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MORPHOLOGICAL INDICATORS OF SKILLED SINGLE AND PAIR KAYAK AND CANOE ROWERS WHO PARTICIPATE IN EVENTS OF DIFFERENT DISTANCES

Vladimir Davydov [1], Vladimir Shantarovich [2], Aleksandr Zhuravsky [3], Dmitriy Prigodich[4]

[1] Doctor of Science in Biology, Professor in the Department of Physical Culture and Sports. Polessky State University, Pinsk, Byelorussia, v–davydov55@list.ru
[2] Associate Professor. The National Team of the Republic of Belarus in kayaking and canoeing, the Ministry of Sport and Tourism, Pinsk, Byelorussia
[3] Ph.D. in Pedagogical Sciences, Associate Professor in the Department of Physical Culture and Sports. Polessky State University, Pinsk, Byelorussia
[4] Assistant Lecturer in the Department of Physical Culture and Sports. Polessky State University, Pinsk, Byelorussia

Abstract

In the foreign and native books on rowing it focuses more on investigation of body build, physical and special preparation of sportsmen. These parameters limit the passing time of a competitive distance, so they are used as qualification criteria for specialization and team batching. ***Methods and investigation design.*** Canoeists and rowers on kayaks participate in the research. The characteristics of group are: age– 19–26 years, both male and female, high sport qualification, group sizes 160 rowers of both sexes. The complex investigation includes the anthropometric measuring of total body sizes (length and body weight, chest circumference, absolute surface of the body). ***Conclusions.*** In the research the biggest length is found in Merited Sports Masters (MSM), each of male and female; the smallest – in Sports masters (SM). The similar trend was noted in parameters of body weight, in exception of single-canoe sportsmen. In this case International Masters of Sports (IMS) show the highest values. In kayaks and canoes, in teams of kayaks pairs at a distance of 200 m, the highest length and body weight were recorded in highly qualified athletes (MSM). The only exception is the body weight of female athletes-canoeists, where this figure is higher for IMS ($p>0,05$). Among singles at a distance of 500 m the MSM canoeists and rowers on kayaks have the best values of length and bodyweight, MS rowers have the worst results., the only exception is the maximum body length of ISM ($p>0,05$)/ the female ISM rowers have the highest parameters ($p>0,05$). The similar trend was found for kayak pairs rowers at a distance of 500 m. At a distance of 1000 m the female and male MSM rowers were superior to IMS' and SM" in their classes, for canoe the maximum parameters of length and body weight wee noted at ISM. In teams of kayaks pairs at a distance of 1000m the size parametersof MSM are higher then ISM' and SM' ones.

Володимир Давидов, Володимир Шантарович, Олександр Журавський, Дмитро Пригодич. Морфологічні показники кваліфікованих веслярів на байдарках і каное в одиночках і двійках, які виступають на різних дистанціях. У вітчизняній та зарубіжній літературі з веслування увагу акцентовано на дослідженнях, пов'язаних із вивченням особливостей тілобудови, фізичної та спеціальної підготовленості спортсменів. Оскільки ці показники лімітують проходження змагальної дистанції, то вони використовуються як критерії відбору, визначенні спеціалізації та комплектуванні команд. ***Матеріал і методи дослідження.*** У дослідженні брали участь веслярі на байдарках і каное високої кваліфікації у віці від 19–26 років обох статей. Усього обстежено 160 веслярів обох статей. Комплексне дослідження включало антропометричні вимірювання тотальних розмірів тіла (довжина та маса тіла, окружність грудної клітки, абсолютна поверхність тіла). ***Висновки.*** Згідно з нашими дослідженнями, найбільша довжина тіла в класі човнів-одинаків на байдарках і каное на дистанції 200 метрів відзначена як у чоловіків, так і в жінок спортсменів ЗМС, найменша – у спортсменів МС. Аналогічну тенденцію протежено стосовно показників маси тіла, окрім каное одинака, де найбільший показник був у спортсменів МСМК ($p>0,05$). У веслуванні на байдарках та каное в командних човнах-двійках на дистанції 200 метрів найбільші показники довжини й маси тіла визначено у висококваліфікованих спортсменів ЗМС, окрім маси тіла в спортсменок-каноїсток, де цей показник більший у МСМК ($p>0,05$). В одинаків на дистанції 500 метрів кращі показники довжини та маси тіла мають байдарочники та каноїсти ЗМС, гірші – веслувальники МС, окрім каноїстів-одинаків у довжині тіла, де більший показник тіла зафіксовано у МСМК ($p>0,05$). У жінок, які спеціалізуються на байдарці-одинаку, найвищі дані спостерігаємо у спортсменок МСМК ($p>0,05$). У класі двійки на дистанції 500 метрів простежено аналогічну тенденцію, до веслувальників-одинаків. На дистанції 1000 метрів ЗМС у чоловічій та жіночій байдарці-одиночці також були

більшими МСМК і МС у своїх класах, у каное найбільші показаники довжини та маси тіла зафіксовано в спортсменів МСМК (p>0,05). У командних човнах-двійках на дистанції 1000 метрів байдарочники-таканоїсти ЗМС мають перевагу над спортсменами МСМК і МС.

Ключові слова: веслування, байдарка, каное, тотальні розміри тіла.

Владимир Давыдов, Владимир Шантарович, Александр Журавский, Дмитрий Пригодич. Морфологические показатели квалифицированных гребцов на байдарках и каноэ в одиночках и двойках, выступающих на различных дистанциях. В отечественной и зарубежной литературе по гребле большое внимание уделяется исследованию особенностей телосложения, физической и специальной подготовленности спортсменов. Поскольку эти показатели лимитируют прохождение соревновательной дистанции, то они используются как критерии отбора, определения специализации, комплектования команд. ***Методика и организация исследования.*** В исследовании принимали участие гребцы на байдарках и каноэ высокой квалификации в возрасте 19–26 лет обох полов. Всего обследовано 160 гребцов обох полов. Комплексное иследование включало антропометрические измерения тотальных размеров тела (длина и масса тела, обхват грудной клетки, абсолютная поверхность тела). ***Выводы.*** По нашим исследованиям, наибольшая длина тела в классе лодок-одиночек на байдарках и каноэ на дистанции 200 метров отмечается как у мужчин, так и в женщин-спортсменов ЗМС, наименьшая – у спортсменов МС. Аналогичная тенденция отмечена и в показателях массы тела, за исключением каноэ одиночки, где наибольшие значения наблюдаем у спортсменов МСМК (p>0,05). В гребле на байдарках и каноэ в командных лодках-двойках на дистанции 200 метров наибольшие значения длины и массы тела отмечаются у высококвалифицированных спортсменов ЗМС, за исключением массы тела у спортсменок-каноисток, где этот показатель больше у МСМК (p>0,05). В одиночках на дистанции 500 метров лучшие показатели длины и массы тела имеют байдарочники и каноисты ЗМС, худшие – гребцы МС, за исключение каноистов-одиночек в длине тела, где большая длина тела отмечается у МСМК (p>0,05). У женщин, специализирующихся на байдарке–одиночке, наибольшие показатели наблюдаем у спортсменок МСМК (p>0,05). В классе двоек на дистанции 500 метров отмечается аналогичная тенденция, что и у гребцов в одиночках. На дистанции 1000 метров ЗМС в мужской и женской байдарке–одиночке также превосходили МСМК и МС в своих классах, в каноэ наибольше показатели длины и массы тела отмечаются у спортсменов МСМК (p>0,05). В командных лодках-двойках на дистанции 1000 метров байдарочники и каноисты ЗМС превосходят спортсменов МСМК и МС.

Ключевые слова: гребля, байдарка, каноэ, тотальные размеры тела.

Introduction. Nowadays great attention is paid to the study of body build, physical and professional preparedness of athletes in native and foreign literature. As far as these indicators limit the passage of the competitive distance, they are used as selection criteria, the definition of specialization, and the acquisition of teams.

The sportsmen body building criteria have a significant influence on the formation of the individual rowing style N. V. Zhmarev [1], improving the rowing of A. M. Shvedov [2] and ultimately, the sport result. All this emphasizes the high importance of body building for the representatives of this sport.

Techniques and Organization of Research. The study involved rowers on canoes and kayaks at age of from 19t o 26, of both sexes, and high qualifications. In general 160 oarsmen of both sexes were examined.

Complex examination included anthropometric measurements of total body size (length and body weight, chest circumference, absolute body surface).

In the process of collecting the material of our study, the morphological indices of the strongest oarsmen of the Republic of Belarus were analyzed. They took part in the 28 th, 29 th and 30 th summer Olympic Games in Athens, Beijing and London, as well as in the World Championships in 2015 in Milan (Italy). These data are presented in Tables 1–6. It was revealed that at all distances the winners-kayakers (men and women) and canoeists on the basis of morphological data significantly exceed the winners and finalists. This is especially noted among canoeists and canoeists (men), where the winners of the Beijing Olympics Vadim Makhnev and Roman Petrushenko (kayak-pair) and the brothers Andrew and Alexander Bogdanovichi (canoe-pair), significantly outperform other rivals.

Results of the study. While comparing the indicators of the total body size of the strongest Belarusian athletes in rowing on kayaks and canoes at a distance of 200 m (table 1), it was revealed that the greatest values of body length were noted in Honored Masters of Sports (HMS) on kayaks (192,0±3,8 cm). The smallest was among Masters of Sports on kayaks (MS) – 183,8±4,5 cm. The differences both of canoeists HMS, and of kayakers MS, are significant (p<0,05). The greatest body weight was also noted among canoeists on canoes (90,0±2,9 kg). The lowest body weight was found among MS men on kayaks (84,6±3,8 kg), that made a difference in weight of about 5,4 kg. Differences are statistically reliable (p<0,05).

Table 1

Age and Morphological Indicators of Highly Skilled Belarusian Oarsmen in Canoe Single for Distance of 200 Meters

№	Boat Rate	Participants Category	n	Age, *Years*		Body Length, *cm*		Body Weight, *kg*		Absolute Body Surface, m^2	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–1 male	HMS	12	22,0	2,7	192,1*	3,82	90,0*	2,94	2,26*	0,24
		MSIC	16	24,7	3,2	187,4	3,54	88,9*	3,54	2,18	0,15
		MS	26	25,5	2,5	183,8*	4,52	84,7*	3,82	2,09*	0,05
2	C–1 male	HMS	6	23,0	4,5	195,1*	2,54	87,1*	2,46	2,22	0,58
		MSIC	12	23,9	2,8	192,7	3,58	87,4	2,74	2,20	0,25
		MS	28	25,1	2,9	184,8*	4,56	82,9*	2,93	2,08	0,32
3	K–1 fem.	HMS	6	24,0	2,5	173,1	2,94	68,1	2,52	1,81	0,35
		MSIC	8	22,0	2,5	171,4	2,81	65,7	3,61	1,77	0,28
		MS	18	22,5	3,5	169,1	2,23	64,1	2,84	1,74	0,45
4	C–1 fem.	HMS	4	24,0	2,5	173,1	2,47	68,0	2,42	1,81	0,52
		MSIC	6	22,0	2,5	171,3	2,55	65,8	2,92	1,77	0,23
		MS	12	23,5	2,8	169,1	2,92	64,1	3,59	1,74	0,36

Note. t – Student's test, * – p<0,05.

Among men in canoe rowing, the body length of HMS, MSIC and MS were on average respectively: 192,0±3,8 cm; 187,3±3,5 cm and 183,8±4,5 cm. Differences are statistically reliable (p<0,05) among HMS and MS.

These indicators were the most informative. In the team boats-pair at the same distance (table 2), a similar tendency is observed, i.e. the most outstanding figures are the Honored Masters of Sports, which do not significantly exceed the Masters of Sports of the International Class and Masters of Sports of the Republic of Belarus. Significant statistical differences (p <0,05) in body weight were noted among men–HMS and MS in kayaks. The difference in these groups was averaged in 3,8 kg. When analyzing the remaining length, weight and absolute body surface of the examined groups of sportsmen, no statistically significant differences were found.

Table 2

Age and Morphological Indicators of Highly Skilled Belarusian Oarsmen in Team Kayaks-pair and Canoes-pair for Distance of 200 Meters

№	Boat rate	Participants Category	n	Age, *years*		Body Length, *cm*		Body Weight, *kg*		Absolute Body Surface, m^2	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–2 male	HMS	24	22,0	2,7	186,05	3,86	85,08*	3,56	2,13	0,18
		MSIC	26	24,7	3,2	184,81	2,92	81,54	3,85	2,08	0,26
		MS	28	25,5	2,5	184,04	3,62	81,24*	2,94	2,07	0,38
2	C–2 male	HMS	12	23,0	4,5	185,08	4,85	78,53	3,62	2,05	0,24
		MSIC	18	23,9	2,8	181,23	2,92	77,71	2,86	1,99	0,22
		MS	23	25,1	2,9	180,35	3,52	77,28	2,47	1,98	0,18
3	K–2 fem.	HMS	12	22,0	2,5	171,58	3,89	64,54	2,96	1,76	0,25
		MSIC	14	20,0	2,5	170,53	4,07	64,76	3,83	1,75	0,28
		MS	19	21,5	2,5	168,48	2,96	63,92	4,25	1,72	0,27
4	C–2 fem.	HMS	6	23,0	2,5	171,54	2,8	64,53	2,33	1,76	0,38
		MSIC	10	20,0	2,5	170,56	3,48	64,77	3,45	1,75	0,21
		MS	12	21,5	2,5	168,43	2,27	63,92	4,23	1,72	0,28

Note. t – Student's test, * – p<0,05.

In single boats for distance of 500 meters (table 3) the best results also showed HMS, more than MSIC and MS. The body length of oarsmen among HMS, MSIC and MS was on average: 192,0±2,9 cm; 192,7±2,9 cm and 184,0±2,9 cm. Differences of body length among oarsmen-HMS and MS are statistically reliable (p<0,05).

Table 3

Age and Morphological Indicators of Highly Skilled Oarsmen in Kayaks-single and Canoes-single for Distance of 500 Meters

№	Boat Rate	Participants Category	n	Age, *years*		Body Length, *cm*		Body weight, *kg*		Absolute Body Surface, m^2	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–1 male	HMS	12	22,0	3,5	188,0	4,96	91,1	3,82	2,19	0,21
		MSIC	16	24,7	3,8	186,3	3,52	85,0	3,53	2,11	0,26
		MS	26	24,5	2,5	183,6	3,42	84,2	4,17	2,08	0,34
2	C–1 male	HMS	8	25,0	4,5	192,1*	3,91	95,0	4,85	2,27	0,29
		MSIC	12	25,9	3,8	192,7	4,06	90,7	3,25	2,23	0,25
		MS	18	22,1	4,9	184,0*	3,28	83,1	4,06	2,07	0,28
3	K–1 fem.	HMS	6	24,0	2,5	171,6	3,07	64,6	3,49	1,76	0,24
		MSIC	14	23,0	2,5	170,6	2,84	64,8	3,89	1,75	0,14
		MS	16	24,5	2,5	168,4	2,64	63,9	3,26	1,72	0,44

Note. t – Student's test, * – p<0,05.

The same tendency was found among single rowing and pair rowing for distance of 500 m (table 4). So, canoeists-HMS possessed greater indicators than MSIC and MS. The parameters of the HMS length, weight and absolute surface of the body in canoe rowing, were slightly inferior to MSIC. At the same time, they had a significant difference in body length, which averaged 8 cm in comparison to MS in canoeing. These differences are statistically significant (p <0,05). For the rest of the indicators, there were no significant differences in all the examined groups.

Table 4

Age and Morphological Indicators of Highly Skilled Oarsmen in Team Kayaks-pair and Canoes-pair for Distance of 500 Meters

№	Boat Rate	Participants Category	n	Age, *years*		Body Length, *cm*		Body Weight, *kg*		Absolute Body Surface, m^2	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–2 male	HMS	12	22,0	3,5	188,0	2,91	91,0	3,85	2,19	0,21
		MSIC	16	24,7	3,8	186,4	2,92	85,1	3,51	2,11	0,26
		MS	26	24,5	2,5	183,7	2,92	84,3	4,18	2,08	0,34
2	C–2 male	HMS	8	25,0	4,5	192,1*	2,92	95,0	4,85	2,27	0,29
		MSIC	12	25,9	3.8	192,7	2,97	90,7	3,22	2,23	0,25
		MS	18	22,1	4.9	184,0*	2,92	83,1	4,03	2,07	0,28
3	K–2 fem.	HMS	6	24,0	2,5	171,5	2,97	64,6	3,46	1,76	0,24
		MSIC	14	23,0	2,5	170,6	2,92	64,8	3,87	1,75	0,14
		MS	16	24,5	2,5	168,5	2,93	63,9	3,83	1,72	0,44

Note. t – Student's test, * – p<0,05

At a distance of 1000 m (table 5), the HMS in male and female kayak-single also outperformed MSIC and MS in their classes. The other picture was observed among the canoeists, where the HMS was insignificant, but inferior in terms of the total size of the MSIC and the MS. The difference in the length, weight and absolute surface parameters of the rowers was 6,8 and 5,8 cm, respectively; 3,8 and 2,6 kg; 0,09 and 0,06 m^2. Therewith, the length and body weight of kayakers-HMS and MS, as well as canoeists are statistically significant (p <0,05). Between women, the differences in length and body weight among HMS and MS were statistically significant (p <0,05).

Table 5

Age and Morphological Indicators of Highly Skilled Oarsmen in Kayaks-single and Canoes-single for Distance of 1000 Meters

№	boat Rate	Participants Category	n	Age, *years*		Body Length, *cm*		Body Weight, *kg*		Absolute Body Surface, m^2	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–1 male	HMS	12	22,0	3,5	186,0*	3,92	85,0*	3,82	2,13	0,28
		MSIC	16	24,7	3,8	181,8	4,93	79,5	5,44	2,01	0,23
		MS	26	21,5	2,5	180,2*	3,59	79,4*	5,16	1,99	0,18
2	C–1 male	HMS	8	25,0	4,5	175,5*	2,82	77,0	3,94	1,95	0,24
		MSIC	12	25,9	3,8	182,4	2,92	81,2	3,66	2,04	0,26
		MS	18	22,1	4,9	181,7*	4,26	79,6*	4,48	2,01	0,18
3	K–1 fem.	HMS	6	24,0	2,5	173,0*	2,63	68,1	3,91	1,81	0,28
		MSIC	14	23,0	2,1	171,4	4,03	65,7	3,45	1,77	0,29
		MS	16	22,5	2,0	169,0*	4,91	64,0*	3,16	1,74	0,48

Note. t – Student's test, * – p<0,05.

In team boats–pair at a distance of 1000 m (Table 6), HMS also outperformed MSIC and MS. This is especially expressed among HMS in the kayak-pair, where the length, weight and relative surface of the body of HMS differed from MSIC and MS by 4,2 and 5,8 cm, respectively; 3,5 and 3,2 kg; 0,12 and 0,14 cm^2. Therewith, the length and body weight of male kayakers-HMS and MS, as well as of canoeists are statistically significant (p <0,05).

Table 6

Age and Morphological Indicators of Highly Skilled Oarsmen in Team Kayaks-pair and Canoes-pair for Distance of 1000 Meters

№	Boat Rate	Participants Category	n	Age, *years*		Body Length, *cm*		Body Weight, *kg*		Absolute Body Surface, *m*	
				$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ	$\overline{X}$	σ
1	K–2 male	HMS	14	23,5	3,2	188,1	2,12	85,0*	2,82	2,13	0,18
		MSIC	18	26,3	2,8	186,4	3,06	79,5	2,32	2,01	0,23
		MS	32	23,8	2,5	183,7	4,53	79,5*	2,91	1,99	0,25
2	C–2 male	HMS	8	28,0	3,5	192,1	3,95	77,7	3,35	1,95	0,24
		MSIC	16	25,5	2.6	192,7*	2,34	81,8	3,69	2,04	0,27
		MS	26	24,9	3.5	184,0	2,74	79,6	4,36	2,01	0,18
3	K–2 fem.	HMS	6	18,0	2,5	171,6	4,93	68,7*	3,64	1,81	0,21
		MSIC	14	20,0	3,2	170,5	3,67	65,7	3,84	1,77	0,18
		MS	16	21,5	3,0	168,4	3,91	64,6*	4,27	1,74	0,26

Note. t – Student's test, * – p<0,05.

Thus, while studying the total body size, a fairly clear pattern of the reliable correlation of these parameters with the athletic result was found. Honored Masters of Sports in almost all indicators of total body size had advantages over Masters of Sports of International Class and Masters of Sports.

Conclusions:

1. The greatest body length in the class of single boats on kayaks and canoes at a distance of 200 meters was noted for both men and women–HMS, the smallest – MS sportsmen. A similar trend was noted in body weight, with the exception of a canoe-single, where the highest values were noted among MSIC athletes (p> 0,05).

2. In rowing on canoes and kayaks at a distance of 200 meters, the largest length and body weight values were recorded among highly qualified athletes HMS, with the exception of the body weight of sportswomen–canoeists, where this figure is higher among MSIC (p> 0,05).

3. In single rowing at a distance of 500 meters, kayakers and canoeists of HMS had better indicators of body length and weight, MS rowers – the worst, except for single canoeists in body length, where the longer body length was marked among MSIC (p> 0,05). Among women specializing in single kayak, the highest rates were noted among MSIC (p> 0,05).

4. In the class of boat-pair at a distance of 500 meters it was marked a similar trend, as among single rowers. So, kayakers and canoeists-HMS had higher rates than MSIC and MS, except for single canoeists in body length, where a larger body length was noted among MSIC (p> 0,05) and a single kayak between women, the highest rates were noted in female MSIC (p> 0,05).

5. At a distance of 1000 meters, the HMS in the men's and women's kayak–single was also superior to the MSIC and the MS in their classes; in the canoe, the MSIC sportsmen (p> 0,05) were the mhighest in length and body weight.

6. In team boats-pair at a distance of 1000 meters, kayakers and canoeists–HMS surpassed the MSIC and MS.

Джерела та література

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