 0,165 sec, i.e. on 0,038 sec less than the average and maximum time of 0,248 sec, i.e. on 0,045 sec more than the average value. The pneumotachometry index was on sniff 4,83±0,224 l/sec and on exhale 4,99±0,211 l/sec, respectively the best score was 5,6 l/sec and 5,8 l/sec and the lowest one 4,0 l/sec and 4,3 l/sec. The error in the determination of dosed muscle force on average was equal to 1,0±0,163 kg with a maximum value and a minimum one 1,66 kg 0,5 kg.

In the group of 13-14 year-old girls, engaged in rowing, when measuring the effect of training actions compared with the first period occurred during the second period of increase in the pace on 3,2 blows, the amount of points on 15,15 with a decrease in the accuracy on 0,47 points. In the third period, the pace increases more (on 5,1 blows) and the amount of points on 22,9, but the accuracy was reduced on 0,65 points; in this period as compared to the second one the pace and the score rises slightly, on 1,9 blows and 7,75 points, the accuracy decreases on 0,18 points, i.e. the studied parameters in the second and the third periods were almost at the same level.

At the maximum amount of pace and amount of points accuracy rate compared with the first period decreased in the second on 1,48 points, in the third on 0,9 points; for minimum values in the second period accuracy increased on 0,56 points, in the third – on 0,43 points.

In the group of girls at the age 15-16 compared to the first period the movements precise in the second period fell within the statistical error on 0,19 points, and the third on 0,163 points. At the maximum pace and the amount of points compared with the first period in the second period, the accuracy is improved on 0,48 points, while the third has decreased on 2,43 points. With minimum terms of pace and amount of points compared with the same accuracy in the second period decreased on 0,29 points, and the third on 1,9 points.

In the group of girls at the age of 17-18 years in the test measuring the effect of training action precise movements was almost identical to the average values with a difference 0,17-0,56 points in the second and third periods as compared to the first one. At the maximum pace and the amount of points accuracy decreased in the second period on 1,13 points, in the third one on 0,29 points. With minimum pace and the rate amount change of points have exactly the same trend. It is a decrease in the second period on 0,11 points, and in the third on 0.89 points.

Research of reaction time to the sound showed a sufficiently high level in the group of 13-14 years, which was then increased in the group of 15-16 years on 0,012 sec and in the group of 17-18 years on 0,024 sec compared to the younger group. The same trend was observed in the determination of the sensorimotor response to light stimulus – corresponding increase on 0,042 sec and 0,056 sec.

The air flow rate characterizing the physical development and functional status, was at the average level, which was specific to girls, that do not go in for sport and, of course, increased with age. Compared with the younger group of 13-14-year-olds, in the group of 15-16-year-olds the air flow rate increased during sniff and exhale, respectively on 0,9 l/sec and 0,55 l/sec and 17-18 years – on 1,73 l/sec and 1,89 l/sec.

Error detection dosed muscle force showed high accuracy of the task in 13-14 years, 15-16 years, the error decreased on 0,37 kg and 17-18 years – 0,6 kg.

Investigating the effect of training action shows that sportswomen in all age groups maintain the pace throughout the test, which increases slightly with each period approximately almost equally, but the initial level in the older age groups is more on 4-5 blows or 18-22%. The amount of points is increased in the same dynamics – 32-46 or 15-22%. However, the accuracy is almost at the same level with the trend of increase in the older group compared to younger on 0,25 points in the first period, on 0,36 points in the second and on 0,11 points in the third and the average for the three periods on 0,35 points.

In our research, testing shows the dynamics of the formation of motor skills, particularly the form of the techniques and actions development, reliability, errors, the effectiveness of the active consciousness participation in the proper execution of movements in biomechanical terms, in which the motor is controlled by the lower parts of the automated parts of the CNS, and notional – by higher ones. It contributes to the primary motor task in definite conditions, the choice and use of the most efficient methods for its solution, i.e. the effective functioning of higher mechanisms of motor control provision.

Conclusions. Test of measuring the training actions effect characterizes formation of motor actions in terms of reliability, variability and ability to achieve generated traffic goals.

The use of this technique in the process of sport training will allow to determine the quality of the technology relevant motor actions development, the formation of skills, which are a prerequisite for the developing of next studying and the subsequent formation of more complex motor skills exercises.

Testing results show the presence of the prerequisites for effective technical improvement, development of the ability for creative thinking, analysis of operated movements, specialized perception improvement.

Prospects for further research. The research with help of proposed methods of motor actions mechanisms formation under the influence of complicating factors (excitation, fatigue, changes in environmental conditions, and others.) will be held in order to create a comprehensive methodology for assessing the prospects of sportsmen in a particular kind of sport.

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Received: 12.06.2015.
Published: 30.08.2015.

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