Analysis of Health and Physical Fitness Indicators of Modern Youth

Analiza wskaźników zdrowia i sprawności fizycznej współczesnej młodzieży

DOI: 10.36740/ABAL202205114

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SUMMARY

Aim: To research the level and dynamics of indicators of students' physical health and physical fitness in higher educational institutions at the present stage.

Materials and Methods: The research involved 106 students: 57 male students and 49 female students. The research of the level of physical health was conducted according to the method of H.L. Apanasenko, which involves determining the amount of points for each of the 5 indices. The level of physical fitness was assessed by the results of 7 physical exercises.

Results: It has been found that students' health indicators do not improve significantly in the process of their education. Most indices correspond to a level below the average. According to most physical fitness tests, both male and female students are rated "satisfactory" and "unsatisfactory". Physical qualities such as endurance and flexibility have the worst level of development.

Conclusions: The low level of health and physical fitness of students confirms the lack of effectiveness of the existing system of physical education in higher educational institutions. Underestimating the role of physical education in improving the health of today's youth can result in a deterioration of the quality of life of students themselves in the future, as well as to a deterioration in their productivity and, consequently, lower economic development of the country.

Key words: health, physical fitness, youth, physical education

Słowa kluczowe: zdrowie, sprawność fizyczna, młodzież, wychowanie fizyczne

Acta Balneol, TOM LXIV, Nr 5(171);2022:457-462

INTRODUCTION

In the current conditions of Ukraine's integration into the European higher education system, the strategic task of reforming higher education in Ukraine foresees the transition to student-centred education, transformation of quantitative indicators of educational services into qualitative, which involves reviewing the content of higher education and filling it with the latest material, introduction of modern learning technologies, ensuring mobility, employment and competitiveness of specialists [1, 2]. In the light of Ukraine's accession to the European Educational Society, the issues of student physical education and sports are newly considered as a component of shaping the professional health of future graduates, who must ensure competitiveness in the world labour market [3, 4]. There is an urgent problem in increasing students' interest in the quality of education, encouraging each student to regular physical exercises and sports, the formation of students' motivation for self-training in the process of learning and future life-sustaining activities [5-7].

Physical education is a component of education and upbringing, pedagogical process, academic subject (discipline), aimed at mastering knowledge, skills and abilities to manage physical development, types of motor activity to teach and educate the individual in the spirit of responsible attitude to their own health and health of others [8-10]. According to the scientists [11-13], physical education in the higher educational institution (HEI) should be a reliable basis for a high level of mental working capacity and intellectual

development of students in the learning process, involving them in regular exercise and sports, creating the need for physical development and improvement to ensure health and professional longevity.

However, unfortunately, according to many scientists [14, 15], the situation with the state of health and physical fitness of students of HEIs of Ukraine is critical at the present stage. About 90% of students have various health problems, more than 50% are characterised by unsatisfactory level of physical fitness [16, 17]. Moreover, the health of the population of Ukraine, including students, has deteriorated significantly due to the coronavirus pandemic and the forced reduction in physical activities [18-21]. Therefore, the research of the level and dynamics of health and physical fitness indicators of students in HEIs of Ukraine at the present stage in order to find and justify effective ways to solve this problem are relevant and timely.

AIM

The aim is to research the level and dynamics of indicators of students' physical health and physical fitness in higher educational institutions at the present stage.

MATERIALS AND METHODS

The research was conducted in 2019-2021 at the Khmelnytskyi National University (Khmelnytskyi, Ukraine). The research involved 106 students who entered Faculty of Humanities and Education and Faculty of Information Technologies in 2019: 57 male students and 49 female students. The research was conducted during the first and the second instructional years (1-4 semesters).

The research of the level of physical health (LPH) was conducted according to the method of H.L. Apanasenko, which involves determining the amount of points for each of the 5 indicators (indices): body mass index (BMI), Life index (LI), strength index (SI), Robinson index (RI), time to restore heart rate to baseline after standard exercise (20 squats for 30 seconds). The LPH was assessed as follows: if the sum of the student's points, scored on 5 indices, was 16 or more points, the LPH was rated as "high"; at 12-15 points the LPH was rated as "above average", at 7-11 points – as "average"; at 4-6 points – as "below average"; at 3 and less – as "low" [22]. The level of physical fitness (PF) of students was assessed by the results of 7 physical exercises, which allowed to assess the development of various physical qualities: speed (100 m run), strength qualities (pull-ups on the crossbar – men, push-ups– women, torso lifting, standing long jump), endurance (3000 m run – men, 2000 m run – women), agility (4x9 m shuttle run), flexibility (torso leaning forward from the sitting position).

Research methods: theoretical analysis and generalization of data from scientific and methodological literature; pedagogical observation; testing of indicators of physical fitness, medical and biological methods; methods of mathematical statistics. During the research, the authenticity of the difference between the studied indicators of students employing Student's t-test was determined. The significance for all statistical tests was set at $p<0.05$. All statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS) software, version 21. The research has been complied with all the relevant national regulations and institutional policies, and has followed the tenets of the World Medical Association Declaration of Helsinki. The research was carried out according to the requirements of the Code of Ethics of Khmelnytskyi National University (No.11 dated 22.07.2019). Prior consent to participate in the research was obtained from all the participants.

RESULTS

The results of the analysis of the level and dynamics of physical health indicators of students (men and women) for the period of study in the HEI during the first and second instructional years are given in Table 1. The analysis of

Table 1. Dynamics of the indicators of physical health of students (male and female) during the research period (n=106, Mean±SD)

Researched indicators	Stages of the research				p1-p4
	first	second	third	fourth	
Male students (n=57)					
BMI, kg/m^2	22.9±0.19	23.2±0.20	23.3±0.21	23.4±0.22	p>0.05
LI, ml/kg	55.4±0.97	55.5±1.02	55.3±1.03	55.2±1.01	p>0.05
SI, %	57.2±1.07	56.9±1.11	56.7±1.09	56.8±1.06	p>0.05
RI, c.u.	89.6±1.18	89.5±1.16	89.8±1.15	89.9±1.17	p>0.05
Time to restore heart rate, s	135.2±2.75	134.8±2.78	134.9±2.80	135.8±2.77	p>0.05
LPH, points	1.96±0.47	2.03±0.45	1.98±0.48	1.95±0.49	p>0.05
Female students (n=49)					
BMI, kg/m^2	21.3±0.24	21.5±0.25	21.8±0.26	21.9±0.26	p>0.05
LI, ml/kg	46.2±1.08	46.1±1.12	45.9±1.09	45.8±1.10	p>0.05
SI, %	39.1±1.03	39.0±0.99	38.8±1.01	38.5±0.97	p>0.05
RI, c.u.	87.5±1.21	87.5±1.20	87.7±1.18	87.8±1.17	p>0.05
Time to restore heart rate, s	138.4±3.01	138.6±2.99	138.9±2.95	139.2±2.93	p>0.05
LPH, points	2.02±0.51	2.05±0.49	1.99±0.50	1.97±0.52	p>0.05

Note: Mean – arithmetical average; SD – standard deviation; Stages of the research: first – 1-st semester, second – 2-nd semester, third – 3-rd semester, fourth – 4-th semester; p1-p4 – the significance of the difference between the students' indicators at the first and fourth stages of the research, determined by Student's t-test

BMI showed that both male and female students tend to its worsening i.e. the difference between the initial and final data is 0.5 and 0.6 kg/m^2, respectively. However, BMI in both groups of students has not changed significantly during the research ($p>0.05$). At the same time, BMI corresponds to the age norm and the average level for both male and female students, at all stages of the research.

The analysis of the dynamics of LI shows that both male and female students tend to its decrease, but it did not change significantly during the research ($p>0.05$). The difference between the indicators of the initial and last stages of the research made 0.2 ml/kg in men and 0.4 ml/kg in women. This indicates that the functional capabilities of the respiratory system in students are weakened in the process of their learning at HEI. LI in both male and female students was assessed as "below average" at all stages of the research. The analysis of SI indicators, which was determined by the ratio of the dynamometry of the stronger hand to body weight showed that its value did not change significantly ($p>0.05$) in students of both sexes during their learning process. Moreover, the level of SI was assessed as "low" in both men and women at all stages of the research. This confirms the conclusions of many authors that physical education does not sufficiently affect the development of the muscular system of students in modern HEIs. The dynamics of RI is characterized by a trend similar to previous indices i.e. the lack of significant changes during the learning process ($p>0.05$) and the gradual deterioration of the functionality of the cardiovascular system in students, both male and female. RI deteriorated by 0.3 c.u. and corresponded to the average level at all stages of the research. The analysis of the dynamics of the time of recovery of heart rate to baseline showed that it did not change significantly in students of both sexes during the research ($p>0.05$), although there was deterioration in male students by 0.6 seconds and in female students by 0.8 seconds. The level of functional state of the body, which was assessed by this index, was characterised as "below average" in both male and female students.

The research of H.L. Apanasenko [22] determined that there is a safe LPH – according to the express method it is 12 points. The author claims that there are almost no diseases, or even risk factors for chronic physical diseases above this level. The analysis of students' LPH showed that it did not change significantly during the research period in both male and female students ($p>0.05$). At the same time, there is some deterioration in the general state of health, the difference between the indicators of the first and fourth stages of the research made 0.1 points in male and 0.5 points in female students. The general state of health in both male and female students was rated as "low" at all stages of the research. The ratio of students with different LPH is presented in Table 2.

It was found that the majority of students (men and women) have low and below average LPH at all stages of the research: 56.1% and 31.6% of students with low and below average LPH, respectively were identified among men at the beginning of the research; this ration made 55.1% and 26.5% among women. The situation deteriorated somewhat during the research period: the number of students with low LPH increased by 5.3% among men and by 8.1% among women, and their number with average and above average LPH decreased.

The results of the analysis of the level and dynamics of indicators of physical fitness of students (men and women) for the period of their study in HEI are given in Table 3. In general, most of the tested characteristics show an improvement in the results of students of both sexes, but no significant difference between the initial and final results of students was found ($p>0.05$). In addition, the level of development of physical qualities is mostly assessed as "satisfactory". Thus, the analysis of the level of development of speed qualities of students showed that the results of 100 m run improved by 0.2 seconds in male students, and by 0.1 seconds in female students. The level of development of students' speed qualities was assessed as "satisfactory" at all stages of the research.

The analysis of the level of development of strength qualities of male students showed that the results in pull-ups improved by 0.6 times and female students revealed better results in push-ups by 0.7 times during the research period. The level of development of strength qualities is assessed as "satisfactory" in both men and women at all stages of the research. Negative dynamics was found in the results of male students in the 3000 m run and female students in the 2000 m run. Thus, male students' results deteriorated by 19 seconds (from 14 minutes 28 seconds at the beginning of the research to 14 minutes 47 seconds at the end of the research) during the research period; in female students – by 18 seconds (from 13 minutes 17 seconds at the beginning of the research to 13 minutes 35 seconds at the end of the research). The level of endurance development in students of both sexes is assessed as "unsatisfactory". The results of the 4x9 m shuttle run for

Table 2. The ratio of students with different LPH at the beginning and the end of the research (n=106, number of people / %)

Stages of the research	LPH				
	High	Above average	Average	Below average	Low
Male students (n=57)					
Beginning	–	2/3.5	5/8.8	18/31.6	32/56.1
End	–	2/3.5	4/7.0	16/28.1	35/61.4
Female students (n=49)					
Beginning	–	3/6.1	6/12.2	13/26.5	27/55.1
End	–	2/4.2	5/10.2	11/22.4	31/63.2

Table 3. Dynamics of the indicators of physical fitness of students (male and female) during the research period (n=106, Mean±SD)

Exercises	Stages of the research				p1-p4
	first	second	third	fourth	
Male students (n=57)					
100 m run, s	14.7±0.11	14.5±0.10	14.4±0.09	14.5±0.09	p>0.05
Pull-ups, times	9.6±0.54	9.9±0.57	10.1±0.58	10.2±0.56	p>0.05
3000 m run, s	868.3±11.73	871.5±11.87	879.7±11.93	886.9±12.04	p>0.05
4x9 m shuttle run, s	9.7±0.48	9.5±0.46	9.4±0.45	9.3±0.46	p>0.05
Torso lifting, times	37.8±0.96	38.1±0.94	39.5±0.93	40.3±0.94	p>0.05
Standing long jump, cm	224.1±2.58	226.3±2.59	226.9±2.60	227.1±2.58	p>0.05
Torso leaning, cm	7.4±0.85	7.4±0.86	7.3±0.82	7.2±0.80	p>0.05
Female students (n=49)					
100 m run, s	17.4±0.10	17.2±0.09	17.2±0.09	17.3±0.10	p>0.05
Push-ups, times	14.1±0.58	14.5±0.61	14.6±0.59	14.8±0.59	p>0.05
2000 m run, s	797.2±10.14	802.3±10.24	809.3±10.31	814.5±10.37	p>0.05
4x9 m shuttle run, s	11.5±0.55	11.4±0.57	11.4±0.59	11.3±0.58	p>0.05
Torso lifting, times	35.2±1.01	36.2±0.99	37.0±0.95	37.4±0.97	p>0.05
Standing long jump, cm	173.4±2.40	175.1±2.44	175.5±2.42	175.6±2.39	p>0.05
Torso leaning, cm	13.4±0.77	13.7±0.76	13.8±0.75	14.2±0.73	p>0.05

Note: Mean – arithmetical average; SD – standard deviation; Stages of the research: first – 1-st semester, second – 2-nd semester, third – 3-rd semester, fourth – 4-th semester; p1-p4 – the significance of the difference between the students' indicators at the first and fourth stages of the research, determined by Student's t-test

students of both sexes improved during the research period, but the level of development of agility of both male and female students is assessed as "satisfactory". Both male and female students developed indicators of abdominal muscle progress during the research period in terms of torso lifting for 1 minute: the difference between the results at the beginning and end of the research is 2.5 times in men, and 2.2 times in women. The level of strength qualities of students of both sexes in this exercise at the end of the research is assessed as "good". The results of the standing long jump of students also tend to increase in the process of their study in the HEI. They improved by 3 cm in men and by 2.2 cm in women. The level of speed and strength qualities of students is assessed as "satisfactory". Insufficient level of flexibility was found in students of both sexes. Thus, the analysis of the results of torso leaning forward from the sitting position showed that they deteriorated by 0.2 cm in male students and improved by 0.8 cm in female students during the research period. Herewith, flexibility indicators for male students are assessed as "unsatisfactory" and as "satisfactory" for female students at all stages of the research.

DISCUSSION

Modernization of higher education in Ukraine is aimed at updating the principles, content and approaches to specialists' training, reorientation of the educational process to achieve integrated results (competencies) [6, 23]. It is no coincidence that among the promising tasks of the National Strategy for Educational Development the following became especially important: updating the goals and content of education on the basis of competency building approach and personal orientation, taking into account world experience and principles of sustainable development; restructuring of the educational process on the basis of developmental pedagogy; building an effective system of national education on the basis of universal, multicultural, civic values, ensuring physical, moral and spiritual, cultural development of a human being, formation of socially mature creative personality, preparing young people for conscious choice of living environment; providing systematic improvement of the quality of education on an innovative basis, modern psychological and pedagogical as well as scientific and methodological support of the educational process [16, 24]. The higher education system is inextricably linked to other social systems, namely: economics, politics, social sphere, etc. The development of personality, training of labour potential of the country, economic development, development of the social sphere and social development in general which together determines the future of the mankind depends on the application of conceptual principles in education. However, the critically low level of physical fitness and health of modern student youth is one of the major problems of today, which does not allow to fully achieve integrated results while studying in the HEI. This is evidenced by the findings of many scientists [2, 4, 17] stating that there is a worrying situation over the past decade in Ukraine: the health and physical fitness of student youth has deteriorated sharply. The analysis of the literature allowed to determine the main reasons for the decline in health and physical fitness of students: devaluation of the social prestige of a healthy lifestyle, physical culture and sports; underestimation of the social, health promoting and educational role of physical education and sports in HEI; low level of physical condition of senior high school students and graduates; reduction of students' interest in the traditional form of organization of physical education training sessions; the focus of the educational process on physical education on students' compliance with examining standards; lack of individual approach and the principle of differentiation in the process of physical education; conditions of study in HEI,

which are accompanied by a decrease in motor activity; bad habits and others [3, 8, 19].

The results of our research confirm the conclusions of many scientists on the low level of health and physical fitness of modern student youth. Our research failed to reveal students with a high LPH, more than 80 % of students have a low and below average LPH. Most students are characterised by a satisfactory and unsatisfactory level of physical qualities development at the end of the research. All this underlines the insufficient effectiveness of the existing system of physical education in HEIs in terms of promoting health, improving students' physical fitness, the formation of motivation for regular exercise and sports.

CONCLUSIONS

It has been found that students' health indicators do not improve significantly in the process of their higher education. Most indices correspond to a level below the average. At the same time, the number of students with low levels of physical health increased during the research by 5.3% among male students and 8.1% among female ones. According to most physical fitness tests, both male and female students are rated "satisfactory" and "unsatisfactory". Physical qualities such as endurance and flexibility have the worst level of development.

The low level of health and physical fitness of students, which was identified in the course of our research, confirms the findings of many previous studies on the lack of effectiveness of the existing system of physical education in higher educational institutions and the need to improve it. Health directly affects the productivity of future professionals, the country's economy, the moral climate in society, reflects the way and quality of life in the country. The health of the generation to come greatly depends on the health of today's students. Underestimating the role of physical education in improving the health of today's student youth can result in a deterioration of the quality of life of students themselves in the future, as well as to a deterioration in their productivity and, consequently, lower economic development of the country.

Prospects for further research are to justify effective ways to improve the level of physical fitness and health of modern youth.

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The study was conducted according to the research plan of the State Scientific Institution "Institute of Education Content Modernization" in 2018-2022 within the topic "Transformation of modern forms and methods of teaching in higher education" (state registration number 0017U004343).

Conflict of interest:
The Authors declare no conflict of interest

Received: 10.03.2022
Accepted: 29.08.2022

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