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## INTEGRAL ASSESSMENT OF PHYSICAL DEVELOPMENT OF STUDENTS OF THE FACULTY OF PHYSICAL EDUCATION NAMU

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### **Annotation**

*The article is devoted to the study and scientific substantiation of the integral quantitative assessment of the physical development of students of the Faculty of Physical Culture of Namangan State University according to the data of the Sports and Health Dispensary of the Namangan Region, based on the results of measuring length and body weight, dynamometer indicators and vital capacity of the lungs, transformed into immanent indicators: BMI, ZHI, SI. The results of the study showed that the quantitative integral assessment of physical development, based on the factor criteria of body length and weight, back strength and vital capacity of the lungs, transformed into the body mass index, strength and life indices, reflects the essence of the concept of physical development (human potential). A comparative assessment of the physical development of students indicates the degradation of the physical development of young men in 2011-2021. compared to students in 1999*

### **Key words**

*students; body length and weight; back strength; vital capacity of the lungs; body mass index; vital and strength indices; physical development.*

**Introduction.** Physical development is a complex of functional and morphological indicators of the body that characterize the processes of its growth and development [4,7,8].

Physical development changes throughout a person's life constantly, but not uniformly, under the influence of genetic and environmental factors. The greatest changes occur in childhood, adolescence, and youth. During these years, the influence of the external environment on ontogeny is most significant [5,6].

Based on physical development, one can judge the correspondence of a person's passport and biological age, and a person's reserve of physical strength.

Human physical development is important in healthcare, physical education, and sports [21].

Together with the functional state, it determines the physical health of the individual [1]. In sports activities, anthropometric morphofunctional characteristics serve as guidelines for choosing a sports specialization or type of sport [18,19,22]. For children of early, preschool and primary school age, adolescents, the main criteria for physical development are the dynamics of linear and weight indicators, an increase in protoplasmic mass [2], general and manipulative motor activity, stages of sexual development and other indicators [3]. The main task of these studies is to determine the correctness of the physical development of children and adolescents, the correspondence of biological age to calendar years. In young men and people of middle age groups, the purpose of the study is to assess the strength of physical development based primarily on the study of physiometric indicators [2, 20]. The main model characteristics of the physical development of this age group should be immanent signs, which in their totality most accurately characterize a person's potential capabilities. Preferences were given in favor of body mass index (BMI), vital index (VI) and strength index (SI).

Body mass index was chosen due to the fact that adaptive mechanisms for regulating physiological functions in the body are significantly higher in people with normal body weight than in subjects with obesity or obesity [10].

In addition, in students with increased body weight, the development of chronic diseases, diabetes mellitus, and diseases of the cardiovascular system is observed more often compared to individuals with normal body weight [23]. It has also been established that the cause of death in 2.6 million people worldwide is excess body weight [16].

Performing deadlifts places a number of demands on a person. Firstly, for its determination there should be no contraindications (the presence of hernias, prolapse of internal organs, spinal diseases, high blood pressure (BP), risk of bleeding, osteoporosis of bones and other pathological conditions of the body), which already characterizes the state of human health.

Secondly, in order to show good results on the backbone dynamometer, it is necessary to activate global muscle activity (muscles of the back, abdominals, lower and upper extremities, neck, face, etc.). What is needed is powerful generation of impulses from the motor analyzer, which is achieved by an extremely high concentration of volitional effort with performing deadlift.

Consequently, the demonstration of deadlift results depends on a number of physiological, biochemical and psychological characteristics of the body [11].

Thus, we can consider that the deadlift index is an indicator of physical potential and biological health. If there were contraindications for determining deadlift strength, dynamometer indicators of the strongest arm were included in the assessment of physical development.

The vital index characterizes the external respiration apparatus, the potential of the lungs, and gives an idea of the functional state and capabilities of the respiratory system. Along with this, vitality and strength indices depend not only on the absolute values of vital capacity of the lungs (VC) and deadlift strength, but also on the body weight of the person being studied.

Consequently, all these three factors are closely interconnected with each other and clearly respond to changes in the components of the integral assessment of physical development.

**Purpose of the study.** To develop and test a method of integral quantitative assessment of physical development in students, based on the results of measuring body length and weight, dynamometer indicators and vital capacity of the lungs, transformed into immanent indicators: BMI, GI, SI.

**Material and research methods.** At the beginning of the school year in September-October 1999 and then from 2011 to 2021. According to the Physical Culture and Health Dispensary of the Namangan Region, 1622 1st year students aged  $17.8 \pm 0.6$  years from the Faculty of Physical Culture of Namangan State University were examined. Somatoscopic and anthropometric research methods were used [12,13].

Subcutaneous fat was measured with an Omron BF 302 device. Body weight, vital capacity and dynamometer parameters were modified into body mass index, vital and strength indices.

Body mass index (BMI) =  $m/L^2$ , where m is body weight, kg; L - body length, m<sup>2</sup>.

Vital index (VI) = vital capacity/m, where vital capacity of the lungs in ml; m - body weight in kg. Strength index (SI) =  $(F \times 100\%)/m$ , where F - deadlift, kg; m - body weight in kg.

Data on the percentage distribution of vital and strength indices were assessed on a five-point scale according to the principle, the higher the result, the higher the score, i.e. a direct proportional rating scale was used (Table - 1).

**Table 1**

**Assessment and percentage distribution of characteristics of physical development of students (n = 250) 2011-2012 years of study**

Vital index (ml/kg body	Strength index (% of body	Assessment	and	%
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weight)	weight)	distribution of characteristics of physical development of students
>87	>226	100-95% - (5)
87-74	226-201	94-75% - (4)
73-57	200-150	74-25% -(3)
56-46	149-112	24-6% - (2)
<45	<112	5- 0% - (1)

Assessing body mass index from the standpoint of the higher the better, as was the case when scoring the vital and strength index, may be incorrect. Let's say the person being examined has increased body weight, obesity, he should be given a good or excellent mark. However, as our studies have shown, weight-dependent indicators of GI and SI in these subjects in 90% of cases had poor or very poor scores. For example, a surveyed student with obesity (BMI >30.8 kg/m<sup>2</sup>) receives 5 points and bad grades, 2 points each, for GI and SI, the sum is 9 points. Divide by 3, on our scale we get physical development equal to 3 points - satisfactory, which is clearly not true.

In the work of D. A. Vasiliev [9], the values of the mass-height index corresponded to the sigmoid type of the rating scale. Recognizing the validity of this approach, some clarifications were made. In the range from 25 to 75 percent, BMI was rated good or excellent if the vital and strength indices corresponded to the same level. In other cases, regardless of the values of GI and SI, the body mass index was assessed as satisfactory. A similar BMI mark was set when it was placed below the 25th centile to the 5th centile. Above 75 to 95% - body weight was classified as poor. Within the top and bottom 5%, BMI was defined as very poor.

Thus, physical development (PD.) = (BMI + GI + SI)/3 = conventional unit.

Statistical processing and analysis of anthropometric data were carried out using a computer mathematical software package (Microsoft Office Excel 2007). The table and text indicate the average value (M) and its error ( $\pm m$ ) (M $\pm m$ ). The probability of an error-free forecast was taken to be (p $\geq$  95%).

**Results and its discussion.** Table 2 presents the results of structural and functional examinations of students. It can be seen that body length and subcutaneous fat tissue among students in 2011-2021. became significantly larger than that of boys in 1999. Body weight, with the exception of students in 2011-2012, did not differ statistically significantly from boys who studied in 1999.

Most other anthropometric data in boys 2011-2021. were significantly lower compared to students in 1999. Among young men in 2011-2020. There were

pronounced differences in individual somatometric values. For example, subcutaneous fat in students of 2011–2012. survey was significantly less than that of their peers in subsequent years. VC in students of 2011 and 2020. exceeded the values of peers in 2016 and 2018.

The deadweight strength of the 2018 boys was greater than that of the 2011, 2012 and 2016 students. There were no obvious differences between students in different years of examination in the dynamometric results of the left and right hands. Thus, according to individual results of anthropometric indicators, in longitudinal studies, it is difficult to provide objective and complete information about the dynamics and trends in the physical development of students.

**Table 2**

**Morphofunctional indicators of physical development of students studying in 1999 and from 2011 to 2021**

Anthropometric student indicators	1999, n=113 (I)	2011, n=250 (II)	2012	2016, n=213 (III)	2017, 2018 n=474 (IY)	2019, 2021 n=572 (Y)
1. Body length, (cm).	172,4±0,6	176,4±0,3*		175,1±0,3	175,3±0,4*	177,0±0,5*,**
2. Body weight (kg).	72,8±1,1	66,1±0,55*,**		70,1±0,7	69,6±1,0*	75,5±1,2*,***
3. Subcutaneous fat fiber (% of body weight).	13,3±0,4	15,04±0,6*,**		17,2±0,35*	16,5±0,34*	17,2±0,45*
4. Vital capacity of the lungs (l.)	4,9±0,07	4,4±0,1*		4,1±0,03*	4,12±0,05*	4,42±0,05*,♦
5. Deadlift strength (kg).	145,0±2,5	114,4±1,2*		111,8±1,3*	121,0±1,9*	116,3±4,0*
6. Right arm strength (kg).	52,3±1,1	43,5±0,5*,**		40,1±0,3*	37,5±0,4*	43,5±0,5*
7. Strength index of the right arm (% of body weight).	72,4±1,0	65,0±0,7*,**		55,3±0,5*	53,5±0,7*	56,2±1,0*
8. Left arm strength (kg).	47,5±1,2	40,8±0,3*,**		36,8±0,3*	33,8±0,43*	40,7±0,81*,**
9. Strength index of the left hand (% of body weight)	62,4±1,3	59,8±0,4*,**		52,5±0,5*	47,4±0,6*	52,1±0,69*

\* - reliability of change compared to (I) P <0.05; \*\* - (III-Y); \*\*\* - (I - IY);

♦ - (II, - IY); x - (II, III)

The inherent values of the physical development of students over the years of study are clearly visible: a gradual decrease in the trend line of back strength, vital

capacity of the lungs and body mass index. In addition, it is clear that the reliability indicators of BMI and SI values are inferior to the reliability value of the integral indicator of physical development, that is, the total effect of the components of a student's physical development gives a higher significance than its individual components.

So, considering the physical condition of students of the Faculty of Physical Culture of Namangan State University, it should be noted that in 1999 they were better than those of students in 2011–2012, 2016–2018 and 2021. Moreover, the physical development of students in 2021 became significantly lower in relation to their peers not only in 1999, but also in relation to students of 2011–2012, 2016–2018,  $p < 0.05$ .

In accordance with the data in Table 3, physical development among students in 1999 and 2011–2012. was rated satisfactorily, however, for young men in 1999 it was significantly higher -  $3.1 \pm 0.10$  conventional units than for their peers in 2011–2012 years of study  $-2.81 \pm 0.02$  conventional units ( $p < 0.01$ ). Students 2016, 2018–2019, 2021 physical development corresponded to a poor to low level of physical development among students of 2021.

From 5 point mark of physical development, students of 1999 and 2011–2012. students with an average assessment of physical development lagged behind by 34% and 41.8%, respectively. Boys 2016–2021 training were inferior in their physical development by 43.7–45.2%. Our research results confirm epochal changes in the physical development of students for the worse [15].

Physical development is a set of hereditary and acquired morphological and functional anthropometric characteristics that change during a person's life. In this part of the understanding of physical development, there are no differences between specialists of various profiles. However, it is incorrect to assert that the physical development of a person determines the reserve of his physical strength, performance, endurance, and capacity of the body. In studies of the health and functional state of students [17], no correlation was found between physical development and indicators of breath holding during inhalation, the Robinson B.F. index. (double product) absolute and relative physical performance, determined by the PWC170 test.

Analysis of materials on the study of physical development and physical fitness of 3905 students of both sexes aged 17–22 years, carried out by Izaak S.I., Panasyuk T.V. [14], showed that the dynamics of their development are not the same. For example, in motor development extreme options (low and high) are more

common, while for physical development the average level of assessment predominates.

Consequently, it is more correct to say that physical development indicates a person's potential capabilities, which, under appropriate conditions, can be realized in the ability to show good physical performance, strength, dexterity and other physical qualities.

**Table - 3**

**Physical development of students**

Reference values for physical development of students	Physical assessment development
<2,5	1 rating, very bad
2,51 - 2,83	2 rating, bad
2,84 - 3,50	3 rating, satisfactory
3,51 - 3,99	4 rating, good
>4,00	5 rating, excellent

Correlation coefficient of physical development of students with BMI ( $r=0.61$ ); GI ( $r=0.67$ ); SI ( $r=0.72$ ); SI of hands ( $r=0.54$ ) .  $P<0.01$ .

The proposed method of integral quantitative assessment of human physical development, based on the immanent values of body mass index, strength and life indices, is a tool that adequately characterizes a person's energy potential.

The indicator of physical development obtained in this way is valid. It is known that the criterion for the value of any study, method, or conclusion is their expert assessment. The completed morphofunctional studies on 1622 students specializing in various types of physical education and sports confirmed the practicality and reliability of the developed method of integral quantitative assessment of physical development.

**Conclusions.** 1. Individual morphofunctional anthropometric indicators do not provide an objective and complete description of physical development.

2. Quantitative integral assessment of physical development, based on the factor criteria of body length and weight, back strength and vital capacity of the lungs, transformed into body mass index, strength and life indices, reflects the essence of the concept of physical development (human potential).

3. A comparative assessment of the physical development of students indicates the degradation of the physical development of young men in 2011-2021. compared to students in 1999

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