

Appropriate standards of physical fitness of students

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Purpose: to establish the due norms and estimates of the level of development of physical fitness of students.

Material & Methods: the assessment of physical fitness of students (young men) was carried out on the basis of the results, which are shown by them in tests: standing long-jump, run of 60 meters, run of 1000 meters, pull ups on a horizontal bar, trunk bending forward from sitting position, and shuttle run of 4x9 m. The selective method was used for the establishment of borders of the confidential interval.

Results: results of the carried-out analysis showed that the level of physical fitness of students of NLA corresponds to the data, which are submitted in special literature.

Conclusions: borders of the confidential interval for indicators of physical fitness of students of the general population, and also due standards and estimates of the level of development of their physical fitness are established on the basis of the received results.

Keywords: physical education, physical fitness, confidential interval, variability, general population, statistical norms.

Introduction

The level of physical health of student's youth as results of the analysis of special literature testify [1; 3; 4; 13], significantly depends on the volume of their motor activity, which is defined generally by the efficiency of training on physical education within the educational process, which is developed in higher educational institutions of Ukraine [5; 12; 17 and others]. It means that the appropriate level of physical health of students is provided generally at the expense of the correct organization of classes in the course of practical realization of the discipline "Physical education". The level of development at students of physical fitness, which is characterized in the basis by the level of development at them physical qualities, is the objective consequence of this process (endurance, force, speed, dexterity, flexibility). In this connection there is the requirement of determination of appropriate standards of physical fitness of students as one of the basic elements of management of the educational-training process. The solution of such task for this time has the important practical value, the Resolution of the Cabinet of Ukraine "About the state tests and standards of assessment of physical fitness of the population of Ukraine" has lost action [7], and the new mechanism of annual estimation of physical fitness of the population of the country takes root, since 2017 [8].

Communication of the research with scientific programs, subjects, plans

The research is executed within the implementation of the scientific project of the 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 appropriate standards of physical fitness of student's youth (young men).

Research tasks:

1. To determine the level of physical fitness of students (young men).
2. To set limits of the confidential interval for indicators of physical fitness of students of population (young men).
3. To establish the appropriate standards and estimates of the level of development of motive qualities at students.

Material and Methods of the research

The following tests were used for the assessment of physical fitness of students (young men). High-speed and power preparedness of students was estimated on the basis of test results "standing long-jump". The level of development of speed at them was estimated by test results "run of 60 meters", endurance – by the results, shown in run on distance of 1000 m, forces – by the results, shown in the test "pulling up on a horizontal bar" (number of times), flexibility – by the results, shown in the test "trunk bending forward from situation, sitting" (sm), dexterity – at the results shown in the test "shuttle run of 4x9 m» (s). The criterion of Student was used for the comparison of average values two sample. The selective method, which essence consists in the assessment of statistical parameters of population through sample indicators, was used for the establishment of limits of confidential interval. For average arithmetic population to limit of confidential interval are set by such inequality $\bar{X}_{sel.} - tm \leq \bar{X}_{gen.} \leq \bar{X}_{sel.} + tm$, where

\bar{X}_{sel} – average arithmetic selective population, $m = \sigma / \sqrt{N}$ – representativeness error; t – the size of the normalized deviation, which is determined by the level of confidential reliability (R) at $P=95\%$, $t=1,96$ [6; 11]. Students of Kharkiv National law university of Yaroslav the Wise (NLU), and Municipal institution “Kharkiv Humanitarianly Pedagogical Academy” of the Kharkiv regional council (KhHPA) participated in the research. Materials of rather physical fitness of students of KhHPA are partially provided by T. S. Bondar.

Results of the research and their discussion

Results of the assessment of level of physical fitness of students (young men) of NLU and KhHPA are presented in the table 1. As the received materials concerning the level of development of high-speed and power preparedness, which was estimated by the results, shown in the test “standing long-jump” testify, students of NLU authentically do not differ from students of KhHPA. If to compare the value of the average-grouped, shown by students of NLU (228,2 sm) and KhHPA (233,7 sm) to the results presented in special literature, then the corresponding intervals of variability in general coincide. For example, in the dissertation research of O. Tserkovnaya [14], the minimum value of interval of variability in this type of testing makes 216,3 sm, and maximum – 245,5 sm. The obtained data also coincide with the results, which are presented in the article of I. Saluk [9], in which the variability interval in this test makes $229,9 \pm 1,7$ sm. As show the research materials, students of KhHPA in comparison with results of students of NLU have shown authentically the best results only in the test “run on 60 m”, respectively $8,5 \pm 0,7$ s and $8,99 \pm 1,37$ s. At the same time it is necessary to take the fact that same-signal interval of variation of results of testing of students of KhHPA into account (the minimum value 7,78 s, and maximum – 9,2 s) is completely absorbed by interval of variation of the results, shown by students of NLU (the minimum value 7,62 s, and maximum – 10,36 s). On the level of the development of endurance, which was estimated by results of run on 1000 m, students of these higher education institutions statistically do

not differ. They have shown such average-grouped results: NLU – 3,4 min, and KhHPA – 3,36 min. Similar regularity is found out also as a result of comparison of indicators of the development of power preparedness of these students HEI, that s average-grouped results in the test “pulling up on a horizontal bar” at students of KhHPA (11,4 times) are slightly higher than at students of NLU (10,97 times). Let's note that the interval of variability of the results shown by students of these HEI in this test coincides with the data of I. Saluk [9] ($9,2 \pm 0,43$ times) and R. Cherkashin [15] ($8,39 \pm 0,07$ times). On the average-grouped level of development of flexibility students of NLU (13,7 sm) statistically do not differ from students of KhHPA (12,6 sm). Practically the same results in this type of testing (namely 10,3 sm) are presented in the work O. Cherepovetskaya [16], and also in already mentioned article of I. Saluk [9] ($10,9 \pm 0,14$ sm). Results of the research have also shown that on the level of development of dexterity which was estimated by results of shuttle run students of NLU and KhHPA statistically do not differ. They have shown average-grouped results, respectively 9,3 s and 9,4 s. Let's note that the obtained data on the level of development at students of dexterity in general coincide with the data provided, for example, in the dissertation researches O. Tserkovnaya [14] ($9,79 \pm 0,13$), and L. Dolzhenko [2] (9,1–8,9), and also in the article of I. Saluk [9] ($10,0 \pm 0,05$).

The analysis of level of physical fitness of students (young men) of NLU is carried out above, taking into account the relevant data of special literature and results presented in table 1, shows that this selection represents population objectively. It means that it is possible to set limits of confidential interval for general average, and also to establish the relevant appropriate standards for assessment of the level of development of motive qualities at students on the basis of the obtained statistical data. The limits of confidential interval for average value of population of students (young men) set on the basis of selective method, presented in the table 2. They demonstrate to what with reliability of 95% can be claimed that according to each test, which is used for assessment of level of physical

Table 1
Indicators of physical fitness of students (young men) of NLU and KhHPA

№	NLU			KhHPA			$T_{count.}$	$T_{gr.}$
	\bar{X}	σ	m	\bar{X}	σ	m		
High-speed and power preparedness								
(standing long-jump, sm) ($n_{NLU} = 182$; $n_{KhHPA} = 46$)								
1	228,15	21,7	1,61	233,7	20,65	3,04	1,618	<1,9759
Level of the development of speed								
(run on 60 m, s) ($n_{NLU} = 146$; $n_{KhHPA} = 70$)								
2	8,99	1,37	0,114	8,5	0,717	0,085	3,67	>1,97
Level of the development of endurance								
(run on 1000 m, min, s) ($n_{NLU} = 136$; $n_{KhHPA} = 70$)								
3	3,4	0,77	0,066	3,36	0,69	0,082	0,4	<1,97
Level of the development of force								
(pulling up on a horizontal bar) (number of times) ($n_{NLU} = 180$; $n_{KhHPA} = 49$)								
4	10,97	4,64	0,346	11,44	3,36	0,48	0,81	<1,97
Level of the development of flexibility								
(trunk bending forward from situation, sitting, sm) ($n_{NLU} = 167$; $n_{KhHPA} = 52$)								
5	13,7	5,4	0,41	12,66	3,36	0,734	1,3	<1,97
Level of the development of dexterity								
(shuttle run of 4x9 m, s) ($n_{NLU} = 21$; $n_{KhHPA} = 21$)								
6	9,30	0,253	0,055	9,37	0,44	0,097	0,63	<2,021

fitness of students average value of each other sample, will be get in the definition thus of limit.

Appropriate standards and estimates of the level of development of motive qualities. Proceeding from the fact that the sample is described by average value which characterizes the level of development of the studied sign, and variability indicator, which displays influence on the studied sign of random factors, it is possible to enter statistically proved standard rating scales. For this purpose it is possible to use Z-scale in which as scale serves the standard deviation [10]. In this scale it is possible to take interval for the average level of development of the studied sign $X \pm \sigma$, to which getting 68,26% of all values. It is natural that the result, which exceeds the top limit of this interval, can be estimated as high (provided that increase in its size is estimated as the positive direction of development of sign). Getting to this interval 15,7% of all values. If the result is less than lower limit of interval which characterizes the average level of development of the studied sign (here getting 15,7% of values), then it needs to be estimated as the low level of development (provided that reduction of its size is estimated as the negative direction of development of sign). Appropriate norms of development of motive qualities on the basis of statistics of sample of students of NLU presented in tab. 3, are defined thus. For example, the average-

group value of test results «standing long-jump» at students of NLU equals 228,15 sm, and standard deviation – 21,7 sm. Proceeding from these data, the minimum value of interval to which getting 68,26% of all values, will equal ($\bar{X} - \sigma$) = 228,15 – 21,7 = 206,4 (sm), and maximum ($\bar{X} + \sigma$) = 228,15 + 21,7 = 249,8 (sm). If the result, which is received during the testing of the specific student, getting to this interval, then the level of development at it high-speed and power preparedness is estimated as average. If the result is shown them in this test surpasses the maximum value of the interval allocated above, then the level of its high-speed and power preparedness is estimated as high if the ostentatious result is less than minimum value of the allocated interval – as low.

Conclusions

1. Results of the assessment of level of physical fitness of students of NLU and their comparison with the similar indicators of students of KhHPA and the relevant literary data demonstrate that the selection of students of NLU represents students of population objectively, that is, it is typical which displays real condition of physical fitness of students of the country. It means that the limits of confidential interval set on the basis of the obtained statistical data, and also the relevant appropriate standards and estimates of the level of develop-

Table 2
Limit of confidential intervals of indicators of physical fitness of students (young men), established for population on the basis of the data obtained in the course of the researches, conducted with participation of students of NLU

No	Tests for assessment of development of physical qualities	Limits of confidential interval for average value of population P=95%, t=1,96
1	Standing long-jump, sm	$225,3 \leq \bar{X}_{gen.} \leq 231,6$
2	Run on 60 m, s	$8,76 \leq \bar{X}_{gen.} \leq 9,21$
3	Run on 1000 m, min, s	$3,27 \leq \bar{X}_{gen.} \leq 3,53$
4	Pulling up on a horizontal bar (number of times)	$10,29 \leq \bar{X}_{gen.} \leq 11,65$
5	Trunk bending forward from situation, sitting, sm	$13,02 \leq \bar{X}_{gen.} \leq 14,38$
6	Shuttle run of 4x9 m, s	$9,19 \leq \bar{X}_{gen.} \leq 9,41$

Table 3
Appropriate standards of development of physical qualities at students (young men)

No	Motor qualities and kinds of testing	Level of development	Assessment intervals
1	High-speed and power preparedness (standing long-jump, sm)	High	more than 249,8 sm
		Average	from 206,4 sm to 249,8 sm
		Low	less than 206,4 sm
2	Speed (run on 60 m, s)	High	less than 7,62 s
		Average	from 7,62 s to 10,36 s
		Low	more than 10,36 s
3	Endurance (run on 1000 m, min)	High	less than 2,64 min
		Average	from 2,64 min. to 4,18 min
		Low	more than 4,18 min
4	Force (pulling up on a horizontal bar, number of times)	High	more than 15,6 times
		Average	from 6,33 times to 15,6 times
		Low	less than 6,33 times
5	Flexibility (trunk bending forward from situation, sitting, sm)	High	more than 19,1 sm
		Average	from 8,3 sm to 19,1 sm
		Low	less than 8,3 sm
6	Dexterity (shuttle run of 4x9 m, s)	High	less than 9,05 s
		Average	from 9,05 s to 9,55 s
		Low	more than 9,55 s

ment of motive qualities at students, have a reliable character.

2. Appropriate statistical standards and estimates of the level of development of motive qualities at students are established, it is possible to use in quality reference points for planning of exercise stresses what they receive in the course of development of the discipline «Physical education».

3. The technique of determination of appropriate statistical norms and estimates of level of physical fitness of student's

youth, which is presented in the research, can be used in the course of annual estimation of physical fitness of the population of the country for the establishment of the relevant appropriate standards.

Prospects of the subsequent investigations. The analysis of level of physical fitness of students and establishment of the corresponding limits of confidential interval for population indicators, which characterize physical fitness, through sample indicators, is planned in the subsequent.

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