



# Influence of physique on the physical fitness of pedagogical university students

UDC 796.011.3



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## Abstract

**Objective of the study** was to determine the dependence of the level of physical fitness of male students of a pedagogical university on the indicators of physique.

**Methods and structure of the study.** The experiment involved 43 first-year students of The Herzen State Pedagogical University of Russia at the age of 18-20 years, classified for health reasons to the main and preparatory medical groups. Body length and weight, body mass index, and percentage of body fat were measured as indicators of physique, which was calculated according to a standard method based on the thickness of skin-fat folds. The following tests were used to assess physical fitness: running 60 and 3000 m, pulling up on a high crossbar, lifting legs to the crossbar from a hanging position, long jump from a place, bending forward while standing on a gymnastic bench. Testing and measurement of physique indicators were carried out at the end of the second semester.

**Results and conclusions.** It was found that the body mass index of students is normal, and the percentage of fat in the body is above the norm ( $22.9 \pm 1.1\%$ ). It follows from this that when determining the compliance of body weight with the norm, the calculation of only the body mass index is insufficient - it is also necessary to take into account body composition. The test results showed the average level of students' physical fitness. Physique indicators significantly affect the results of tests that evaluate the speed and strength abilities of students. In this case, the correlation coefficient ranges from -0.61 to 0.52, with body fat having the greatest effect. However, the correlation of physique indicators with the results of tests for endurance, speed-strength abilities and flexibility turned out to be unreliable ( $p > 0.05$ ). The regularities obtained can serve as a basis for the development of physical culture programs for students, taking into account the need to correct the body composition of those involved.

**Keywords:** *students, physical fitness, physique, total body dimensions, body composition.*

**Introduction.** Specialists involved in research in the field of physical culture have recently noted a significant decrease in the level of physical fitness of students of higher educational institutions of the Russian Federation [4, 6]. One of the main components of a person's physical fitness is the degree of development of basic physical qualities, which are assessed by means of generally accepted tests. In the specialized literature there is evidence that there is a relationship between the level of physical fitness and the physique indicators of students of technical universities [7]. The same relationship was found for women of different ages during physical exercises [8]. It is appropriate to assume that such a relationship is also characteristic of other contingents of students, in particular, stu-

dents of pedagogical universities. Identification of the factors that have the greatest impact on the level of physical fitness of students would make it possible to make adjustments to the curricula and programs on the subject "Physical Culture and Sports" for universities of various profiles.

**Objective of the study** was to determine the dependence of the level of physical fitness of male students of a pedagogical university on the indicators of physique.

**Methods and structure of the study.** The study involved 43 young men - first-year students of various faculties of the The Herzen State Pedagogical University of Russia. All of them, for health reasons, were assigned to the main and preparatory medical groups



and were engaged in physical culture in the group of general physical training. The age of the subjects at the time of the study was 18-20 years. Testing of physical fitness and measurement of physique indicators were carried out at the end of the second semester.

The level of physical fitness of students was determined on the basis of six tests widely used in practice: running 60 and 3000 m, pulling up on a high crossbar, raising legs to the crossbar from a hanging position, long jump from a place, bending forward while standing on a gymnastic bench with lowering hands below support level.

The students were tested under standard conditions after a warm-up. Running for 60 and 3000 meters was held at the stadium, the rest of the testing took place in the gym. In the long jump from a place, the best result of three attempts was counted.

Measurement of the total body dimensions of the subjects (body length and weight) was carried out using a medical stadiometer and scales. The percentage of body fat, which is an important characteristic of body composition, was determined from a nomogram based on measuring the thickness of two skin-fat folds: on the inner side of the lower leg and the outer side of the shoulder [10]. Measurements were made using a Lange caliper. This method, characterized by sufficient simplicity and accuracy, has become widespread with mandatory testing of students in a number of foreign countries. In addition to body fat content, body mass index (BMI) was calculated.

Experimental data were processed using the SPSS 24.0 statistical package.

**Results of the study and their discussion.** In Table 1 shows the average values of physique indicators and the results of testing students.

As can be seen from Table 1, the obtained values of the length and weight of the body of students are generally consistent with the data of other specialists [3,5]. The students' BMI is normal. At the same time, the percentage of fat in the body turned out to be above the norm, which, according to most research-

ers, ranges from 10 to 20% for young people of this age. The fact of excess fat content in the body of male students is also stated by other authors [7]. This allows us to conclude that, as we have already indicated [2], when determining whether the body weight is normal, the calculation of BMI is insufficient. It is necessary to take into account the composition of the body, that is, the ratio of fat and muscle tissue in the body.

The results of students' physical fitness tests on average correspond to 2.5 points on a five-point scale proposed by the Physical Education Program for universities [9], which can be assessed as an average level. The data obtained basically coincide with the results of similar studies conducted with the same contingent of students in other universities of the country. Although there are differences, due, in our opinion, to the different conditions in which testing was carried out [1].

To determine the relationship between the physique indicators and the test results of students, the correlation coefficients presented in Table 2 were calculated.

Analyzing the data in table 2, we can conclude that the body length of male students does not significantly affect the results shown in most tests that assess their physical fitness ( $p > 0.05$ ). A weak negative correlation is noted only with such an indicator as raising the legs to the crossbar in the hang, which is consistent with the data obtained by O.I. Ponomarev and P.P. Sivashchenko [7]. The body weight of the subjects affects the results in the 60 m run and in lifting the legs to the crossbar in the hang. The higher the body weight, the worse the results shown by those involved in these tests.

BMI significantly affects only the result in the 60-meter run. At the same time, there is an average correlation between the body fat content and the results in the 60-meter run, pull-ups on the bar and lifting the legs to the bar in the hang. Despite the fact that, as follows from the calculations, body weight and the percentage of body fat are interconnected

**Table 1.** Total dimensions, body composition and test results of students, **M±m** (n=43)

| Body length, cm | Body weight, kg | BMI       | % fat     | 60 m run, s | 3000 m run, min, s | Pull-ups on the bar, number of times | Raising the legs to the crossbar, number of times | Standing long jump, cm | Standing forward bend, cm |
|-----------------|-----------------|-----------|-----------|-------------|--------------------|--------------------------------------|---|------------------------|---------------------------|
| 178,2± 0,9      | 66,7± 1,0       | 21,0± 0,9 | 22,9± 1,1 | 8,5± 0,2    | 14.27,7± 18,3      | 9,3± 0,9                             | 8,5± 0,5  | 233,9± 3,1             | 7,9± 0,7                  |



**Table 2.** Correlation coefficients between total sizes, body composition and test results of students ( $n=43$ )

| Indicators      | 60 m run, s | 3000 m run, min, s | Pull-ups on the bar, number of times | Raising the legs to the crossbar, the number of times | Standing long jump, cm | Standing forward bend, cm |
|-----------------|-------------|--------------------|--------------------------------------|---|------------------------|---------------------------|
| Body length, cm | 0,16        | - 0,07             | - 0,27                               | - 0,34*   | 0,02                   | - 0,21                    |
| Body weight, kg | 0,52**      | 0,21               | - 0,25                               | - 0,37*   | 0,01                   | 0,09                      |
| BMI             | 0,47**      | 0,25               | - 0,11                               | - 0,22  | 0,01                   | 0,22                      |
| % fat           | 0,52**      | 0,24               | - 0,51**                             | - 0,61**  | - 0,26                 | 0,05                      |

\*  $p \leq 0,05$ ; \*\*  $p \leq 0,01$

( $r=0.52$ ), the results of tests characterizing the physical fitness of students are largely determined by the content of body fat.

It is noteworthy that all the considered indicators of the students' physique are not significantly related to the results in the 3000-meter run, standing long jump and standing forward bend. Standing long jump, unlike another test that characterizes speed and speed-strength abilities - 60-meter running, is largely determined by technique and possible performance errors (insufficient torso tilt during repulsion, premature lowering of the legs, etc.). This can explain the lack of connection between his result and physique indicators.

**Conclusions.** The results of the study allow us to conclude that when determining the compliance of body weight with the norm, the calculation of BMI is insufficient, it is also necessary to take into account the composition of the body, that is, the ratio of fat and muscle tissue in the body. The level of physical fitness of young students of the first year of a pedagogical university at the end of the second semester can be estimated as average. Physique indicators such as body length and weight, body mass index and body fat percentage affect to varying degrees the results of tests evaluating students' speed and strength abilities, but their relationship with the results of endurance tests, speed and strength abilities and flexibility is unreliable. The information obtained should be taken into account when developing physical education programs for students, and they should be focused, in particular, on reducing the percentage of body fat.

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