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CHARACTERISTICS OF ANTHROPOLOGICAL AND FORCE INDICATORS OF SPORTSWOMEN OF VARIOUS QUALIFICATION KAYAK ROWING

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Abstract

Topicality. Morphological features of the man is one of the genetically predetermined factors, which most fully and clearly determines the individual specificity, allowing to assess a person's capabilities in a particular sport. Record achievements are demonstrated by those who have the most optimal morphofunctional data. **The aim of work** was to investigate the anthropological and power indexes of sportswomen of different qualification in rowing on kayaks. **Material and Methods of Research.** A total of 136 sportswomen were surveyed. Of these, athletes of high qualification – 57 people. Age of subjects is ranging between 13 to 26. The comprehensive examination included anthropometric measurements of total, longitudinal, transverse body dimensions, diameters, girths, partial body dimensions, and analysis of components of body composition. **Results.** When comparing the indicators of the anthropological survey, it was revealed that the greatest length and weight of the body, the circumference of the chest and the absolute surface of the body were noted by athletes of the elite, and the least indicators were noted at the athletes of the second grade. With age and advanced training, total dimensions and indicators of absolute and relative muscle mass increase, which is due to age-related changes and the influence of rowing classes on the athletes. Analysis of the components of the weight composition of athletes showed that with increasing age and athletes' qualifications, the fat mass declines. There is also an increase in the circumferential dimensions of the body, the kayak strength indicators. **Conclusions.** Morphofunctional indices of athletes of different qualification groups engaged in kayaking rocks were studied. It is revealed that with the increase of qualification there is an increase in muscle and a decrease in fat mass. It is noted that the greatest morphofunctional indicators are with athletes of the elite group: Honored masters of sports and masters of sports of international class. The model characteristics of kayak-athletes elaborated developed by us, differing in qualifications from the honored masters of sports to the second level, can be used for selection and sport orientation in the rowing at various stages of preparation and control of the dynamics of the morphofunctional state in the annual training cycle.

Key words: rowing, kayak, morphofunctional indices.

Володимир Давидов, Володимир Шантарович, Дмитро Пригодич. Характеристика антропологічних та силових показників спортсменок різної кваліфікації в гребелі на байдарках. Актуальність. Морфологічні особливості людини – одна з генетично задалегідь визначених факторів, що найбільш повно та наочно визначає індивідуальну специфічність дає змогу цінити можливості людини в тому чи іншому виді спорту. Рекордні досягнення демонструються саме тими, хто володіє найбільш оптимальними морфофункціональними даними. **Мета роботи** – дослідити антропологічні й силові показники спортсменок різної кваліфікації в гребелі на байдарках. **Матеріал і методи дослідження.** Усього обстежено 136 спортсменок, із них високої кваліфікації – 57. Вік досліджуваних – 13–26 років. Комплексне обстеження включало антропометричні вимірювання тотальних, повздовжніх, поперечних розмірів тіла, діаметрів, обхватів, часткових розмірів тіла та аналізу компонентів маси тіла. **Результати.** За зіставлення показників антропологічного обстеження виявлено, що найбільша довжина та маса тіла, обхват грудної клітини й абсолютна поверхня тіла відзначаються в спортсменок еліти, найменші показники – у досліджуваних II розряду. Із віком і підвищенням кваліфікації тотальні розміри та показники абсолютної та відносної м'язової маси збільшуються, що пов'язано з віковими змінами та впливом заняття греблею в спортсменок. Аналіз компонентів складу маси тіла досліджуваних засвідчив, що зі збільшенням віку та кваліфікації спортсменок

показники жирової маси зменшуються. Також відзначається збільшення обвідних та силових показників спортсменок. **Висновки.** Вивчені морфофункціональні показники досліджуваних різних кваліфікаційних груп, які займаються гребнями на каяках. Виявлено, що з підвищенням кваліфікації відбувається збільшення м'язової й зменшення жирної маси тіла. Відзначено, що найбільшими морфофункціональними показниками володіють спортсмени елітної групи: заслужені майстри спорту та майстри спорту міжнародного класу. Розроблені нами модельні характеристики для спортсменок-байдарочниць, різної кваліфікації від заслужених майстрів спорту до II-го розряду можна використовувати для відбору й спортивної орієнтації в греблі на різних етапах підготовки та контролю динаміки морфофункціонального стану в річному циклі підготовки.

Ключові слова: гребля, байдарка, морфофункціональні показники.

Владимир Давыдов, Владимир Шантарович, Дмитрий Пригодич. Характеристика антропологических и силовых показателей спортсменок различной квалификации в гребле на байдарках.

Актуальность. Морфологические особенности человека – один из генетически предопределенных факторов, наиболее полно и наглядно определяющий индивидуальную специфичность, позволяющий оценить возможности человека в том или ином виде спорта. Рекордные достижения демонстрируются именно теми, кто обладает наиболее оптимальными морфофункциональными данными. **Цель работы** – исследовать антропологические и силовые показатели спортсменок различной квалификации в гребле на байдарках.

Материал и методы исследования. Всего обследовано 136 спортсменок. Из них высокой квалификации – 57 человек. Возраст испытуемых – от 13 до 26 лет. Комплексное обследование включало антропометрические измерения тотальных, продольных, поперечных размеров тела, диаметров, обхватов, частичных размеров тела и анализ компонентов состава массы тела. **Результаты.** При сопоставлении показателей антропологического обследования выявлено, что наибольшая длина и масса тела, обхват грудной клетки и абсолютная поверхность тела отмечается в спортсменок элиты, наименьшие показатели отмечаются у спортсменок II разряда. С возрастом и повышением квалификации тотальные размеры и показатели абсолютной и относительной мышечной массы увеличиваются, что связано с возрастными изменениями и влиянием занятий греблей у спортсменок. Анализ компонентов состава массы тела спортсменок показал, что с повышением возраста и квалификации спортсменок показатели жировой массы уменьшаются. Также отмечается увеличение обхватных размеров тела, силовых показателей байдарочниц. **Выводы.** Изучаются морфофункциональные показатели спортсменок разных квалификационных групп, занимающихся греблей на байдарках. Вывявлено, что с повышением квалификации происходит увеличение мышечной и уменьшение жировой массы. Отмечается, что наибольшими морфофункциональными показателями обладают спортсменки элитной группы: заслуженные мастера спорта и мастера спорта международного класса. Разработанные нами модельные характеристики спортсменок-байдарочниц разной квалификации от заслуженных мастеров спорта до II-го разряда можно использовать для отбора и спортивной ориентации в греблю на различных этапах подготовки и контроля динамики морфофункционального состояния в годичном цикле подготовки.

Ключевые слова: гребля, байдарка, морфофункциональные показатели.

Introduction. Currently, the trainers in selection of perspective rowers mainly rely on pedagogical criteria. They are guided by the rapidity of mastering the technique of rowing, take into account the intensity of the progress of sports results and the levels of the formation of specific physical abilities [2]. These qualities, characteristics and abilities are temporary and cannot significantly affect the prospects of oarsmen in their further sports activities. [1]. The constitution is one of the most important factors, which largely determines success in rowing. The discrepancy between the rates of morphological development and the proper characteristics makes the athletes compensate this shortcoming by forcing the work of other systems of the body [4]. In conditions of competitive activity, when the athlete's body is in the state of maximum stress of all functional systems, such compensation causes additional expenditure of energy, which, in turn, leads to a reduction in its reserve capabilities [3].

Indicators of the morphofunctional status of athletes of various specializations and qualifications are the least studied in sports practice. According to E.G. Martirosov [5], it is not known what requirements the strongest athletes of different specializations should meet; whether there are differences in the selection of criteria and factors that influence the achievement of the same specializations concerning men and women.

Purpose of work was to investigate the anthropological and strength indicators of sportswomen of various skills in rowing kayaks.

Methods and objects of research. 136 athletes were examined. High-qualified athletes (HMS – Honoured Sport Master, MSIG – Master of Sports of International Grade, MS – Master of Sport) were 57 people, CMS were 28 people, I class – 26 people, II class – 25 people. The age of the probationers is 13 to 26.

The complex examination included anthropometric measurements of total, longitudinal, transverse body dimensions, diameters, girths, partial body sizes (Popescu tests), and analysis of the components of the body mass composition (J. Matieka, 1921).

Measurement of longitudinal body sizes was conducted by Martin's anthropometer according to the common method (V. V. Bunak, 1941). Diameters measurement was carried out by big spreading calipers. Straps measurement was led by centimetric tape with accuracy of measurement up to 1 cm. Mass of the body was defined with the help of medical balance with price of division 50 gr. Popesku's Tests include measurement of the hands scope (cm), length of the body sitting with the hands upwards (cm) and length of the body sitting up to 7-cervical vertebra (cm). Handgrip and deadlift dynamometry of both hands was also measured with the help of dynamometer (kg).

According to the results of measurements average sizes of morphofunctional ratings, coefficient of variation were determined. The Student's method was used to determine the difference between the average arithmetic anthropometric characteristics of athletes of different qualifications.

Results and discussion. The analysis of total body sizes of sportswomen-kayakers of different qualification is presented in Table 1.

While comparing the ratings of anthropological test, it was revealed that the largest length and mass of the body, the strap of chest and absolute body surface is noted with the sportswomen of the elite (HMS and MSIC), least ratings are noted concerning sportswomen of the II class.

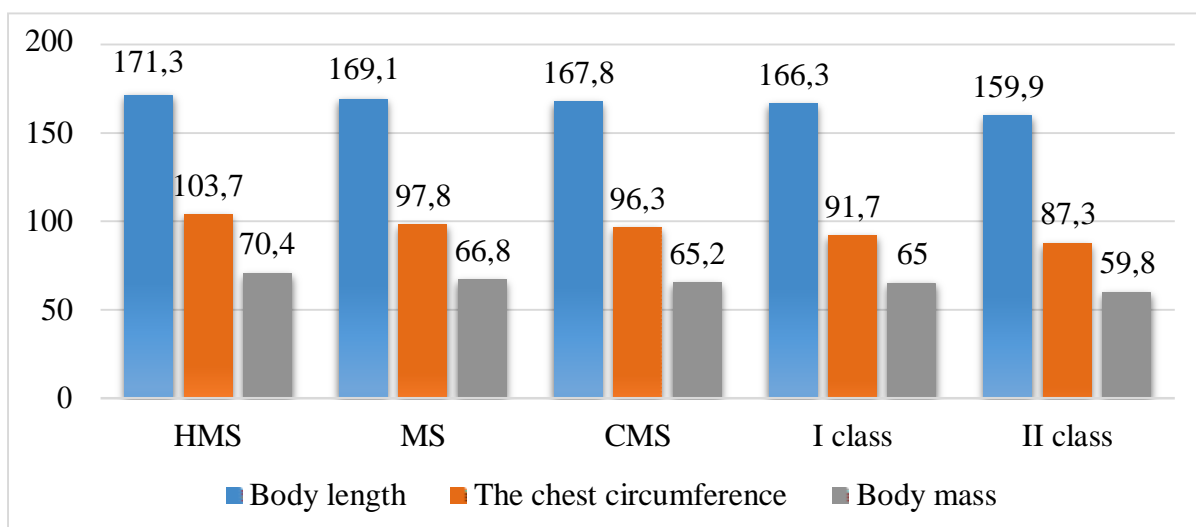
Table 1

Total body size of sportswomen-kayakers, with different qualifications ($M \pm \sigma$)

№	Qualification	n	Length bodies, cm	Mass bodies, kg	Chest circumference, cm	Absolute body surface, m ²
1.	HMS, MSIC	27	171,3±5,18*	70,4±6,03*	103,7±3,8*	1,81±0,09*
2.	MS	30	169,1±5,20	66,8±5,11*	97,8±3,42*	1,72±0,08*
3.	CMS	28	167,8±6,03	65,2±5,38	96,3±4,01	1,70±0,09*
4.	I class	26	166,3±5,37*	65,0±6,40	91,7±3,82	1,69±0,07*
5.	II class	25	159,9±5,11*	59,8±6,18*	87,3±2,34*	1,62±0,06

Notes: *t*-the Student criterion, * - $p < 0,05$, * - $p < 0,01$.

The differences are significant in body length between HMS and MSIC and the I – II class ($p < 0,05$), in body weight and chest circumference between the same groups ($p < 0,05$), in absolute body surface between HMS-MSIC and MS, CMS, the I class ($p < 0,05$), HMS and MSIC and the I class ($p < 0,01$) (pic.1).



Pic. 1. Body length, chest circumference and body mass of sportswomen-kayakers of different qualifications.

Total sizes are increased with the age and the improvement of professional skills which is connected with the age changes and the influence of rowing practice on sportswomen.

In Table 2 partial sizes of the body (Popescu's tests) are presented and body proportions of sportswomen-kayakers of various qualification.

Table 2

Partial sizes of the body (Popescu's tests) and body proportions of sportswomen-kayakers with different qualifications (M±σ)

Indicators	HMS, MSIC	MS	CMS	I category	II category
n	27	30	28	26	25
Body length, cm	54,1±3,13*	52,8±2,82	48,9±2,41	46,1±3,01*	44,1±2,34*
Arm length, cm	76,3±2,11	75,0±2,43	73,8±1,36	72,6±2,12	72,0±2,34
Scope of hands, cm	182,3±2,34*	177,1±3,6*	173,4±3,18*	166,4±3,8*	164,3±2,42*
The length of the body sitting with outstretched hands, cm	143,1±3,16*	139,3±2,1*	136,4±2,22	131,4±1,99*	130,1±2,17*
«The operating position of the kayaker»	113,0±3,00*	108,9±3,3*	105,1±3,12	103,0±4,2*	100,1±4,52*

Notes: t-Student test, * - p<0.05, * - p<0.001.

The analysis showed that all the presented indicators of partial body size and Popescu tests have a linear relationship, i.e., with the improvement of qualification, these indicators increase, which is due to the natural growth of morphological indicators.

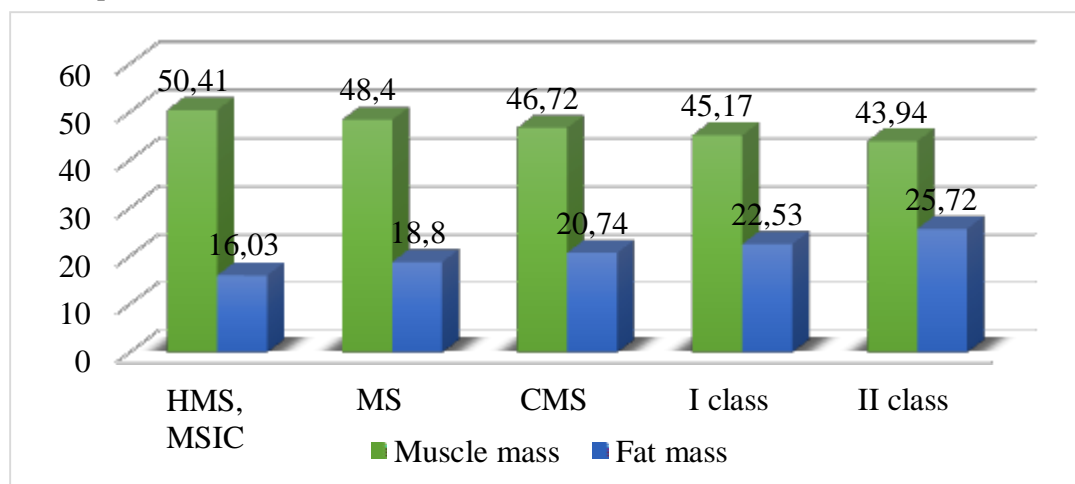
The athletes of elite (HMS and MSIC) have the highest rates of part-body measurements (tests Popescu) and some body proportions, athletes of the II class have the lowest rates.

According to body length differences are authentic between the HMS–MSIC and female athletes of the I and the II class (p<0.05). As for the length of the hands the differences are statistically not authentic, the arm span reliably significantly differs between the HMS–MSIC and CMS (p<0,05), HMS and MSIC – athletes of I and II class (p<0,001) between MS – sportswomen of the I and II class (p<0,05), between CMS and athletes of the II class (p<0,05).

As for the length of the body sitting with outstretched hands the difference is statistically significant between the HMS–MSIC and female athletes of the I and II class (p<0,05), and MS athletes of the II class (p<0,05).

In «working position of the kayaker» the difference is statistically significant between the HMS–MSIC and female athletes of the I and II class (p<0,001), and MS athletes of the II class (p<0,05).

The composition of the components of the weight of athletes in rowing kayaks of various qualifications are presented in pic. 2.

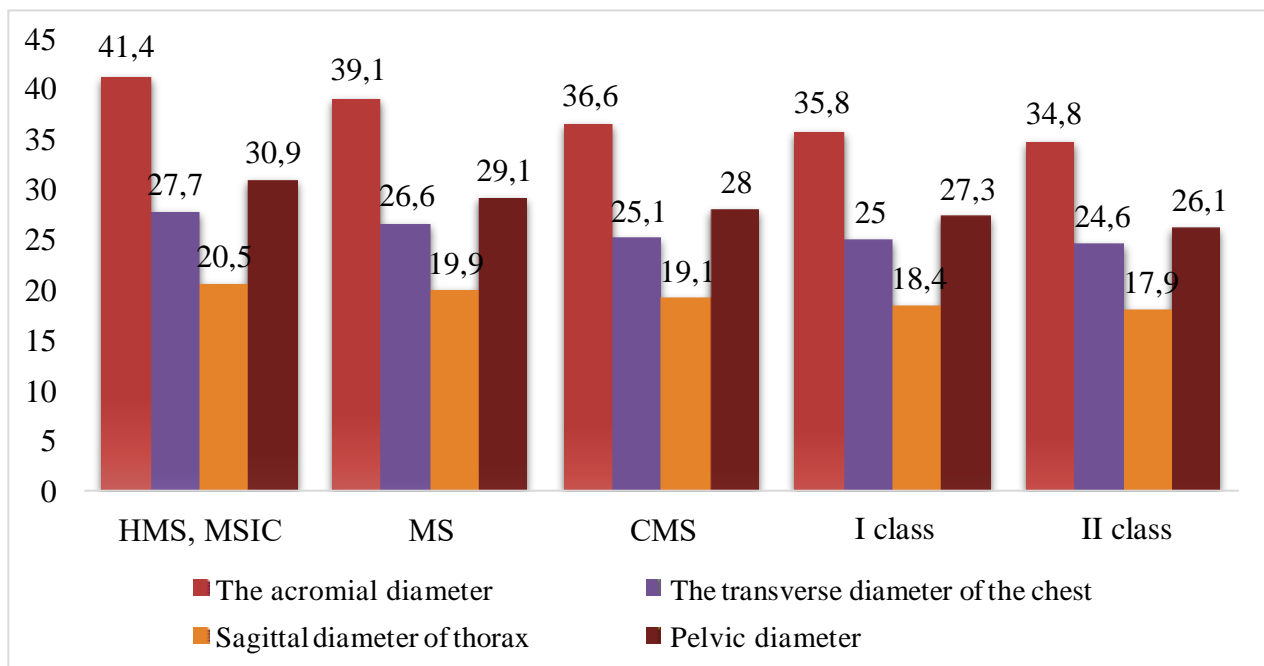


Pic.2 Relative muscle and fat mass (%) of female athletes of various skill levels who specialize in kayaking

The analysis of the components of the body weight of athletes involved in rowing kayaks of various qualifications showed that elite athletes have the lowest values of absolute and relative fat mass, athletes of the II class have the largest values of absolute and relative fat mass. Fat mass (kg and %) is reduced with increasing age and qualification of athletes, indicating the impact of rowing on these indicators. Distinctions are in relative fatty mass between HMS sportswomen - MSIC and sportswomen of the I class ($p < 0,05$), HMS - MSIC and sportswomen of the II class ($p < 0,01$), on absolute HMS - MSIC and the sportswomen of the II class ($p < 0,05$).

Female athletes of the elite (HMS and MSIC) have the greatest absolute and relative muscle mass, female athletes of the II class have the lowest rates. The rates of absolute and relative muscle mass increase with the improvement of qualification, which is connected with rowing. Differences are significant in absolute muscle mass between HMS-MSIC and athletes of the II class ($p < 0,05$), relative muscular mass between HMS-MSIC and athletes of the I and II class ($p < 0,05$).

Fig. 3 shows the transverse dimensions of the body of athletes of various qualifications involved in kayaking.



Pic.3 Cross-sectional dimensions of the body (cm) of athletes of various qualifications specializing in rowing kayaks

Analysis of the transverse dimensions of the body of canoeists of various qualifications showed that the athletes of the elite (HMS and MSIC) have the largest indicators of transverse body dimensions (width of shoulders and pelvis, transverse and sagittal diameter of the chest), and athletes of the II class have the least indicators of transverse body dimensions.

Differences are significant only in terms of the acromial diameter (shoulder width) between HMS and MSIC and female athletes of the II class ($p < 0,05$).

The analysis of the body dimensions of canoeists presented in Table 3 showed that elite athletes (HMS and MSIC) have the largest indicators of body size, the lowest rates were registered in athletes of the II class.

The greatest excursion of the chest was noted in masters of sports, the smallest in athletes of the II class.

With the increase in qualification, an increase in body circumference is noted, which is associated with age-related changes and the influence of rowing.

In chest circumference on inspiration, differences are significant between HMS-MSIC and MMR ($p < 0,05$), between HMS-MSIC and athletes of the I and II class ($p < 0,01$), between MS and athletes of the II class ($p < 0,05$).

As for chest circumference as a result of exhalation, differences are significant between HMS-MSIC and athletes of the I and II class ($p < 0,01$).

The differences between athletes in a chest excursion are unreliable. The differences in the arm circumference in a strained state are only noticeable between HMS-MSIC and athletes of the II class ($p < 0.05$).

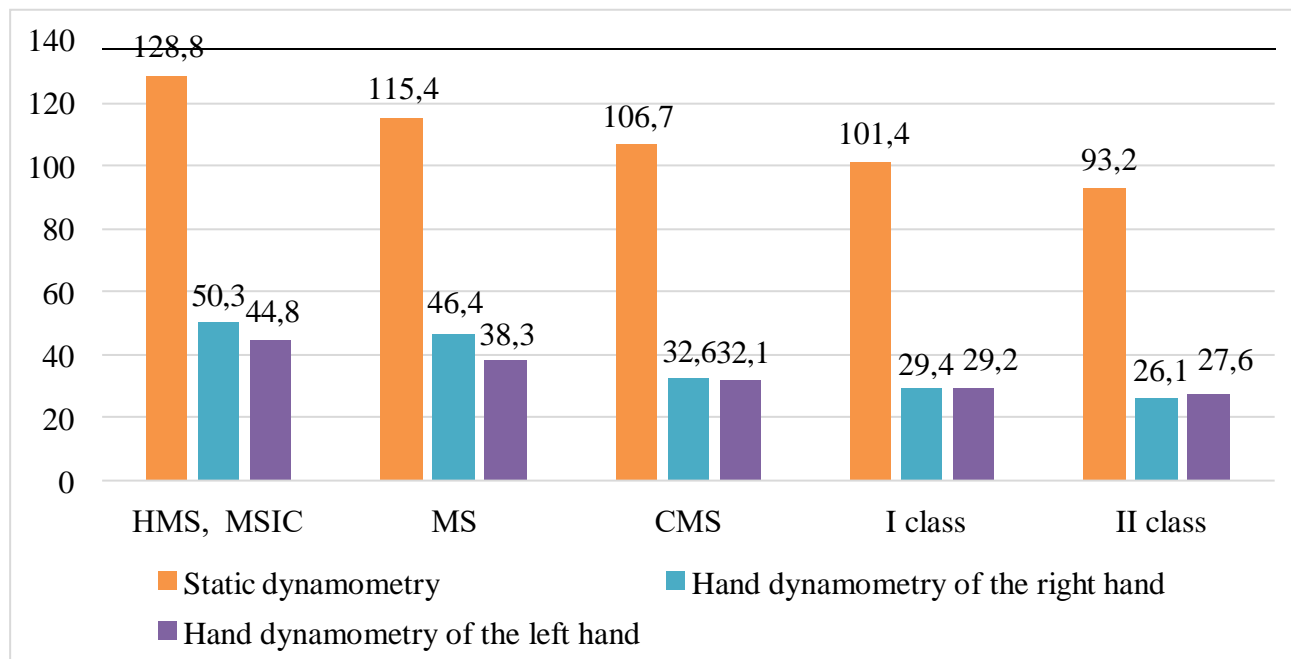
Table 3

The body dimensions of athletes, kayakers of various qualifications ($M \pm \sigma$)

Indicators	HMS, MSIC	MS	CMS	I class	II class
n	27	30	28	26	25
Chest circumference (inhalation) cm	106,7±2,72**	98,0±3,23*	96,3±28,0*	94,5±3,07*	90,3±5,51**
Chest circumference (exhalation), cm	99,3±2,90*	88,7±2,80	88,1±2,92	86,6±2,05*	82,9±4,72*
Chest excursion, cm	7,4±1,54	9,3±1,46	8,2±1,71	7,9±1,32	65,0±2,34
Girth of the shoulder (tensely), cm	32,6±2,43*	30,4±2,01	29,9±2,17	28,1±2,46	26,8±2,18*
Shoulder circumference (relaxed), cm	30,6±1,18	28,5±2,16	27,9±1,38	25,6±1,73	24,9±2,01
Girth of forearm, cm	28,3±2,46	25,4±3,33	25,2±1,66	23,4±1,90	23,2±1,42
Hip circumference, cm	58,6±2,72*	58,6±3,36	55,2±2,76	51,4±3,17	49,7±3,34*
Chest circumference, cm	36,4±1,76	34,1±1,44	33,5±1,34	32,8±2,17	32,0±1,68

Notes: *t*-Student test, * - $p < 0,05$, ** - $p < 0,001$.

As for the forearm, the differences are unreliable. In terms of the hip circumference, the differences are significant between HMS - MSIC and athletes of the I and II class ($p < 0.05$). On the shin circumference the differences are not noticeable ($p > 0.05$). Analysis of the strength indicators of canoeists of various qualifications is presented in Fig. 4.



Pic.4 Static and carpal dynamometry (kg) of athletes of various qualifications specializing in rowing kayaks

Analysis of power indicators of kayakers of various qualifications has shown that the greatest indicators of machine and hand dynamometry (right and left) are the hands of athletes of HMS and MSIC, the smallest athletes of the II class.

According to the carina dynamometry (right hand), differences are significant between HMS and MSIC and the athletes of the CMS and of the I and II class (from $p < 0,05$ to $p < 0,001$), between MS and athletes of the I and II class ($p < 0.05$).

By carpal dynamometry (left hand), differences are significant between athletes HMS-MSIC and athletes of the I and II class ($p < 0.05$).

Conclusions. Morfofunctional indicators of athletes of different skill groups engaged in canoeing have been studied.

It was revealed that with an increase in skill there is an increase in muscle and a decrease in fat mass.

It is noted that athletes of elite group HMS and MSIC possess the greatest morfofunctional indicators.

The model characteristics of sportswomen-kayakers, different qualifications from HMS to the II class, developed by us, can be used for selection and sports orientation in rowing at various stages of preparation and control of the dynamics of the morphofunctional state in one year training cycle.

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