

Олімпійський і професійний спорт

УДК 797.122

MORPHOFUNCTIONAL INDICATORS OF 9–12 YEAR-OLD CANOE AND KAYAK ROWERS

Vladimir Davydov¹, Vladimir Shantarovich¹, Aleksandr Zhuravskiy¹, Dmitriy Prigodich¹

¹ Polessky State University, Pinsk, Byelorussia, v-davydov55@list.ru

<https://doi.org/10.29038/2220-7481-2017-03-186-191>

Abstract

The problem of selecting young canoe and kayak rowers can not be successfully solved unless the medical and biological aspects are subjected to a thorough analysis. The basis of individual differences of development and improvement preconditions of the sportsman's motor abilities is his morphological features. For kayaking and canoeing, the most informative are the following indicators: body length, arm length, arm spread, body length, when kneeling with arms outstretched, body length when sitting arms up and body length up to the 7th cervical vertebra.

Key words: rowing, sport selection, kayak, canoe, morphofunctional indices.

Володимир Давидов, Володимир Шантарович, Олександр Журавський, Дмитро Пригодич. Морфофункціональні показники хлопчиків 9–12 років, які займаються веслуванням на байдарках і каное. Проблема відбору юних веслярів на байдарках і каное не може бути успішно розв'язана, якщо не будуть схильні до глибокого аналізу її медико-біологічні аспекти. Основою індивідуальних відмінностей як передумов розвитку й удосконалення рухових здібностей спортсмена є його морфологічні особливості. Для веслування на байдарках і каное найбільш інформативними є такі показники: довжина тіла, довжина руки, розмах рук, довжина тіла, стоячи на колінах із витягнутими вгору руками, довжина тулуба сидячи руки вгору й довжина тулуба до 7-го шийного хребця.

Ключові слова: веслування, спортивний відбір, байдарка, каное, морфофункціональні показники.

Владимир Давыдов, Владимир Шантарович, Александр Журавский, Дмитрий Пригодич. Морфофункциональные показатели мальчиков 9–12 лет, занимающихся греблей на байдарках и каное. Проблема отбора юных гребцов на байдарках и каное не может быть успешно решена, если не будут подвержены глубокому анализу её медико-биологические аспекты. Основой индивидуальных различий как предпосылок развития и совершенствования двигательных способностей спортсмена являются его морфологические особенности. Для гребли на байдарках и каное наиболее информативными являются следующие показатели: длина тела, длина руки, размах рук, длина тела, стоя на коленях с вытянутыми вверх руками, длина туловища сидя руки вверх и длина туловища до 7-го шейного позвонка.

Ключевые слова: гребля, спортивный отбор, байдарка, каное, морфофункциональные показатели.

Introduction. The level of results in modern sports is so high that in order to reach them, a sportsman needs to have rare morphological data, a unique combination of the complex of physical and mental abilities that are at the highest level of development [1]. Such a combination is very rare even with the most favorable construction of many years of training and the availability of all the necessary conditions. Therefore, one of the central training systems for sportsmen of higher qualification is the problem of sports selection [3].

In modern conditions of higher sport achievements, the identification of the most talented promising sportsmen acquires special significance, since record achievements are typical to the athletes with the most optimal indicators characteristic for this kind of sport [4; 5].

Methodology and Research Objects. The study included 9–12 year-old boys doing canoeing and kayaking. 190 sportsmen were examined altogether.

The survey included anthropometric measurements of total, longitudinal, partial body size (Popesku's tests) and analysis of components of body mass [J. Matieka, 1921].

Measurement of the longitudinal dimensions of the body was carried out by anthropometer Martin according to the general methodology [V. V. Bunak, 1941]. The body weight was determined using medical

scales with the scale factor 50 g. The tests of Popescu include measuring arm length (cm), body length when sitting arms up (cm), the length of the body, kneeling with arms outstretched (cm) and body length up to the 7th cervical vertebrae (cm). Also, the casting dynamometry of the strongest arm was measured with the help of a cyst dynamometer (kg) and lung vital capacity using a spirometer (ml).

Results And their Discussion. When solving the primary task, i. e. the selection of the most promising rowers from the number of those not going in for sports and assessing their predisposition to this sport, as well the most promising sportsmen, it is necessary to take into account, first of all, the stable indicators: body length (cm), arm length (cm), arm spread (cm), body length when sitting with arms up (cm), body length when kneeling with arms up (cm) and body length to the 7th cervical vertebra (cm) [2].

The analysis of the main indicators of morphofunctional development of 9-year-old boys doing canoeing and kayaking is presented in table 1. When comparing the indicators of morphofunctional survey, it was revealed that the greatest values of body length were noted for kayak rowers ($133,9 \pm 9,4$ cm), the smallest – for canoe rowers ($131,8 \pm 6,9$ cm). The differences are reliable ($p < 0,05$).

Body weight is also the largest among 9-year-old rowers of kayaks ($27,1 \pm 2,9$ kg). The smallest values of body weight were noted by canoers ($25,8 \pm 2,3$ kg), which was the difference in body weight of 1,3 kg ($p > 0,05$).

The lowest relative fat weight (%) was observed in kayakers ($11,75 \pm 1,86$), the greatest among canoers ($16,94 \pm 2,46$), the differences are significant ($p < 0,05$). The greatest indices of the relative muscle mass have kayakers ($37,78 \pm 6,47$), the smallest have canoers ($34,37 \pm 9,18$), the differences are significant ($p < 0,05$).

Table 1

Basic Morphofunctional Characteristics of 9-Year-old Boys

№	Morphofunctional Values	Kayaker (n = 28)		Canoer (n = 22)	
		$\bar{X} \pm \sigma$	min-max	$\bar{X} \pm \sigma$	min-max
1	Body length, cm	133,92±7,44*	129,2-137,3	131,84±6,95*	128,3-135,9
2	Body weight, kg	27,13±2,93	25,6-30,4	25,83±2,35	20,3-36,5
3	Arm length, cm	62,24±4,83	57,3-65,7	61,82±3,54	57,6-66,3
4	Arm spread, cm	134,66±5,14	129,6-137,8	132,45±4,32	128,3-138,1
5	Body length when sitting with arms up, cm	111,05±4,06	108,5-116,7	–	–
6	Body length when kneeling with arms up, cm	–	–	127,74±3,92	123,6-131,2
7	Body length to the 7th cervical vertebra, cm	49,73±1,95	42,6-53,9	49,05±3,25	42,3-55,3
8	Fat weight, %	11,75±1,86*	10,2-13,7	16,94±2,46*	11,9-20,3
9	Muscle mass, %	34,37±9,18*	30,4-38,3	37,78±6,47*	33,6-45,8
10	Lung vital capacity, ml	1762,4±0,31*	1623,1-1864,3	1509,3±0,45*	1352,1-1750,2
11	Carpal dynamometry, kg	4,52±1,52	3,6-6,4	5,28±1,83	4,5-7,9

Note: t – Student's criterion * $-p < 0,05$.

The greatest values of lung vital capacity (ml) were noted in kayak rowers ($1762,4 \pm 0,31$), the least significant difference between 9-year-old canoers ($1509,3 \pm 0,45$) was significant ($p < 0,05$). Among the other indicators of 9-year-old canoe and kayak rowers the difference is not reliable ($P > 0,05$).

The main indicators of morphofunctional development of 10-year-old canoe and kayak rowers are presented in table 2.

When comparing the morphofunctional indices of the survey, it was revealed that 10-year-old kayak rowers have larger indications of body and arm length, i.e. conservative indicators, and canoe rowers have higher rates of body length.

The body length of kayak rowers is the greatest ($143,92 \pm 2,46$), the smallest body length have canoers ($140,87 \pm 3,94$), the differences are significant ($p < 0,05$). The differences are significant ($p < 0,05$) in indicators of body length, arm spread, relative muscle mass (%), lung vital capacity (ml).

Table 2

Basic Morphofunctional Characteristics of 10-Year-old Boys

№	Morphofunctional Values	Kayaker (n = 28)		Canoer (n = 24)	
		$\bar{X} \pm \sigma$	min-max	$\bar{X} \pm \sigma$	min-max
1	Body length, cm	143,92±*2,46	140,3-152,7	140,87±3,94*	133,5-148,6
2	Body weight, kg	36,73±2,94	34,1-57,0	35,85±4,36	29,6-40,2
3	Arm length, cm	64,27±1,26	60,2-68,3	62,84±1,45	57,3-68,2
4	Arm spread, cm	148,65±3,14*	143,5-151,8	143,45±2,36*	139,4-150,7
5	Body length when sitting with arms up, cm	115,03±2,82	111,3-124,1	-	-
6	Body length when kneeling with arms up, cm	-	-	147,7±3,29	130,5-152,4
7	Body length to the 7th cervical vertebra, cm	52,73±1,94	48,3-55,6	51,07±3,26	45,6-55,7
8	Fat weight, %	12,74±1,85	11,2-13,9	11,94±2,43	10,2-14,8
9	Muscle mass, %	44,34±9,15*	41,5-48,2	47,77±6,46*	40,5-53,7
10	Lung vital capacity, ml	2374,21±0,31*	2100,7-2430,6	2685,42±0,45*	2430,0-1890,3
11	Carpal dynamometry, kg	4,58±1,52	3,2-7,5	5,29±1,83	4,2-8,4

Note: t – Student’s criterion, *–p<0,05.

Table 3 presents an analysis of the main morphofunctional indices of young 11-year-old rowers of canoes and kayaks.

When comparing the indicators of morphofunctional analysis, it was revealed that the largest values of body length were recorded of young canoers (151,3 ± 4,82 cm), while young canoe rowers have the length of the body 147,3 ± 10,09 cm. In average, the difference was 4 cm. However, the differences are not reliable. It should also be noted that 11-year-old boys practicing kayak rowing predominate in body weight and carpal dynamometry over canoers. The differences are statistically significant (p <0,05). The remaining morphofunctional indices of the kayak rowers had a slight advantage over the canoers with the exception of muscle mass (for canoeists 50,53 ± 1,88, for canoeists 48,0 ± 4,07). The differences are not reliable.

Table 3

Basic Morphofunctional Characteristics of 11-Year-old Boys

№	Morphofunctional Values	Kayaker (n = 22)		Canoer (n = 20)	
		$\bar{X} \pm \sigma$	min-max	$\bar{X} \pm \sigma$	min-max
1	Body length, cm	151,3±4,82	142,5-160,3	147,3±10,09	135,4-159,8
2	Body weight, kg	44,9±6,73*	36,0-57,0	37,6±8,44*	29,2-45,9
3	Arm length, cm	69,5±3,05	65,3-74,9	67,0±2,54	63,7-69,2
4	Arm spread, cm	152,9±9,06	138,3-165,5	149,3±7,48	138,5-155,6
5	Body length when sitting with arms up, cm	116,3±5,87	108,3-124,2	-	-
6	Body length when kneeling with arms up, cm	-	-	150,1±11,16	136,4-163,7
7	Body length to the 7th cervical vertebra, cm	50,2±3,68	44,5-55,9	49,2±4,76	44,0-55,5
8	Fat weight, %	13,6±4,34	7,2-21,0	10,73±3,25	8,3-15,2
9	Muscle mass, %	48,0±4,07	38,8-57,5	50,53±1,88	48,2-52,7
10	Lung vital capacity, ml	2308,3±490,74	1500,0-3000,7	2100±294,39	1800,2-2400,5
11	Carpal dynamometry, kg	9,5±3,91*	5,5-16,5	6,25±3,50*	2,2-10,0

Note: t – Student’s criterion, *p<0,05.

An analysis of the main morphofunctional characteristics of 12-year-old canoe and kayak rowers is presented in table 4.

Analyzing the data of the morphofunctional indicators of 12-year-old canoe and kayak rowers, it should be noted that the greatest values of body length were recorded of canoe rowers ($158,5 \pm 2,37$).

But the largest values of body weight ($50,6 \pm 13,46$) and muscle mass ($47,7 \pm 3,20$) were recorded of kayak rowers. The average difference is 1.8 kg and 1,9 %, respectively. The differences are not reliable. The other morphofunctional indicators of canoers also had a little advantage over their peers – kayakers. However, they were insignificant.

Table 4

Basic Morphofunctional Characteristics of 12-Year-old Boys

№	Morphofunctional values	Kayaker (n=24)		Canoeer (n=22)	
		$\bar{X} \pm \sigma$	min-max	$\bar{X} \pm \sigma$	min-max
1	Body length, cm	158,2±11,70	140,4-180,6	158,5±2,37	154,6-160,8
2	Body weight, kg	50,6±13,46	32,0-80,0	48,8±8,66	39,4-63,2
3	Arm length, cm	70,5±4,36	62,7-79,3	71,9±2,37	69,0-75,3
4	Arm spread, cm	155,9±13,67	135,7-180,2	158,2±1,57	156,3-160,5
5	Body length when sitting with arms up, cm	122,8±9,78	110,6-140,6	-	-
6	Body length when kneeling with arms up, cm	-	-	162,4±0,92	161,6-163,7
7	Body length to the 7th cervical vertebra, cm	53,1±4,76	44,5-62,5	53,4±2,53	50,5-57,2
8	Fat weight, %	13,1±4,75	5,9-22,2	13,76±5,99	8,8-23,8
9	Muscle mass, %	47,7±3,20	42,5-53,8	45,8±3,99	42,2-50,6
10	Lung vital capacity, ml	2500,0±777,57	1600,2-3700,6	2620±164,31	2500,0-2900,0
11	Carpal dynamometry, kg	12,4±7,63*	4,2-24,0	16±6,48*	10,0-24,0

Note: *t* – Student's criterion, * $p < 0,05$.

But it should be noted that there exist the statistically significant differences of carpal dynamometry between canoe rowers ($16,0 \pm 6,48$) and kayak rowers ($12,4 \pm 7,63$) ($p < 0,05$).

Evaluation of morphofunctional development of rowers was carried out using special scales for assessing the morphofunctional suitability of 9–12 year-old rowers using the method of V. Yu. Davydov with others [1]. The final assessment of the morphofunctional state was calculated as the average sum of indicators according to the scale indices.

The distribution of 9–12 year-old kayak rowers according to their morphological development is shown in figure 1.

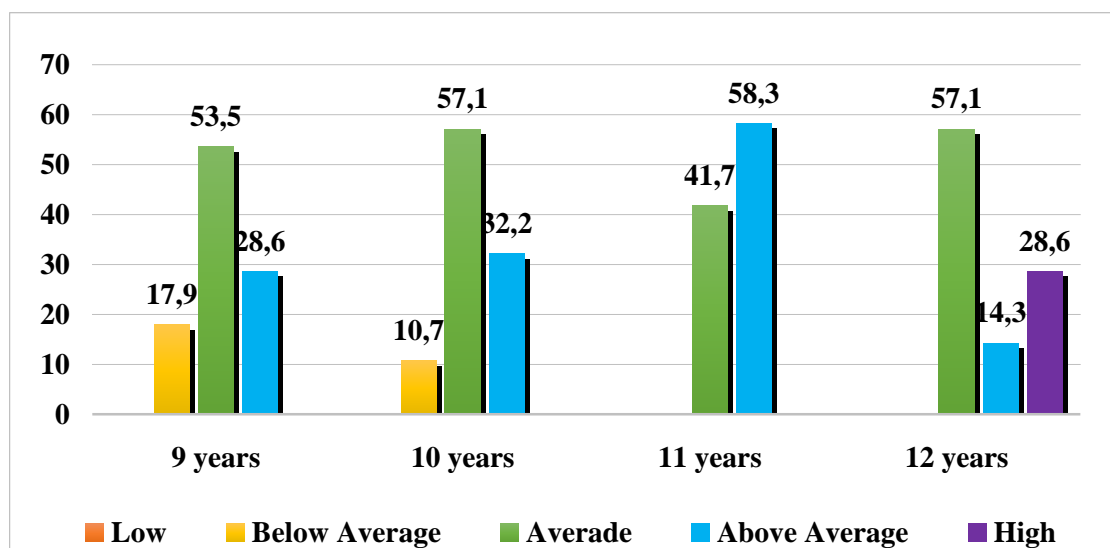


Fig. 1. The Indices of Morphological Development of 9–12 Year-old Kayak Rowers (%)

9,9 % of 9 year-old kayak rowers are below the average morphofunctional development, 53,5 % – the average and 28,6 % – above the average morphofunctional development.

10,7 % of 10 year-old kayak rowers are below the average morphofunctional development, 57,1 % – the average and 32,2 % – above the average morphofunctional development.

41,7 % of 11 year-old kayak rowers are the average morphofunctional development, 58,3 % above the average morphofunctional development.

57,1 % of 12 year-old kayak rowers are the average morphofunctional development, 14,3 % – above the average and 28,6 % – high morphofunctional development.

The distribution of 9–12 year-old canoe rowers according to their morphological development is shown in figure 2.

27,3 % of 9 year-old canoe rowers are below the average morphofunctional development, 45,5 % – the average and 27,2 % – high morphofunctional development.

25 % of 10 year-old canoe rowers are below the average morphofunctional development, 54,2 % – the average and 20,8 % – high morphofunctional development.

20 % of 11 year-old canoe rowers are below the average morphofunctional development, 60 % – the average and 20 % – high morphofunctional development.

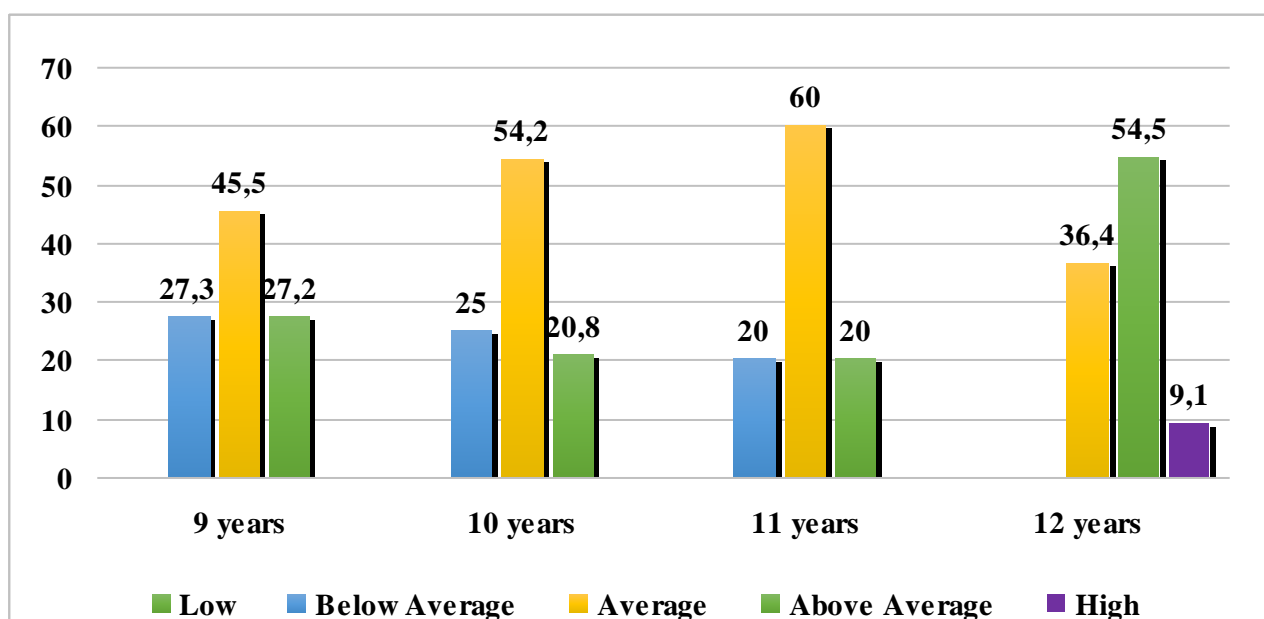


Fig. 2. The Indices of Morphological Development of 9–12 Year-old Canoe Rowers (%)

36,4 % of 12 year-old canoe rowers are the average morphofunctional development, 54,5 % – above the average and 9,1 % – high morphofunctional development.

In total, 12,6 % of all surveyed rowers are below the average, 49,5 % – the average, 32,6% above the average and 5,3 % of high morphofunctional development.

Conclusions. The survey of 9–12 year-old canoe and kayak rowing made it possible to form an original rower model based on anthropometric indicators.

The age dynamics of the development of morphofunctional indices of kayak and canoe rowers aged 9–12 is revealed.

As an informative criterion for assessing canoe and kayak rowers, it is advisable to use Popescu's tests, which allow to determine the basic parameters of a person. These include the body length, arm length, arm spread, and also for kayakers (length when sitting, arms up) and for canoers (length when kneeling, arms up).

For kayak rowing high young sportsmen with a long body should be selected (height is exceeded due to the body length).

While selecting, you can use relative indicators of morphological development: kayakers should have a ratio of body length to the length of the upper and lower limbs, the canoers should have a greater ratio of arm length to the body length and leg length to body length.

It is determined that the majority of the surveyed rowers aged 9–12 refer to the average (49,5 %) and above the average (32,6 %) level of morphological development.

Sources and Literature

1. Давыдов В. Ю. Морфофункциональные критерии отбора и контроля в гребле на байдарках и каноэ: метод. рек. Пинск: ПолесГУ, 2015. 88 с.
2. Давыдов В. Ю. Технология отбора и ориентации гребцов на байдарках и каноэ в системе многолетней подготовки: пособие: в 2 ч. Мозырь: МГПУ им. И. П. Шамякина, 2015. Ч. 1. 320 с.
3. Иссурин В. Б. Биомеханика гребли на байдарках и каноэ. Москва : Физкультура и спорт, 1986. С. 77–80.
4. Жмарев Н. В. Факторы, определяющие рост спортивных результатов в гребле. Тренировка гребца. Москва: Физкультура и спорт, 1981. С. 6–11.
5. Мартиросов, Э. Г. Морфологический статус человека в экстремальных условиях спортивной деятельности. *Итоги науки и техники: антропология*. Москва, 1985. Т. 1. С. 100–153.

References

1. Davydov, V. Yu. (2015). Morfofunktsionalnye kriterii otbora i kontrolya v hreble na baidarkakh i kanoe [Morphofunctional selection and control criteria in rowing and canoeing]. Pinsk, PolesHU, 88.
2. Davydov, V. Yu. (2015). Tekhnolohiia otbora i orientatsii hrebtsov na baidarkakh i kanoe v sisteme mnoholetnei podgotovki: posobyie [The technology of selection and orientation of rowers on canoes and kayaks in the system of long-term training]. Mozyr, MHPU imeni I. P. Shamiakina, chast 1, 320.
3. Issurin, V. B. (1986). Biomekhanika hrebli na baidarkakh i kanoe [Biomechanics in rowing and canoeing]. M., Fizkultura i sport, 77–80.
4. Zhmarev, N. V. (1981). Faktory, opredeliaiushchie rost sportivnykh rezultatov v hreble. Trenirovka hrebttsa [Factors determining the growth of sports results in rowing. Rower training]. M., Fizkultura i sport, 6–11.
5. Martirosov, E. H. (1985). Morfolohicheskii status cheloveka v ekstremalnykh usloviiah sportivnoi deiatelnosti [Morphological status of a person in extreme conditions of sports activity]. Itohi nauki i tekhniki: Antropolohiia, M., t. 1, 100–153.

Стаття надійшла до редакції 18.08.2017 р.