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THE EVALUATION OF THE MORPHOLOGICAL FEATURES OF THE BODY OF SPORTSMEN SPECIALIZING IN ATHLETICS

ABSTRACT. The article presents the results of the studies of the morphological and functional state of qualified sportsmen specializing in various athletics types: sprint running, medium distance running and shot-put. During the research, anthropometric measurements were carried out. Body weight was fractionated into muscle, fat and skeletal mass, body proportions were determined and somatic types were identified.

Comparison of the data obtained as a result of the research with the recommendations for selection into the groups of sports improvement showed that sportsmen specializing in athletic shot-put meet the recommended criteria in terms of body length and weight. For sportsmen specializing in sprinting, these indicators are lower, and for medium distance runners – the indicators in body weight are higher than the recommended.

Thus, the obtained results make it possible to distinguish two groups of features that are important for selection in sports. The first group of features shows a significant dependence on sports specialization, and the second is associated mainly with the somatic gender. The revealed tendencies can be taken into account in the selection of sportsmen for certain disciplines of athletics.

KEYWORDS: morphological features; anthropometric measurements; somatic types; athletics; sports specialization; sports selection.

Introduction. The modern level of sports achievements and the urgent tasks of sports dictate the need to study and assess the potential of the sportsmen's systems in their relationship, as well as individual characteristics and their influence on sports results [2, 4, 6, 7]. One of the conditions of the process of formation of sportsmanship is the steady morphological and functional improvement of the sportsman's body, proceeding with certain regularities [3, 5, 7]. Sports practice shows that the features of the morphological signs of the physique have a significant impact on the effectiveness of the formation of skills and abilities in any kind of sport. The revealed somatic differences between sportsmen of different specializations exist due to the influence of the dominant indicators of purposeful

sports activity, which influence the selection of the most geno- and phenotypically suitable characteristics of the adaptive somatic type [1, 4, 7]. Data on sexual dimorphism of morphological and functional characteristics of sportsmen are of fundamental interest [4, 6, 7]. Correspondence of a specific personality to model traits provides a great chance of achieving success with the lowest possible damage to the body.

The goal is to analyze the morphological and functional state of sportsmen in the process of lasting control. To achieve the goal of the study, the following methods were used: anthropometric measurements, fractionation of body weight into muscle, fat and skeletal mass, determination of body proportions and somatotyping according to V.P. Chtetsova [3, 5] for adult subjects. To distinguish somatic types, a set of features was taken, grouped into categories that characterize the development of fat, muscle and bone tissue. At the same time, average scores were calculated for each category, which are the basis for the diagnosis of somatotypes.

The study involved 38 sportsmen of various qualifications – from the first sports category to masters of sports at the age of 17 to 22 years, specializing in short and long distance running and shotput.

Research results and their discussion. Comparison of groups of sportsmen with acyclic and cyclic orientation of training – shot putters and sprinters – showed that shot-putters are significantly ahead of sprinters and runners in most of the factors (Table 1). The difference in the size of the factors is expressed as a percentage ($\Delta\%$).

Table 1 – Differences in somatic characteristics of sportsmen, specializing in different types of athletics

Anthropometric data		Shot-putters				Medium-distance runners	
		sprinters		Medium-distance runners		sprinters	
		$\Delta\%$	p	$\Delta\%$	P	$\Delta\%$	p
Body length		+6,2	<0,05	+8,6	<0,05	-2,3	<0,05
Body mass		+25	<0,05	+12,2	<0,05	+9,8	<0,05
Forearm girth		+8,6	<0,05	+34,8	<0,05	-19,5	<0,05
Calf girth		+12,2	<0,05	+9,4	<0,05	+1,7	<0,05
Wrist girth		+11,6	<0,05	+12,0	<0,05	-1,8	<0,05
Ankle girth		-5,9	<0,05	-7,8	<0,05	+1,4	<0,05
Wrist girth		+6,3	<0,05	+15,5	>0,05	-10,5	<0,05
Girth above the ankles		+7,3	<0,05	+16,8	<0,05	-8,1	<0,05
Anteroposterior chest diameter		+1,9	<0,05	0,0	<0,05	+1,9	<0,05
Shoulder diameter		-0,5	<0,05	-2,6	<0,05	+2,1	<0,05
Pelvis diameter		+2,4	<0,05	+4,9	<0,05	-2,7	<0,05
Transverse chest diameter		+5,9	<0,05	+6,6	<0,05	-1,1	>0,05
Back dynamometry		+19,5	>0,05	+36,4	<0,05	-12,4	>0,05
Dynamometry of the right hand		+17,9	>0,05	+32,1	<0,05	-10,8	>0,05
Fat folds	Shoulder	-10,1	<0,05	+30,6	<0,05	-58,5	<0,05
	Stomach	+17,6	<0,05	-6,2	<0,05	+20,0	<0,05
	Hip	+10,0	<0,05	+10,0	<0,05	0,0	<0,05
	Back	+31,5	<0,05	+74,2	<0,05	-24,5	<0,05
Muscle mass		+1,2	<0,05	+15,0	<0,05	-13,4	<0,05
Fat mass		+50,5	<0,05	+41,3	<0,05	+18,4	<0,05
Bone mass		-2,2	<0,05	-1,7	<0,05	-0,6	<0,05

The given data of the table indicate a different degree of discrepancy of signs among sportsmen of the compared groups. All differences are statistically significant for the 5 % significance level, with the exception of the back and hand dynamometry indicators in two cases.

Between shot putters and sprinters, a high degree of discrepancy is noted for body length, muscle strength indicators, the thickness of fat folds on the abdomen and back, body fat mass, and body surface area.

Based on anthropometric data, the dominant somatotype among shot-putters is muscular (80 %). Note that the differences between them and medium-distance runners in a number of characteristics are much higher than when compared with sprinters.

When comparing runners for different distances, it was found that among runners for medium distances, in contrast to sprinters, body length decreases, indicators of back and hand dynamometry, absolute and relative muscle and bone mass, as well as indicators characterizing the development of muscle (girth), bone (diameters), fatty (TZhS) components. In general, there is some gradualization of the somatic development of middle-aged sportsmen due to the fact that the compared specializations differ in time and intensity of work (energy consumption for work) and, as a consequence, in the somatic status of sportsmen. According to our data, the thoracic-gracil and thoracic-muscular somatotype prevails in them (72 %).

In a number of cases, there are slight discrepancies between sprinters and runners for medium distances. This is obviously due to the fact that the activity of sportsmen takes place in the same position (standing) and with the same emphasis on the load on the musculoskeletal system (emphasis on the legs).

The interaction of the links of the kinematic chains of the upper limb (shoulder, forearm, hand) and lower limb (thigh, lower leg, foot) ensures the action of a number of important biomechanisms in sprint running, such as: biomechanisms of swing movements of the upper and lower extremities, raking legs, accumulation in muscles energy of elastic deformation, extension of the leg joints with an emphasis on extension in the hip joint. It was found that amongst candidates for master of sports specializing in sprint running, in comparison with first-class sprinters, there is an increase in the following informative indicators (generally recognized in intergroup comparisons): shin girth / thigh girth (70 %), calf girth + thigh girth / leg length (55 %), leg length / body length (95 %), forearm girth / forearm length (114 %), torso length / body length (29.8 %), shoulder girth / forearm girth (113.4 %), calf girth / shin length (97.3 %), shoulder length / arm length (40.9 %).

Analysis of the obtained data revealed that more qualified sprinters (candidates for master of sports and master of sports) had a slightly lower total body weight ($x = 69.8$, $\delta = 2.58$ kg), body fat mass ($x = 7.21$, $\delta = 1.91$ kg), muscle ($x = 35.78$, $\delta = 4.24$ kg), bone ($x = 12.5$, $\delta = 1.40$ kg) components in comparison with sportsmen of the 1st category. This can probably be explained by the inexpediency of being overweight. In running, body weight makes a negative contribution against the background of the positive influence of body length due to the fact that it takes energy to accelerate body weight.

Runners of the analyzed distances, in comparison with other groups of sportsmen, have a long shin, which is quite justified and beneficial from a biomechanical point of view. And, it is the increase in skeletal dimensions that leads to an increase in the amplitude of muscle

contraction, or the maximum speed of muscle contraction and running is due to an increase in the length of muscle fibers and the size of the skeleton.

Comparison of our results with the materials for selection into the groups of sports perfection showed that our shot-putters correspond to the recommended data in terms of body length and weight, in contrast to sprinters, who have less of these indicators, and in contrast sportsmen – whose body weight is higher than the recommended values [1].

Conclusions. The obtained results allow to distinguish two groups of features that are important in the practice of selection in sports. The first group of signs shows a significant dependence on sports specialization. The signs of this group, in terms of their severity, are arranged in the following sequence: shot-putters-sprinters-runners for medium distances. From our data, this group includes: body length, wrist girth, ankle girth, girth above the ankles, pelvic diameter, transverse chest diameter, muscle and fat mass of the body.

The second group of signs is associated mainly with the somatic sex. These signs have a different orientation of differences: shot-putters-sprinters– runners for medium distances or shot-putters-runners. This group includes the girth of the forearm and lower leg, antero-posterior chest diameter, shoulder width, pelvic diameter, muscle and fat mass.

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