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FLEKSIBILITY AND STRENGHT OF ROWERS

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STRESZCZENIE

Wstęp: Aktywność fizyczna jest niezbędna do prawidłowego funkcjonowania układu ruchu. Zarówno niedobór jak i nadmiar ruchu może być szkodliwy. Zagadnienie to w dużym stopniu dotyczy kwalifikowanych zawodników różnych dyscyplin sportowych. Wioślarstwo, to sport wymagający i aktywizujący większość mięśni człowieka. Nieodpowiednie uprawianie tej dyscypliny sportowej może prowadzić do poważnych zaburzeń układu ruchu. Mogą one wynikać zarówno ze specyfiki dyscypliny jak i obciążeń treningowych.
Cel i hipotezy pracy: Celem pracy było stwierdzenie różnic poziomu siły i gibkości zawodników zróżnicowanych rodzajem stosowanego wiosła. Przyjęto hipotezę, o większych dysproporcjach siły i gibkości zawodników wioseł długich.
Materiał i metody: Badaniami objęto wioślarzy lewego i prawego wiosła oraz wioseł symetrycznych w wieku od 15 do 28 lat z większym niż 3 letnim stażem treningowym. Dokonano pomiarów wysokości i masy ciała zawodników, zakresów ruchomości tułowia oraz siły w ruchach: zgięcia tułowia w przód, przeprostu tułowia, rotacji w lewą i prawą stronę oraz zgięcia bocznego w prawą oraz lewą stronę. Dokonano analizy materiału w zakresie jego rozkładu, porównań wynikających ze zróżnicowania używanego wiosła oraz porównań wewnątrzgrupowych. Do oceny statystycznej zastosowano testy: Shapiro-Wilka, Wilcoxona**,** Kruskala-Wallisa, Chi-kwadrat oraz analizę korelacji r Paersona.
Wyniki: Stwierdzono, że wioślarstwo symetryczne sprzyja równomiernemu rozwojowi siły mięśniowej tułowia zawodników. Spostrzeżono, że wioślarze pływający na wiośle długim cechują się większą siłą rotacji tułowia w stronę używanego wiosła. Zaobserwowano, że

zarówno wioślarzy asymetrycznych jak i symetrycznych cechuje duża zależność siły rotacji tułowia w prawą i lewą stronę ciała.
Wnioski: Sformułowano wnioski o dużym wpływie budowy morfologicznej na wynik sportowy, niezależnie od rodzaju używanego wiosła i potrzeby wprowadzania do treningu ćwiczeń symetryzujących wielkości badanych parametrów, co wpłynęłoby korzystnie na obniżenie ryzyka kontuzji oraz poprawę wyników sportowych.

SUMMARY

Introduction: The physical activity is essential for the normal functioning of the musculoskeletal system. Both deficiency and excess of motion can be harmfull. This issue mostly concern all kinds of sport players. The rowing, as a sport discipline, is physicly demanding so that activates most of human muscles. An inadequate training can lead to serious disorders of the musculoskeletal system. Demages can be caused by the nature of particular sport discipline or training loads.
Aim of the thesis: The main goal is to examin and present differences in force level and flexibility factor among sportsman according to used oar. Take hypothesis that bigger inequality in strenght and flexibility have rowers of oar.
Material and methodology: Research covered rowers of left and right oar and also symmetric paddle in age between 15 to 28 years old with at least 3 years training experience. From all contestants measurement of weight and height were taken. Another examined factors were range of corps movement and strenght in moves: a corps flexion forward, hyperextension of the corps, rotation into left and right and lateral flexion on the left and right side. Material was analized by normal distribution and comparison of inner group. Results of rowers were compered by groups used various rowing equipment.
Results: It is said, that symmetric rowing supports steady muscle strenght development in players corpses. Other noticed issue concerning rowers using oars is possesion of bigger force for corps rotation towards hand used for rowing. It is also observed for both symmetric and asymmetric rowers that they have better strenght of corps rotation on whatever side of the body.
Conclusions: Research confirms sygnificant influence of morphology on sport results but with no visible difference in used rowing tools or in force inequality of oar players and their lack of flexibility The introducion of symmetric excercises can be beneficial for athletes especially in intesive training period by decreasing risk ijury and improvement of sport achievements.

Słowa kluczowe: GIBKOŚĆ; SIŁA; WIOŚLARZY

Key words: FLEKSIBILITY; STRENGHT; ROWERS

ADMISSION

Rowing is a popular form of recreation and a sport that can be practiced on many levels, and the general perception is considered physical activity that benefits health [1,2,3,4]. They can grow so symmetrically rowing. short oars or asymmetrically so. Long paddle (right or left). Many years of training, and particularly aimed at developing forces certain muscle groups, depending on the type of paddles, may lead to serious disorders of symmetry of the body of players, often favors the formation of long and difficult to treat injury [5,6,7]. Generated overload of traffic due largely inadequate rowing motion technique, and the published literature, including research teams work environment Bydgoszcz, allow to conclude,
The aim of this study was to assess asymmetry of muscle strength and flexibility of the body in the trunk rowers different kind of oar used, as well as to establish the relationship between

muscle strength and mobility of the spine of players and the basic morphological characteristics.
Hypothesis erected larger disparities in muscle strength and range of movement, the torso of players paddles long and strong relationship of these characteristics to the basic somatic features.

MATERIAL AND METHOD

In the 2016 study were athletes Bydgoszcz rowing clubs, which belong to the national arena for leading in this sport. We examined 30 young players aged 15-20 (18.83 ± 3.02) years with a body height 188.47 ± 6.42 and 82.65 ± body mass index of 11.16 and 1.23 ± 0.14 Rohrer floating on a long paddle left or right, and players also using short paddles. In the period preceding the survey, they have done a week 6 training units, and during the camps up to 12 workouts.
The research was conducted in the period from April to May 2016. Always before the workout. Eligibility criterion for the study was longer than 3-year-old athlete training experience.
The study was conducted in a modern branch Rehabilitation Center, Aesculapius Hospital - Center for Treatment of Heart Disease and Vascular in Osielsko.
Made measurements of the height and weight as the basic morphological characteristics and age of the respondents established players.
Functional studies in the field of muscle strength and mobility of the joint body was carried out using a complex Tergumed certified devices using four separate apparatuses. The first of them was used to test the range of motion and muscle strength of the back extensors. Tested held a sitting position with stable knees and feet-based support. A lever located on the back of the test, as the actuator, measured the range of motion. The test performed slow snap torso to the point where the rear upper iliac spines become stationary. Another attempt on the same device was performed on a locked arm of the executive, which would turn the sensor measuring the pressure generated by the rectifiers trunk player.
The second device was tested abdominal muscles bending the torso position in the legs as in the previous study. Actuator was based on the player before the chest special pillows. 2 tests were performed measuring as in the previous study. In the first trial test performed slow slope forward to the point where soft tissue began to pull the hip spike rear upper ventral and slow snap torso position. In a second test frame implementing devices in the front of the chest was locked and began working as a pressure sensor measuring the force of flexor body.
Another device was measured Tergumed lateral flexion to the right and left. Tested accept sitting position facing the device stabilized knees and machine actuator positioned under the arms of the test. The therapist shook torso player armpits stabilized at the test and increased accuracy and significantly reduced the risk of error. The measurement was performed during the movement of lateral flexion of the trunk to the right and left sides, and the strength was measured using an apparatus locked.
The fourth device Tergumed measured the range of motion of the trunk rotation on the left to the right and vice versa, and the torso rotator strength in both the right and the left. The test was sitting on the seat with adjustable stabilized by barge and a cantilevered section of the lumbar spine and lower limbs [12,13].
The study used the basic methods of descriptive statistics and tests, study material obtained by varying the type of the oars and rowing party player.
To develop research results and morphological features of muscle strength and range of movement, the trunk was used the Shapiro-Wilk, and to determine the significance of differences intragroup comparisons due to the lack of normal distributions, some of the parameters used in the non-parametric Wilcoxon test.
In comparisons between groups to determine the significance of differences was used Kruskal-Wallis analysis was performed using variable chi-squared test.

In order to determine the relationship between biometric parameters, and the parameters measured were created correlation matrix between variables. These matrices were calculated for each group separately and based on all the data.
To find all the analyzes used the coefficient significance level $\alpha = 0.05$, which allowed for the variables considered statistically significant at $p < 0.05$.

FINDINGS

An analysis of the somatic tested competitors, and the characteristics of comparative functional characteristics preceded by distribution analysis of the material taking into account the adopted differentiation.
It shows that measurements of body height rowers paddle left and right has a normal distribution, and body mass of players left the oars and paddles short, similar to the normal distribution.
The results range flexion, hyperextension and lateral flexion of the two rowers left the oars, as well as hyperextension, both rotation and lateral flexion of the trunk players floating on the right paddle, as well as two trunk rotation and lateral flexion to the right team applying short paddle has a normal distribution.
In terms of force measurement, the results of the players floating oar left except measured in the trunk rotation to the left and the results of research rowers right paddle, with the exception of forces in the crook of the side to the left side has a normal distribution, and the results of men using paddles short with the exception of force lateral flexion characterized the right material decomposition studies near normal.
Other results has received less than the p-value, which means that their distribution is non-parametric.

Table I presents the results of morphological features, which indicates that the designated adopted diversified teams of rowers are characterized by similar mean basic morphological features. Average Measurement of players using the paddle right are slightly larger, at the same time a smaller standard deviations.

Table I. The numerical characteristics of the test results of morphological features.

Category paddle	n	min	max	M	SD	Med.	Q1	Q3
Body height (cm)								
paddle left	10	177.00	202,00	188,00	7.75	184,00	183.25	193.75
paddle right	10	184,00	199.00	189,20	4.32	188,00	187,00	191.00
short paddle	10	173,00	194,00	188.20	7.30	192,00	183.25	194,00
together	thirty	173,00	202,00	188.47	6.42	188,00	184,00	193.75
Body weight (kg)								
paddle left	10	65,00	110.00	81.65	14.05	77.50	70.88	91.00
paddle right	10	69,50	93,00	84.90	6.28	86,00	84.25	87,00
short paddle	10	61,50	105.00	81.40	12.49	78.00	75.25	89,75
together	thirty	61,50	110.00	82.65	11.16	82.75	74.25	89.50
Rohrer index								
paddle left	10	1.1162	1.5301	1.2210	.1213	1.1839	1.1497	1.2326
paddle right	10	1.1040	1.3996	1.2554	.1092	1.2522	1.1775	1.3579
short paddle	10	.8423	1.4381	1.2250	.1844	1.2858	1.1362	1.2938
together	thirty	.8423	1.5301	1.2338	.1381	1.2308	1.1491	1.2987
Age (years)								
paddle left	10	16.50	24,00	19,00	2.91	18,60	18.44	19.57
paddle right	10	15,00	24.30	18.40	2.63	18.12	18.06	19.40
short paddle	10	15,00	28.00	19.10	3.69	19.82	17.95	20.20
together	thirty	15,00	28.00	18,60	3.41	18.32	17.92	19.45

Table II shows the characteristics of comparative test results of range of movement of the trunk, and in table III and figures 1 and 2, the characteristics of comparative test results of muscle strength torso rowers varied the type of the paddle.

Table II. Comparative characteristic ranges of motion of the trunk rowers varied kind used paddle.

Category paddle	n	M	SD	Med.	chi2	p
trunk flexion range						
paddle left	10	16.98	3.10	16.20		
paddle right	10	18,97	4.38	19.05		
oars short	10	17.81	4.09	19.15	0.98	.6120
range hyperextension of the trunk						
paddle left	10	16,34	2.50	15,15		
paddle right	10	15.75	3.44	14.60		
oars short	10	16:16	2.94	15.40	1.13	.5694
range of trunk rotation to the left						
paddle left	10	9.82	2.35	8.75		
paddle right	10	9.14	0.91	9.70		
oars short	10	8.95	1.13	9.15	1.17	.5585
range of trunk rotation to the right						
paddle left	10	9.39	2.23	9.65		
paddle right	10	10.15	1.50	8.85		
oars short	10	8.92	1.81	9.20	2.85	.2411
range of lateral flexion of the trunk to the left						
paddle left	10	5.46	0.69	6.30		
paddle right	10	6.21	1.35	6.80		
oars short	10	6.21	1.88	5.75	1.51	.4703
range of lateral flexion of the trunk to the right						
paddle left	10	6.33	1.22	5.50		
paddle right	10	6.84	1.60	6.10		
oars short	10	6.74	2.19	5.60	1.07	.5853

Table II shows that the differences of all the measured parameters, which characterize the mobility of the trunk units of runner adopted differences are minor and not statistically significant.

Table III. Comparative characteristics of trunk muscle strength varied kind used rowers paddle.

Category paddle	n	M	SD	Med.	chi2	p
strength in trunk flexion						
paddle left	10	239.43	3.10	230.60		
paddle right	10	278.53	4.38	287.35		
oars short	10	217.05	4.09	234,80	5.68	0.0584
trunk strength hyperextended						
paddle left	10	391.48	2.50	385.25		
paddle right	10	387.29	3.44	377.35		
oars short	10	328.45	2.94	346.35	1.24	.5376
strength in trunk rotation to the left						
paddle left	10	160.45	2.35	144.05		
paddle right	10	141.22	0.91	149.95		
oars short	10	116.73	1.13	128.05	3.67	.1594
strength in trunk rotation right						
paddle left	10	132.67	2.23	128.65		
paddle right	10	172.33	1.50	174.50		
oars short	10	111.92	1.81	120.65	5.67	0.0584
force in the crook of the left side of the trunk						
paddle left	10	131.4	0.69	122.65		
paddle right	10	120.4	1.35	124.60		
oars short	10	102.22	1.88	99.90	6.13	0.0466 *
force in the crook of the right side of the trunk						
paddle left	10	105.43	1.22	101.65		
paddle right	10	148.66	1.60	150.35		
oars short	10	98.23	2.19	90.05	12.09	0.0024 *

* Statistically significant difference at $p < 0.05$

As can be seen from Table III in trunk flexion and hyperextended and in both rotations, teams of rowers designated adopted diversity, characterized by a similar level of upper-body strength, and the team with the lowest short oars level of force in all of the surveyed body movements.

In the crook of the left lateral force is characterized by highest average team who use the paddle left and right lateral flexion right rowers paddle, which depicted figures 1 and 2. The observed differences are statistically significant.

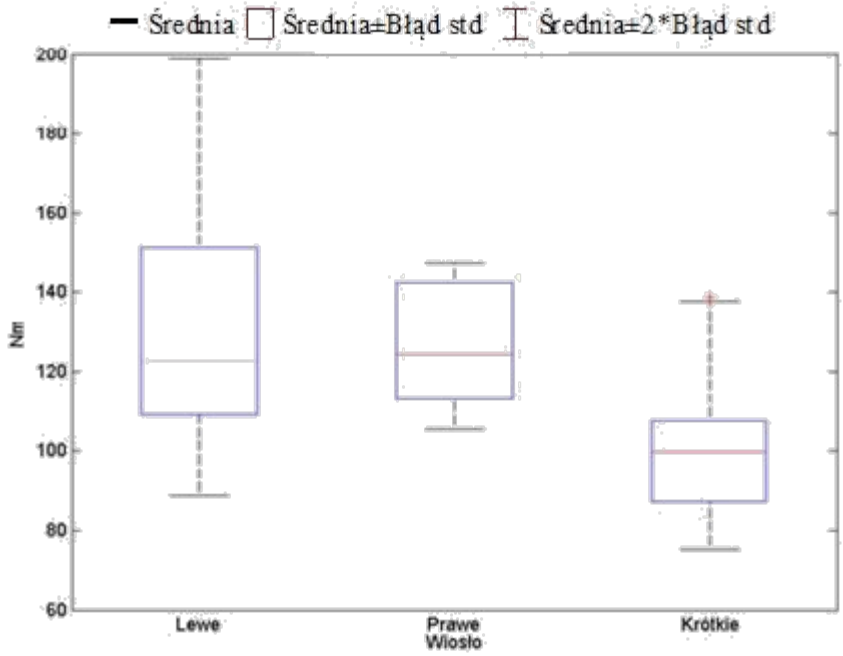

Figure 1. Graphic characteristics of bending force to the left side rowers treatment groups.

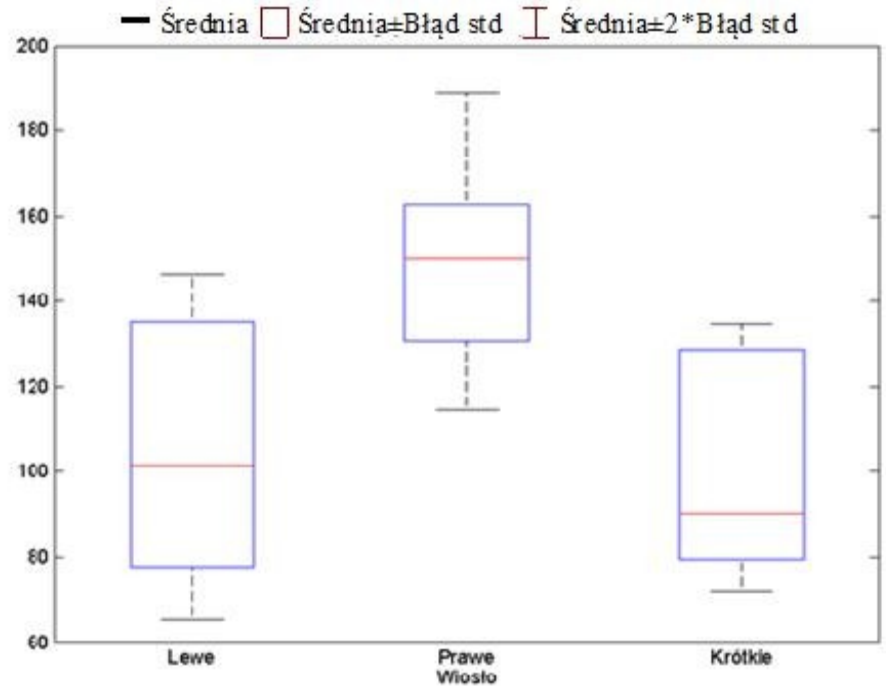

Figure 2. Graphical lateral flexion strength characteristics of the groups studied law rowers.

Table IV shows the comparative characteristics of the range of motion of the trunk movements opposing designated groups rowers.

Table IV. Comparative characteristics of the range of motion of the trunk designated groups of rowers.

Category - motor act	M	SD	D	FROM	p
oars left					
flexion	16.98	3.10			
hyperextension	16,34	2.50	0.64	-0.9834	.3254
rotation to the left	9.82	2.35			
rotation to the right	9.39	2.23	0.43	1.0213	.3071
left lateral flexion	5.46	0.69			
lateral flexion to the right	6.33	1.22	0.87	-1.7479	.0805
oars right					
flexion	18,97	4.38			
hyperextension	15.75	3.44	3.22	-1.7028	.0886
rotation to the left	9.14	0.91			
rotation to the right	10.15	1.50	1.01	-1.5147	.1298
left lateral flexion	6.21	1.35			
lateral flexion to the right	6.84	1.60	0.63	-0.794	.4272
oars short					
flexion	17.81	4.09			
hyperextension	16:16	2.94	1.65	-0.5672	.5706
rotation to the left	8.95	1.13			
rotation to the right	8.92	1.81	0.03	-0.2269	.8205
left lateral flexion	6.21	1.88			
lateral flexion to the right	6.74	2.19	0.53	-0.6816	.4955

As you can see from the table difference ranges movements opposing groups of rowers set the type of the oars were small and therefore irrelevant in the statistical evaluation.

Table V shows the characteristics of the numerical results of muscle in trunk movements opposing designated groups rowers.

Table V. Comparative characteristic level of upper-body strength designated groups of rowers.

Category - motor act	M	SD	D	FROM	p
oars left					
flexion	239.43	66.40			
hyperextension	391.48	137.01	152.05	-2.2308	0.0257 *
rotation to the left	160.45	46.48			
rotation to the right	132.67	38.10	27.78	1,588	.1123
left lateral flexion	131.84	35.17			
lateral flexion to the right	105.43	31.09	26.41	1.6252	.1041
oars right					
flexion	278.53	50.17			
hyperextension	387.29	96.33	108.76	-2.7602	0.0058 *
rotation to the left	141.22	23.01			
rotation to the right	172.33	26.96	31.11	-2.5324	0.0113 *
left lateral flexion	120,40	29.33			
lateral flexion to the right	148.66	22.83	28.26	-2.3812	0.0173 *
oars short					
flexion	217.50	59.94			
hyperextension	328.45	104.27	110.95	-2.8347	0.0046 *
rotation to the left	116.73	44.28			
rotation to the right	111.92	40,38	4.81	.4158	.6776
left lateral flexion	102.22	21.42			
lateral flexion to the right	98.23	23,59	3.99	.6425	.5205

* Statistically significant difference at $p < 0.05$

The data in the table shows that the force level in all tested movements opposing players paddles right differ significantly. Larger average were characterized by strength and hyperextended trunk rotation and lateral flexion towards the rowing. The other teams were characterized by significantly higher average power hyperextended and triggered flexion and trunk rotation were similar.

In the following part of the study the collected material was analyzed values calculated Pearson correlation coefficients R between biometric parameters and functional separately for each group of diversity.
It was observed that in all groups of players is a very strong connection force level in both rotations (respectively 0.902, 0.902, 0966).
Rowers paddle left has a strong relationship in the range of rotation of the left and right rotation (0.773) and the height of his body weight (0.804). Similarly correlated parameter

bending force in the front of the trunk with the force of the two trunk rotation (respectively 0.896, 0.738), and the bending force to the left side and bending strength in the trunk of the right (0.885). Similarly also, between trunk flexion with rotation in front of the torso to the left (0.841) and between the mobility of the trunk rotation to the left and right (0.773).
It was found that the rowers paddle floating on the right has a strong association with body height mobility of the trunk hyperextended (0,750) and the range of rotation to the left (0.751). In a similar extent it correlates to the force bending the body forward with the mobility of the flexed side to the right (0.820) as well as a range of hyperextension and two rotation (respectively 0.848, 0.783), and lateral flexion right (0.781). The same level of correlation also exists between the mobility of the trunk flexed forward, and the two rotations of the body (respectively 0.732; 0.701) and between (0.773). The range of rotation to the right also correlates strongly with the degree of lateral flexion movement to the right (0.811). But a strong negative correlation was found between the body height and the degree of bending to the left side (-0.759), and between the levels.
Short wake paddles has a very strong correlation extent of bends in both directions (0.937) and They force level in the crook of the body and found in the hyperextended (0.958). The band also showed the presence of the strong association of body weight and the level of bending force to the left side (0.716) and the range of hyperextension and bending in both directions (respectively 0.762; 0.716). And a strong negative association was found between the level of force hyperextended and flexion of the trunk forward (-0.719). Compounds other characteristics studied were characterized by small teams of rowers correlation coefficients.

DISCUSSION

In many works of a scientific find examples of the positive impact of physical activity on the human body. But there are few publications on the negative impact of sports training system implemented professionally movement and health rower. From the available literature it is known that the sport practiced at a professional level carries many risks, including the risk of injury [5,7]. In any sport, but you can minimize the risk of their occurrence by optimizing the training load and work on proper technique, balance and muscle player development.
The main working hypothesis wagered assumed that training rowing implemented at the level of competitive imbalance causes the development of the musculoskeletal system paddlers, especially the players using long oars. Analysis of the results confirmed the validity of this thesis, but only to the extent of muscle strength imbalances surveyed players, which confirmed earlier findings A. Kopec et al. and the results of research Dobrowolna P, Hagner W., and indirectly own observations regarding pain rowers [10,14,15]. Cited authors concluded that causes injuries rowers may be either too large to use as a training load and getting excessive range of motion in the joints of the spine as a result of asymmetric muscle strength, because of its uneven development causes nadruchomość joints in the direction of a stronger muscle groups. It is therefore highly probable that in sport rowing lumbar players is to a greater extent than other segments of the body exposed to overload, and in the case of long paddles to the asymmetry of its functions and construction [11]. Such an assumption implicitly justify findings Czubak K. pointing to the large range of motion, while the harmonious development of the musculature of the shoulder girdle and arm rowing national team players [3].
In the present study, with the exception of lateral flexion, which was characterized by the smallest average range of players short oars, but there were no significant differences in the mobility of the body designated teams adopted diversity. Thus, the results do not fully correspond with the results cited studies and observations Cley H. et al., Confirming the presence of scoliosis of players paddles long [16]. It is well known that scoliosis in its effects also limits the mobility of the spine, and found in the present study the differences are small range of flexibility. Thus, it seems likely that the high mobility of the trunk rowers is typical and has an impact on the sports score obtained by a player [17].

Results of this study also made it possible to verify the hypothesis of a connection size of the basic morphological characteristics of rowers selected sports discipline and their motoric abilities. The results obtained were different from previous observations Ligman O. et al. Examining players 13-15 years old and the subsequent comparative study Cieślicka M. et al. [18,19]. The observed differences detected indicating a slightly higher proportion of players with an athletic physique, translate higher average age now examined groups of runner and progressive changes in the selection of young people to the sport discussed.
In workout sports, including rowing, as well as developing various manifestations of motor skills such as strength or flexibility is important harmony and combine all components of both the substrate and the manifestations of human motor skills in order to achieve the best possible result sport. For this reason, in the present study also it assumes the existence of the relationship between muscle strength and flexibility of the body rowers. The results of the tests showed negative but irrelevant relationship between these parameters. Investigated rowers were characterized by large ranges of motion of the trunk flexed forward and the high values of average trunk muscle strength. Both players in a long rowing oar and rowed group floating short observed a strong correlation between the strength of the muscle movements in the side of the trunk. This relationship, however, is the most balanced in rowing athletes symmetrically. Floating group of rowers rowed asymmetric characterized by higher values of muscle strength of the trunk in the direction of using oars. Indirectly, the similar results obtained in their research Cieślicka M. et al., Who found that the players cultivating rowing characterized by both increased the flexibility and torso muscle strength in a ratio of peers were practicing sport [20]. The convergence of the results of these observations and both their accuracy can affect both similar age and sample sizes of runner. This relationship, however, is the most balanced in rowing athletes symmetrically. Floating group of rowers rowed asymmetric characterized by higher values of muscle strength of the trunk in the direction of using oars. Indirectly, the similar results obtained in their research Cieślicka M. et al., Who found that the players cultivating rowing characterized by both increased the flexibility and torso muscle strength in a ratio of peers were practicing sport [20]. The convergence of the results of these observations and both their accuracy can affect both similar age and sample sizes of runner. This relationship, however, is the most balanced in rowing athletes symmetrically. Floating group of rowers rowed asymmetric characterized by higher values of muscle strength of the trunk in the direction of using oars. Indirectly, the similar results obtained in their research Cieślicka M. et al., Who found that the players cultivating rowing characterized by both increased the flexibility and torso muscle strength in a ratio of peers were practicing sport [20]. The convergence of the results of these observations and both their accuracy can affect both similar age and sample sizes of runner. similar results were obtained in their research Cieślicka M. et al., who found that the players cultivating rowing characterized by both increased the flexibility and torso muscle strength in a ratio of peers were practicing sport [20]. The convergence of the results of these observations and both their accuracy can affect both similar age and sample sizes of runner. similar results were obtained in their research Cieślicka M. et al., who found that the players cultivating rowing characterized by both increased the flexibility and torso muscle strength in a ratio of peers were practicing sport [20]. The convergence of the results of these observations and both their accuracy can affect both similar age and sample sizes of runner.
The problem of the impact of competitive rowing on the development of the musculoskeletal system and the level of flexibility and strength of individual sections of the body is an interesting player, but it seems insufficiently examined, which justifies the statement of the need for further observation of the problem. Fuller's insight can be very useful in practice, competition-as well as coaching and may help to minimize the risk of injury and pain athletes rowing, which are widespread and occur even as a result of frequent, however, conducive to control the correctness of movement, intensive training conducted on the ergometer rowing [21].

The final result of this research could undoubtedly have an impact occurring limitations. Bands competition-covered observation, despite its homogeneity in age and training experience, has been relatively small, and the observation limit players to one sports club, also raises concerns about the representativeness of the results for the general population of rowers. The results of the studies, however, are certainly representative of the young players leading Polish rowing club and thus seem to be worth the presentation and summary of proposals formulated below.

CONCLUSIONS

1. Size and found no significant differences in the basic characteristics of the studied somatic teams of men, regardless of the differences arising from the type of paddle, show similar morphological conditioning as a result of sports athletes of all sports rowing competition.
2. Also the average size range of flexibility of the trunk groups of runner examined, evidence of a similar impact rowing technique and training loads occurring in various sports competitions the rowing levels movable body rowers, which, however, may result from the use of specialized additional training.
3. Significantly different level of muscle triggered in the rotation of the trunk groups of runner varying the type of the paddles, may result from other specifics of the training paddle long and short, and found significant differences in muscle strength players paddles symmetric and asymmetric indicate that training paddles short greater will balance balance muscular rowers.
4. The observed higher level of muscle strength on the side of the paddle used in players paddles long, it may be the result of long-term repetition of one of the asymmetric pattern of the locomotive, or perhaps it results from a lack of sufficient volume implementation of exercise leading to balance the detected imbalance.
5. The calculated correlation coefficients characteristics of somatic and motor under observation suggests that irrespective of whether significant differences in muscle strength triggered the opposing movements of the rowers oars long, in all groups accepted diversity, there is a very strong or strong relationship between the level of strength of the right and left sides of the body studied players, which reflects both the importance of this characteristic in the sport rowing.

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