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STUDYING THE DEPENDENCE OF THE RESULTS OF PHYSICAL EXERCISES ON MORPHOFUNCTION CHARACTERISTICS OF STUDENTS

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ANNOTATION. The article describes the practical application of the method of canonical values in studying the correlation of physical and motor skills of schoolchildren who play sports and those who do not.
KEY WORDS: fitness, correlation coefficient, canonical values, morphometric parameters, mobility.

INTRODUCTION.

Implementation of large-scale work aimed at the further development of physical education and mass sports is one of the urgent problems of our time. To this end, the Resolution of the President of the Republic of Uzbekistan Shavkat Mirziyoyev No. PP-3031 dated June 3, 2017 “On measures for the further development of physical education and mass sports”, as well as the Decree No. PF-5924 dated January 24, 2020 “On measures for the further improvement and popularization of physical education and sports in the Republic of Uzbekistan”, set the task of implementing large-scale work on creating modern conditions for the population, especially the younger generation, to regularly engage in physical education and mass sports, and systematically organizing targeted training of talented athletes. This determines the need to develop consistent measures to popularize physical education and sports in Uzbekistan, create the necessary conditions and infrastructure to promote a healthy lifestyle among the population, especially young people, and ensure our country's worthy participation in international arenas [1,2].

LITERATURE ANALYSIS AND METHODOLOGY

One of the main directions of changing the system of physical education in general education schools in accordance with modern requirements is to introduce monitoring of students' health, physical development and physical fitness. The results of students' physical exercise depending on their physical characteristics have attracted the attention of researchers for a long time [3,4].

In order to implement the practical aspects of this issue, the introduction of the "Physical Fitness Level" sports test complex, approved on June 17, 2021, is of particular importance in creating a comprehensive system of physical education of young people for general secondary education, higher education institutions, and other links of the physical education movement in order to further develop physical education and sports in our country, turn it into a mass movement, and form a healthy lifestyle among the population [3].

Further improvement of the “Physical fitness” test exercises depends on the total body size of the child, that is, heavier children have advantages in throwing, and taller children have advantages in high jumping. In exercises determined by relative strength values (for example, pull-ups), the advantage goes to those with a smaller body weight [4].

Numerous scientific studies have been conducted on the physical and motor skills of schoolchildren. According to V.P. Filin, O.V. Goncharova, L.V. Volkov, V.K. Balsevich, L.I. Lubysheva, Y.F. Kuramshin

and many other leading specialists, all physical qualities and abilities should be developed starting from primary school age [7,8,9,10,14].

Also, as a result of the analysis of scientific and methodological literature on the subject, the following was revealed, namely, two methods were proposed to eliminate the influence of anthropometric indicators on the results of physical fitness tests [6]. The first proposal is that using only physical fitness tests as a test when working with children does not affect their results, the characteristics of the morphological structure of the body. However, the implementation of this proposal is very difficult for two reasons. First, the number of exercises of this type is relatively small; secondly, test exercises for assessing the level of physical fitness lead to the exclusion of all movements associated with overcoming the resistance of one's own body weight, i.e. traditional physical exercises - throwing, high jumping. The second method is the introduction of various indicators that take into account the influence of overall body dimensions on the results of individual physical exercises, as shown in the practice of a number of foreign countries. The practical difficulty here is that with this approach it is necessary to use different methods for each physical exercise or, at best, for a certain group of them (for example, for all throws). This follows from the obvious fact that the dependence of the results of various physical exercises on anthropometric characteristics is not the same.

If we try to formulate the approaches described above in more rigorous terms of mathematical statistics, then the first of these proposals is suitable for attempts at such motor tasks that do not correspond to morpho-functional characteristics, and the second - for determining, on the one hand, the success in any physical exercise and, on the other hand, for calculating multiple correlation coefficients and regression equations between a group of morphological characteristics.

If we turn to calculations called canonical quantities and canonical correlations, it helps to achieve certain successes in solving the problem raised.

RESULTS.

The purpose of our study is to test the practical application of the canonical values method in studying the interrelationship of physical and motor skills of schoolchildren, as well as to identify canonical values and canonical correlations between the indicated groups. The research was conducted among boys aged 14-17 who were not involved in sports and were studying in general secondary schools. The tests in the study were conducted from traditional and relatively rare motor tasks. The measurements taken cover the main areas of morphofunctional indicators. The measurements were carried out using the measurement methods of R. Martin in generally accepted anthropometric practice. The measurement results are presented **in Table 1.**

Table 1

Experimental results

Age	Number of students	Height, cm	Weight, kg	% of body muscle tissue
		$\bar{x} \pm \sigma$	$\bar{x} \pm \sigma$	$\bar{x} \pm \sigma$
8	128	120.00±5.03	22.96 + 3.79	44.25 + 2.60
10	120	129.60 ± 3.91	28.27 + 2.79	43.72 ± 3.49
12	125	138.60+ 8.44	32.84 + 6.11	45.79 ± 2.45
14	132	151.60+7.30	41.80 + 6.62	46.43 ± 3.23
17	125	166.90 + 5.15	56.81+6.12	50.04 ±2.91

The head, neck, chest, abdomen and pelvis, arms and legs of the students are compared and their growth or changes are monitored. Length, width and angular characteristics are measured using anthropometric instruments.

Also, skinfolds were determined using a Tanner caliper according to a scheme developed by anthropologists. The absolute mass of muscle tissue, the absolute mass of fat and subcutaneous fat were determined using the Matievka formula, and the absolute body surface area was determined using the Isakson formula.

Mathematical processing was carried out in two stages. At the first stage, one-dimensional statistical

characteristics, correlation matrices were calculated for each age group, and factor analysis was performed (the principal components method was used with the rotation of the corresponding axes according to the Varimakh criterion). Based on factor analysis, nine morphofunctional indicators and eight motor tests were selected, which gave the highest factor weights for the identified factors. In the second stage, canonical analysis was conducted on two sets of different variables. Given the large amount of data obtained, in this article we are limited to the results of canonical analysis and present only the highest canonical correlation coefficients obtained in the group of 12-year-old boys and the corresponding canonical values (Table 2)

Table 2

Canonical values of morphometric indicators and movement test results (n=125 participants, canonical coefficient = 0.768)

	Adults	$\bar{x} \pm \sigma$	The canonical k magnitude		
			I	II	III
Morphofunctional indicators					
1.	Body length, cm	138.6 + 8.44	1,594	1,746	2,550
2.	Shoulder length, cm	25.90 ±2.11	- 1,310	0.021	
3.	Leg length, cm	74.97 ± 5.22	- 0.998	2,146	1,817
4.	Foot length, cm	31.91 ± 3 .0 4	2,040	- 1,459	
5.	Chest diameter, cm	30.7 2± 1.85	0.013	0.991	0.016
6.	Shoulder circumference, cm	20.1 0±2.07	- 2,036	1,143	0.014
7.	Average thickness of skin and subcutaneous fat layer, cm	3.034 ± 0.87	1,266	0.017	0.879
8.	Percentage of subcutaneous fat	6.08 ± 1.99	0.196	-0.673	-0.024
9.	Percentage of muscle tissue	45.79 ± 2.45	0.742	-0.638	0.620
Physical fitness tests					
1.	Running 30 m, s	5.852 ± 0 .4 0	0.581	-0.848	-0.272
2.	Shuttle run 3 x 10 m, s	9.768 ± 0 .6 2		-0.676	0.028
3.	Throwing the ball from the position with the legs apart, facing backwards, m	456.2 ± 129.9	0.960	-0.164	
4.	Running 500 m, s	131.6±22.0	-0.302		-0.017
5.	Writing with folded hands while leaning on the floor (kolich. raz)	11.76±5.00	-0.139	-0.015	1,282
6 .	Sitting with legs stretched forward, cm	5.08 ± 4.45	0.513	0.153	-0.794
7 .	M uvozanat test , p	12.22 ± 5.0 4	0.235		-0.259

The canonical correlation coefficient of the values of the parameters obtained as a result of the measurement is 0.768. This indicates a very close correlation with the morphological and functional parameters in the specific movement tests. It should be noted that the canonical correlation method automatically avoids "false" correlations (or at least a significant part of them) that arise from the presence of correlations between characteristics belonging to the same set. For example, the relationship between high jump efficiency and torso length may be "false" and can be observed only because body length is related to leg length, and the latter directly affects jump height.

DISCUSSION

It should be emphasized that such a large value of the canonical correlation coefficient is determined by the fact that morphological and functional indicators, for example, the proportion of fat and muscle tissue, directly reflect the state of the child's motor function. Two canonical values can be used to calculate indices that most accurately assess the morphofunctional state of the child and his physical fitness. In particular, if the values of the morphofunctional indicators recorded in the subjects are multiplied by the corresponding canonical values and the values obtained are summed, the final total canonical index is obtained, the value of which is most closely related to the results of motor tests. Since such a

canonical index is also random and has a statistical distribution, the canonical indices of individual children differ from each other. This variability can be used, on the one hand, to assess the morphofunctional state of the child, and on the other hand, to eliminate the influence of differences in morphofunctional state in assessing physical fitness. This can be done, for example, by introducing different norms for children with different morphofunctional states. Such procedures are determined in studies conducted on a large part of the population.

CONCLUSION

It is proposed to use the canonical analysis method to assess the relationship between morphological and functional indicators and motor abilities of schoolchildren aged 8-17.

The canonical correlation coefficient of morphological and functional indicators, the proportion of fat and muscle tissue can directly reflect the state of motor function of students.

According to the results of its use to assess the morphofunctional state of students who do not engage in sports, and on the other hand, to eliminate the influence of differences in morphofunctional state in assessing physical fitness, certain achievements can be achieved in solving the problem raised.

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