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ANTHROPOMETRIC PARAMETERS OF FIRST-YEAR STUDENTS OF PEDAGOGICAL SPECIALTIES

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The topic is relevant due to a detailed study of the factors determining the health level of nowadays students, and taking these factors into consideration for the development of programs to strengthen their health. Since the scientific literary data on the physical development of student youth is somewhat contradictory, namely the morphological and functional indicators of a person depends on the level of physical health and adaptive capacity, it has been decided to determine the freshmen's anthropometric parameters.

The aim of the study was to take anthropometric measurements of total and comprehensive body size of 105 students studying at Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, assess their compliance with anthropometric standards, determine the somatotype and foot shape in order to create a database for further monitoring of physical development and identify patterns of anthropometric indicators under conditions of modern learning technologies.

Research methods. Anthropometric measurements were taken according to standard anthropometric methods suggested by V. V. Bunak [1]. Data estimation was performed by the method of centile intervals and indices. The foot shape was assessed by the plantogram based on the Chyzhyn index. The obtained data were statistically processed according to the STATISTICA 5.5 program.

Research results. The peculiarities of anthropometric parameters and somatotype of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University first-year students are established: height, body weight; girth sizes: chest, waist, hips; body mass index, Kettle mass-growth index, body harmony indices, foot shape

Keywords: body length and mass, girth sizes of the body, body mass index (BMI), anthropometric measurements, somatotype

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1. Introduction

Analysis of anthropometric parameters is an important factor in assessing the health status of students of all ages. Constant monitoring of anthropometric indicators allows to notice changes in time and, using special methods, correct the identified deviations. The main task of using the anthropometry method in a higher educational institution is to establish some indicators of the physical development of students.

Physical development together with morbidity, fertility, mortality are the leading indicators of sanitary statistics and testify to the social well-being of the population. Physical development is assessed by the state of morphological and functional properties and qualities that underlie the determination of age characteristics, physical strength and endurance of the body, and the level of biological age.

2. Literature review

Analysis of recent studies and publications indicates that the results of previous studies of somatometric indicators of physical development of modern youth are somewhat contradictory. Some authors note a tendency towards an increase in the number of boys and girls with asthenic physique [2]. Based on a comparison of anthropometric parameters and adaptive capabilities of modern

young men and women with their peers in the 1920s–1990s, they concluded that an epochal trend towards an increase in body length and deterioration of strength indicators, as well as a slight increase in body weight in modern young men [3]. Other researchers note that the anthropometric indicators of today's youth correspond to average standards [4]. The average statistical parameters of the total and girth sizes of the body of boys and girls of 16–20 years old, urban residents of the Podolsk region of Ukraine have been established [5]. In the literature there are a number of works in which the indicators of physical development of young people in different regions of different age groups were studied, depending on gender and somatotype [6].

It is noted that the intensity of mass-growth processes is influenced by the conditions of the educational process. Thus, students of a medical university with a high level of pedagogical load and a lower level of physical exertion were found to have moderate changes in partial sizes, an increase in the skin-fatty component and a decrease in the muscle component of body weight (changes in harmony indices) during training in the I–III courses [7].

Considering all of the above, it was decided to conduct research on the anthropometric parameters of first-year students at the Vinnytsia Mykhailo Kotsiubyn-

skyi State Pedagogical University and create a database for further monitoring the physical development and somatic health of students.

3. The aim and objectives of research

The aim of research se of the study is to study the level of physical development of students of the Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University.

To achieve the aim, the following objectives were set:

1. Improve methods for assessing physical development, physical fitness, health level of first-year students and modernize the average statistical anthropometric standards.

2. Assess the anthropometric status of a typical modern student, future teacher.

3. Carry out activities to improve health, increase functional reserves and adaptability, improve physical and mental performance.

4. Materials and methods

We conducted a survey of 105 first-year students of various specialties, with the exception of students of the Institute of Physical Education and Sports at the age from 17 to 20 years old, including 32 boys and 73 girls.

The research was carried out for the last 3 years, from 2017 to 2020. All surveyed students gave their voluntary consent to participate in the study. Anthropometric measurements were carried out according to standard methods [1]. Body length was assessed using the centile interval method [8]. Correspondence of body weight to height was determined using body mass index (BMI),

Quetelet's mass-growth index. The coefficient of proportionality of the body and chest (Erisman index) was calculated. To determine the shape of the foot, plantograms were evaluated with the calculation of the Chyzhyn index.

The data obtained were statistically processed using the STATISTICA 5.5 program using the Student's t-test.

5. Research results

Average indicators of body length (height) in the surveyed boys are 175.08 ± 5.24 ; for girls – 165.25 ± 5.1 . These indicators in all growth groups, both for boys and girls, exceed the centile intervals, that is, all the surveyed students have a height above the average. The average body mass indicators for boys are 68.08 ± 1.75 kg, for girls – 56.996 ± 1.03 kg (Table 1).

The proportionality coefficient of the body in the surveyed both sexes is within the normal range: in boys – from 87 % to 92 %, and in girls – slightly lower – from 87 % to 89 %.

According to the Quetelet's index, it was determined that 7 students (22 %) have normal weight, 15 (48 %) underweight, and 10 (30 %) overweight. In the group of girls surveyed, according to this index, normal weight was determined in 27 people (37 %), underweight – in 24 (33 %), overweight – in 22 (30 %).

According to informative unified BMI, it was determined that 17 boys (53 %) and 55 girls (75 %) have normal weight, 7 boys (22 %) and 13 girls (18 %) are underweight, and overweight – in 8 boys (26 %) and 5 girls (6 %). Obesity (BMI over 30 kg/m^2) was not recorded in either boys or girls (Fig. 1).

Table 1

Average anthropometric indicators of first-year students

Anthropometric indicators	Boys ($n=32$)	Girls ($n=73$)
Height, cm	175.08 ± 5.24	165.25 ± 5.1
Weight, kg	68.08 ± 1.75	56.99 ± 1.03
Chest circumference (pause), cm	88.52 ± 2.14	84.98 ± 0.90
Waist girth, cm	72.90 ± 0.91	70.05 ± 1.98
Hip girth, cm	99.10 ± 0.73	97.06 ± 2.0
BMI, kg/m^2	19.84 ± 0.96	20.72 ± 0.33
Chest proportionality index (Erisman)	2.5 ± 0.47	0.77 ± 0.58
WG/HG	0.80 ± 0.02	0.75 ± 0.03

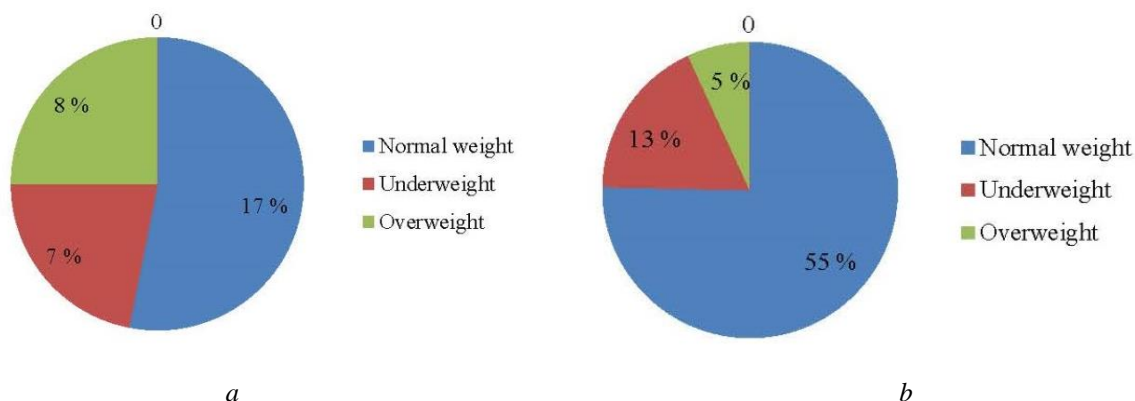


Fig. 1. Distribution of body mass index among the surveyed students: *a* – boys; *b* – girls

At the same time, the arithmetic mean values of BMI among the surveyed students (19.84 ± 0.96 – among boys; 20.72 ± 0.33 – among girls) correspond to the norm, and the average body mass indicators of first-year students of the VSPU in 2020 are slightly higher in comparison with the results of our previous studies conducted in 2017 ($p > 0.05$) [9, 10]. The maximum BMI values for boys were 28.7 kg/m^2 , and for girls 26.9 kg/m^2 . As it is known, a BMI above 25 kg/m^2 indicates overweight and is one of the health risk factors: it leads to increased blood pressure, hyperglycemia and other adverse changes [11, 12].

The average indicators of weight and body length of the examined students are comparable with the results of a survey of Moscow students of the 1st–2nd year, conducted by M. Negasheva and T. Mishkova in 2002–2003 [3]. However, when comparing these parameters with the weight and body length of 17-year-old adolescents, one can note a significant increase in body length ($p < 0.001$) and a tendency towards a decrease in the body weight of modern girls ($p > 0.05$) [13], which confirms the opinion of some authors about asthenization as a modern epoch-making trend [2, 3].

The proportionality of chest development was assessed using the Erisman index. 56 % of boys and 68 % of girls have a narrow chest (insufficient development). The average development of the chest was determined in 44 % of boys and 28 % of girls, and in 4 % of girls – a broad chest.

According to the data, in the last decade, there has been a significant increase in the chest index in 18-year-old boys, in contrast to girls, in whom these changes are less pronounced. Researchers note a significant increase in the chest in adolescents in Krakow in comparison with the data in 1983 and explain this fact by social changes and the level of economic development of the country [14].

To determine the somatotype (body build), the Pignet index and the Soloviev index were used. The Pignet index is considered more informative, since it takes into account a larger number of parameters of the human body: height, body weight and girth of the chest clique. This index determined that 24 % of the surveyed young men have a strong body type, 22 % – normal, 17 % – average, 17 % – weak and 17 % – very weak. Among the surveyed girls, 11 % have a strong body type, 22 % – normal, 16 % – average, 40 % – weak and 11 % – very weak. (Fig. 2)

According to the Soloviev index (wrist girth), it was determined that among the surveyed young men, 70 % have an asthenic body type, the remaining 30 % have a normosthenic type. In the group of girls surveyed, the normosthenic body type predominates; it was identified in 71 % of people. 29 % of female students have asthenic type.

The waist-hip index was used to assess the distribution of body fat and the body. Modern studies show that the mass of adipose tissue and its abdominal accumulation significantly affect the functional state of the cardiovascular system, increase the level of blood pressure even with normal BMI [15–19]. It has been determined that both boys (61 %) and girls (94 %) have a favorable gynoid type of fat deposition (“pear” type). The intermediate type (“avocado”) was found in 39 % of

boys and 6 % of girls, and the unfavorable android type (“apple”) was not found in the surveyed students.

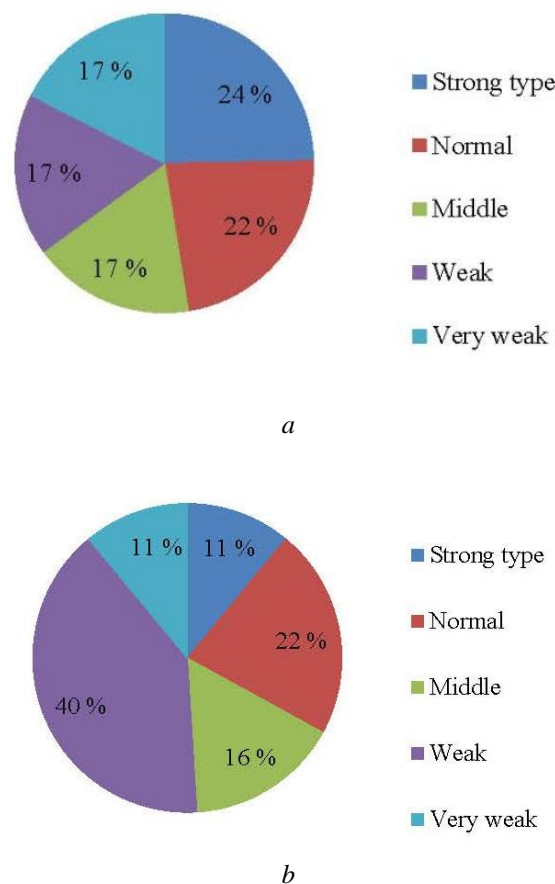


Fig. 2. Distribution of somatotypes among the surveyed students: *a* – boys; *b* – girls

The study of the shape of the foot showed that 85 % of boys have a normal foot, 10 % have a flat foot and 5 % have a flat foot. Among girls, 57 % have a normal foot, 20 % have a flattened foot and 23 % have a flat foot. So, 15 % of boys and 43 % of girls have violations of the shape of the foot (flattening or flat feet), which disrupts the functional state of muscles and joints and can cause pathological changes not only in the musculoskeletal system, but also in other functional systems.

5. Conclusions

1. A comprehensive study of the anthropometric status of students of different age and social groups, different specialties, living in different regions will improve the methods for assessing their physical development, physical fitness, health level and modernize the average anthropometric standards.

2. The data allow to describe the generalized anthropometric status of a typical modern student, a future teacher. This is an asthenic of high or above average height with normal or deficient body weight, with a narrow chest, with a favorable gynoid type of fatty tissue; every second has a flattened or flat foot.

3. As a result of the survey, data on the anthropometric parameters of the body of VSPU first-year students, their somatotype, the shape of the chest and feet are obtained, and on this basis a database for further monitor-

ing of the physical development and the level of physical health of these students are created. This will strengthen

their health, increase their functional reserves and adaptability, improve physical and mental performance.

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