

# Appropriate norms of physical development of student's youth

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**Purpose:** the determination of proper norms of physical development of student's youth.

**Material & Methods:** the following indicators were used for the assessment of physical development of students: body weight, length of body standing, vital capacity of lungs. Index of body weight and vital index were defined on their basis. The selective method was used for the establishment of borders of the confidential interval.

**Results:** the assessment of ratio of weight and length of body at students and students, who participated in the research, showed that it is in norm limits, and the size of vital index is lower than norm.

**Conclusions:** results of the carried-out analysis showed that the level of physical development of students of NLA and KhHPA meets the established standards and the relevant data which are submitted in special literature. The borders of the confidential interval are established for indicators of physical development of students on the basis of the obtained data which characterize the general population.

**Keywords:** physical education of students, physical development, body weight, body length, vital capacity of lungs, confidential interval, variability, general population.

## Introduction

The practical organization of physical education of student's youth is regulated by the Provision on the organization of physical training and mass sport in higher educational institutions [6]. It follows from it that the key tasks of the system of physical education, which functions in HEI, is providing at student's youth of the appropriate level of development of physical qualities, motor abilities, working capacity, functional and morphological opportunities of organism. It is important to have the objective data on the valid and appropriate level of physical development of students for their decision. This problem is rather widely presented in scientifically-methodical literature. So, for example, the annual changes of indicators of physical development and physical fitness of students depending on the level of their physical activity are analyzed in the research of F. Volochyi, M. Vasilkiv [4] that gave them the chance to formulate conclusion about the negative tendency in physical development of students, who are engaged on "The program on physical education for higher educational institutions". According to data of M. M. Bobyriova [2], there is big percent of those who have unsatisfactory state of health, the low level of physical development, excess body weight among student's youth. The analysis, which is carried-out by G. V. Vlasov [3], showed that 7,8% have excess body weight, and 9,6% – deficiency of body weight among the examined students. There are 11,9% of the examined have excess weight, and 13,3% – deficiency of body weight among students. It is shown that 52% have deviation from the developed standards of physical development in the research of N. M. Balamutova and V. V. Brusnyk [1] during which length and body weight, circle of thorax were measured and ratios between them were defined at 1300 students-young men of National University "Yaroslav Mudryi National Law Academy of Ukraine". Analyzing body weight index at students of National aviation university, L. V. Yasko [10] showed that 38%

of young men and 48% of girls have insufficient body weight, and excess body weight is noted in 21% of young men and 7% of girls. The provided data confirm need of carrying out additional researches of the problem of physical development of student's youth.

## Communication of the research with scientific programs, plans, subjects

The research is executed within the implementation of the scientific project MES of Ukraine "Theoretic-methodical principles of formation of culture of physical health at student's youth" (number of the state registration: 0115U006767).

## The purpose of the research:

the determination of proper norms of physical development of student's youth.

## Research tasks:

1. To estimate the level of physical development of students of NLA and KhHPA.
2. To set limits of confidential interval for parameters which characterize physical development of students of the general population through the sample indicators.

## Material and Methods of the research

The following indicators, which are received from materials of medical reviews, were used for assessment of physical development of students: 1) body weight, 2) body length, standing (height), 3) the vital capacity of lungs. On their basis were defined: 1) body weight index (index of Quetelet) = body weight is divided into the body length, which is expressed in

square meters ( $\text{kg} \cdot \text{m}^{-2}$ ) (the size of this index in normal is ranging from  $18,5 \text{ kg} \cdot \text{m}^{-2}$  to  $24,9 \text{ kg} \cdot \text{m}^{-2}$ ), 2) The vital index =  $\text{VCL}/\text{Body weight} (\text{ml} \cdot \text{kg}^{-1})$  (if this indicator is less than  $60 \text{ ml} \cdot \text{kg}^{-1}$  at men, and it is less than  $50 \text{ ml} \cdot \text{kg}^{-1}$  at women, it can testify to insufficient VCL or to excess body weight).

The selective method, which essence consists in assessment of statistical parameters of the general population through sample indicators, was used for the establishment of limits of the confidential interval. They are set by such inequality for the average arithmetic population to limit of the confidential interval:  $\bar{X}_{\text{sel.}} - t \cdot m \leq \bar{X}_{\text{gen.}} \leq \bar{X}_{\text{sel.}} + t \cdot m$ , where  $\bar{X}_{\text{sel.}}$  – the sample arithmetic average;  $m = \sigma / \sqrt{N}$  – representativeness mistake;  $t$  – the size of the normalized deviation which is determined by the level of confidential reliability ( $P$ ) at  $P=95\%$ ,  $t=1,96$  [8]. Materials of rather physical development of students of KhHPA are partially provided by T. S. Bondar.

## Results of the research and their discussion

The key element is obtaining objective data on the valid and appropriate level of their physical development and physical fitness in the course of improvement of the existing system of physical training of student's youth. It is the important scientific and practical problem, for this time the Resolution of the Cabinet of Ukraine "About the state tests and standards of assessment of physical fitness of the population of Ukraine" lost action (The resolution CM No. 992 from 05.11.2008) which complicates the determination of appropriate level of physical development and physical fitness of students, and there are certain divergences that complicates the process of carrying out the comparative analysis in the data, which are presented in modern scientific works. So, for example, it is visible from materials of tab. 1, in which the submitted data on physical development of students, who study at Daniil Galytskyi Lviv

national medical university (LNMU), A. S. Makarenko Sumy state pedagogical university (SSPU), Ivan Pulyuya Ternopil national technical university (TNTU) that the difference in absolute average values of length of body of students makes  $3,9 \text{ sm}$  ( $178,3-74,4=3,9 \text{ sm}$ ), and body weights –  $4,3 \text{ kg}$  ( $68,6-64,3=4,3 \text{ kg}$ ). If to consider the level of variability of these indicators (the lower limit of interval of variability on length of body makes  $172,0 \text{ sm}$ , on the body weight of  $58,1 \text{ kg}$ , and the top respectively  $184,6 \text{ sm}$  and  $75,5 \text{ kg}$ ), then the divergence in sizes of intervals of variability significantly increases, respectively  $12,6 \text{ sm}$  and  $17,4 \text{ kg}$ . At the same time it is necessary to consider that interval  $\bar{X} \pm \sigma$  includes at itself only  $64,26\%$  of values of sample. If to choose interval to which  $95\%$  of values of sample get and it is defined as  $\bar{X} \pm 3\sigma$ , the limit of variability of selective sign will extend even more. In this case, for example, the lower limit on length of body will make  $178,3-18,9=159,4 \text{ sm}$ , and the top –  $197,2 \text{ sm}$ . The similar dependence is shown also in body weight size.

The marked-out feature is traced also in estimates of level of physical development of students who study in data of HEI. So, the interval of variability of indicator of the average-grouped length of body at students has the size of  $1,2 \text{ sm}$  ( $167,0-165,8=1,2 \text{ sm}$ ), and body weight indicator –  $3,7 \text{ kg}$  ( $58,6-54,9=3,7 \text{ kg}$ ). If to consider sizes of group variations (the lower limit of interval of variability of growth makes  $166,6-5,7=160,9 \text{ sm}$ , body weight  $54,9-6,3=48,6 \text{ kg}$ , and the top respectively  $166,6+5,7=172,3 \text{ sm}$  and  $54,9+6,3=61,2 \text{ kg}$ ), then the size of interval of variability of these indicators considerably increases, it makes respectively  $11,4 \text{ sm}$  and  $12,6 \text{ kg}$ . The noted divergences testify to need of carrying out the additional research. Its results are shown in table 2 in which indicators of physical development of students, who study in NLA and KhHPA, are presented. They demonstrate that the average-grouped indicator of length of body makes

Table 1

Level of physical development of students of different HEI of Ukraine

Nº	Indicators of physical development	A. Khokhla [9]	I. Saluk [7]	O. Ushkalenko [5]
<b>Boys</b>				
1	Body length (sm)	178,3±6,3	176,6±0,3	174,4±2,0
2	Body weight (kg)	66,8±8,7	68,6±0,4	64,3±2,2
<b>Girls</b>				
1	Body length (sm)	166,6±5,7	165,8±0,7	167,0±1,7
2	Body weight (kg)	54,9±6,3	58,6±0,8	56,9±2,0

Table 2

Indicator of physical development of students of NYuU and HGPA

HEI	Quantity of students (n)	Height (sm)		Body weight (kg)		VCL (l)		Index of Quetelet ( $\text{kg} \cdot \text{m}^{-2}$ )	Vital index ( $\text{ml} \cdot \text{kg}^{-1}$ )
		$\bar{X}$	$\sigma$	$\bar{X}$	$\sigma$	$\bar{X}$	$\sigma$	$\bar{X}$	$\bar{X}$
<b>Boys</b>									
NLA	n=201	178,8	6,5	74,2	11,2	3,9	0,56	23,3 (nor.)	52,6
KhHPA	n=79	175,4	7,3	70,4	8,6	3,7	0,51	22,9 (nor.)	52,5
<b>Girls</b>									
NLA	n=140	167,3	5,6	56,9	7,7	2,8	0,47	20,6 (nor.)	49,2
KhHPA	n=166	164,1	0,6	56,9	0,3	2,6	0,10	21,1 (nor.)	45,7

respectively 178,8±6,5 sm and 175,4±7,3 sm, and body weight – 74,2±11,2 kg and 70,4±8,6 kg at children. The interval of variability of these indicators in general coincides with data, the above-stated (see tab. 1), and despite of the fact that the absolute average-grouped body weight indicators at students of NLA and KhHPA are a little higher. The similar regularity is shown also in the size assessment of the average-grouped indicators of length and body weight at students of NLA and KhHPA which make respectively height – 167,3±5,6 and 164,1±0,6, body weight – 56,9±7,7 and 56,9±0,3. If to estimate ratio of body weight and length of body (index of Quetelet) at students and students of NLA and KhHPA, who participated in the research, then it is possible to claim that this indicator is in norm limits (norm 18,5–24,9). Results of the conducted researches demonstrate also that the size of vital index at them is lower than norm (tab. 1). As the ratio of body weight and length of body is in norm limits at students, who participated in researches, this fact can demonstrate that they have insufficient size of VCL that is caused by the insufficient level of exercise stresses.

Results of the carried-out analysis showed that limits of variability of absolute average-grouped indicators of length and body weight at students of LNMU, SSPU, TNTU, and also NLA and KhHPA significantly do not differ. The received results allow to set limits of the confidential interval for the general population indicators on the basis of statistics of sample what is represented by students of NLA, that is to establish with the set reliability (it is accepted for problems of physical culture that P =95%) the appropriate level of physical development of students of HEI. Leaving the statistics, which are presented in table 2, for the selection of male students of NLA  $m_{\text{height}}=0,457$ ,  $m_{\text{body weight}}=0,788$ , and for female students,

respectively,  $m_{\text{height}}=0,747$  and  $m_{\text{body weight}}=0,652$ . Therefore, proceeding from the obtained data, with reliability of 95%, it is possible to claim that the general population indicator which characterizes length of body of students (boys) will be in limits  $177,9 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 179,7 \text{ sm}$ , and body weight indicator within  $72,6 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 75,7 \text{ kg}$ . The average values of length and body weight of the general population for female students will be in such limits: body length –  $165,8 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 168,76 \text{ sm}$ , and body weight –  $55,62 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 58,8 \text{ kg}$ .

## Conclusions

1. Results of the carried-out analysis showed that the level of physical development of students of NLA and KhHPA satisfies to the established norms and the relevant data, which are submitted in special literature.

2. Proceeding from the obtained data, with reliability of 95%, it is possible to claim that the general population indicator which characterizes length of body of students (boys) will be in limits  $177,9 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 179,7 \text{ sm}$ , and body weight indicator within  $72,6 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 75,7 \text{ kg}$ . The average values of length and body weight of the general population for female students will be in such limits: body length –  $165,8 \text{ sm} \leq \bar{X}_{\text{gen. height}} \leq 168,76 \text{ sm}$ , and body weight –  $55,62 \text{ kg} \leq \bar{X}_{\text{gen. body weight}} \leq 58,8 \text{ kg}$ .

**Prospects of the subsequent investigations.** The analysis of physical fitness of student's youth and establishment of limits of the confidential interval for the corresponding indicators of the general population through the sample indicators is planned in the subsequent.

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