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Analysis of Physical Condition of First-Year Military Higher Education Institution Cadets

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The purpose of the study was to determine the dynamics of anthropometric and functional indicators of the physical condition of first-year cadets over three years (from 2019 to 2021).

Materials and methods. 152 cadets from Ivan Kozhedub Air Force National University were involved in the experiment. The age of participants was from 17 to 22 years. All cadets were informed about the experiment and gave their consent. Anthropometric (measurement of anthropometric data) and medical-biological (rhythm inversion, electromanometry) methods of investigation were used to determine the assessment of the cadets' physical condition. A highly informative method – the assessment of O. Pirogova index was used for analysis of the cadets' physical condition. Pirogova physical condition index is a complex indicator based on the heart rate, systolic and diastolic blood pressure, age, body weight, and body height. Statistical analysis of the results was carried out using the EXCEL tables. The data was analyzed using Student's test, p less than 0.05 was considered the level of significance.

Results and discussion. The results of the study showed that the mean values of the anthropometric and functional indicators of the first-year cadets have not been changed statistically significant over three years. The exception is the difference in the average value of systolic blood pressure of control group 1 and control group 3 representatives, which is statistically reliable ($p < 0.05$). Current anthropometric indicators of cadets obtained during the experiment confirmed the data available in the scientific and methodological literature about the anthropometric indicators of candidates for training in higher military educational institutions of Ukraine. The Pirogova physical condition index calculating showed the following average values of the Pirogova physical condition index: control group 1 – 0.704 points, control group 2 – 0.688 points, control group 3 – 0.671 points. However, the results of the study show a statistically significant deterioration of the Pirogova physical condition index of the 2021 recruitment cadets by 4.7% compared to the representatives of 2019. The comparative analysis of the first-year cadets' physical condition assessments demonstrates a gradual, significant decrease in the number of "high" physical condition ratings: 12% among control group 1 cadets (2019 year of recruitment); 9% among control group 2 representatives (2020 year of recruitment) and only 3% among control group 3 cadets (2021 year of recruitment). However, over three years, the percentage of representatives with physical condition assessment rating "Lower than average" has increased significantly: 1% among cadets of control group 1 (2019 year of recruitment); 7% among cadets of control group 2 (2020 year of recruitment); 7% among representatives of control group 3 (2021 year of recruitment).

Conclusion. Over the last 3 years, there has been a deterioration of the general physical condition of higher military educational institution cadets.

Keywords: physical condition assessment, cadets, higher military education institutions.

Connection of the study with scientific programs, plans, topics. The study is conducted in accordance with the plan of research work of the Ministry of Defense of Ukraine and the combined plan of the National Development and Reform Commission of the Ministry of Youth and Sports of Ukraine 3.1. "Theoretical and methodological foundations of improving the programmatic and normative foundations of physical training of children, adolescents and youth", state registration number 0111V001626.

Introduction. The high intensity and long duration of active combat during the aggression of the Russian Federation in Ukraine demonstrates the need to ensure the excellent physical condition of military personnel. The guarantee of high combat readiness and combat capacity of the personnel of the Armed Forces of Ukraine is not only a high level of professional training and sufficient motivation, but also a high functional condition of the main body systems of servicemen [1]. Modern researches of foreign scientists proved the need of high physical condition level of military personnel to conduct combat tasks [2-5].

The level of physical condition is one of the leading information indicators of the health monitoring system, important and accessible for measurement and evaluation. It is determined by a set of morphological and functional abilities of the organism that

characterize the process of its growth and formation. In the scientific literature, the definition of the term "physical condition" is used in different interpretations: as a process of changes of forms and functions of the human body during its individual life or as a set of indicators characterizing the functional state of the body at one or another stage of its physical development (height, weight, heart rate frequency, blood pressure, spirometry, dynamometry). Studying the physical condition of cadets is one of the main warranties for increasing the effectiveness of the physical education process in higher military educational institutions (HMEI).

Many authors have observed the problem of the physical condition of young people in modern scientific literature [6-11]. Other scientists have studied the physical fitness, physical condition and health level of servicemen in Armed Forces, National Guard and other military formations of Ukraine [12-18]. Researchers decided that the problem of the deterioration of the physical condition of population was caused by a number of factors: insufficient level of physical activity, irrational nutrition, low material level, stressful nature of modern life, environmental pollution, low motivation for a healthy lifestyle [19-21].

According to V. Bobrytska, the main reasons for the decline in the state of health of the country's population are: poor ecology, underestimation of the importance of problems at the national level, and limiting the opportunities for forming a healthy lifestyle through physical education and sports in educational institutions and labor teams [22]. Therefore, the problem of formation, preservation and improvement of the functional condition of future officers – cadets acquires a special significance.

The purpose of the study was to investigate the dynamics of the physical condition of first-year cadets of the higher military educational institutions during the last three years. The hypothesis for our study was the assumption of the authors [23, 24] about a significant deterioration in the physical condition of school youth, including candidates for training in military educational institutions, over the past 10-20 years.

Materials and methods. The research was conducted on the base of Ivan Kozhedub Kharkiv National Air Force University. Three control groups of first-year cadets of the 2019, 2020, and 2021 recruitment were involved in conducting the physical condition study. The number of respondents was 83, 84 and 85, respectively. The age of participants was from 17 to 22 years. All cadets were informed about the experiment and gave their consent.

Ethical considerations. The study conforms to the Helsinki Declaration (1997), the Convention on Europe on Human Rights and Biomedicine (1997), the International Code of Medical Ethics (1983), ICHGSP (2002). Informed consent was obtained from the participants.

Medical and biological research methods were used to solve the research tasks: measurements of anthropometric data, electromanometry and determination of heart rate frequency. Anthropometric indicators of cadets (body length in sm and body weight in kg) were measured according to standard methods. A highly informative method – the assessment of O. Pirogova index was used for analysis of the cadets' physical condition. Pirogova physical condition index (PPCI) is a complex indicator based on the heart rate (HR), systolic (SBP) and diastolic blood pressure (DBP), age, body weight and body length. The methods of mathematical statistics (one-dimensional statistical analysis) were used to prove the regularities discovered in research and hypothesis testing. Statistical processing of the data was carried out on a computer using the standard EXCEL tables. Data were presented as means (X) and standard deviation (SD). The normality check of data was made in STATISTICA 7.0 programs using Distribution Fitting Module. The data were independent and normal. Therefore, a parametric test (i.e., the independent samples *t*-test) was used for analysis. During the study the authenticity of difference between the indices of cadets of two groups by means of Student's criterion was determined. The significance for all statistical tests was set at $p < 0.05$.

Research results. The anthropometric and functional indicators of physical condition of the first-year cadets of the 2019-2021 years of recruitment were determined during the study. The data are presented in **Table 1**.

The results of the study showed that the average values of almost all investigated anthropometric and functional indicators of the physical condition of first-year cadets did not undergo statistically significant changes over three years. The exception is the difference in the average value of systolic blood pressure (SBP) of CG-1 and CG-3 representatives, which is statistically reliable.

For detailed analysis of the cadets physical condition we used a highly informative method – the assessment of the physical condition index according to O. Pirogova (**Table 2**). The results of indicator calculating showed the following average values of the PPCI: CG-1 – 0.704 points, CG-2 – 0.688 points, CG-3 – 0.671 points. The obtained results confirm the data available in the scientific and methodological literature about the level of the PPCI of recruits and candidates for training in higher military educational institutions of Ukraine [7, 17, 18].

In order to find out the dynamics of changes in the physical condition of candidates for training in higher military educational institutions, we compared

Table 1 – Physical condition indicators of the first-year cadets in 2019-2021

Groups	Indicators, X±SD					
	Age	Body length	Body weight	Heart rate	SBP	DBP
	years	sm	kg	b./min	mm	mm
CG-1, 2019 (n = 83)	18.27±0.25	177.41±0.97	70.97±1.10	71.90±0.85	118.48±0.87	70.14±0.93
CG-2, 2020 (n = 85)	18.35±0.17	178.67±1.07	72.18±1.17	73.02±0.75	119.25±1.03	71±0.64
CG-3, 2021 (n = 84)	18.57±0.18	176.85±1.13	71.99±1.18	73.66±0.68	121.40±0.84	72.20±0.75
Level of meaningfulness X1-X2	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Level of meaningfulness X2-X3	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05
Level of meaningfulness X1-X3	p>0.05	p>0.05	p>0.05	p>0.05	**p<0.05**	p>0.05

the PPCI average values of first-year cadets of 2019-2021 years of recruitment (**Table 2**).

The results of the experiment showed that the PPCI average value of first-year cadets has deteriorated by 4.7% over the past three years, and the change in indices is statistically significant at p<0.05 (**Table 2**).

Table 2 – Comparison of the Pirogova physical condition index of cadets in 2019-2021

Groups	CG-1, 2019 (n = 83)	CG-2, 2020 (n = 85)	CG-3, 2021 (n = 84)
PPCI (X±SD), points			
	0.704±0.01	0.688±0.01	0.671±0.01
Difference in indices (Δ), points			
CG-1, 2019	-	0.016	0.033
CG-2, 2020	- 0.016	-	0.017
CG-3, 2021	- 0.033	- 0.017	-
Level of meaningfulness (p)			
CG-1, 2019	-	p>0.05	**p<0.05**
CG-2, 2020	p>0.05	-	p>0.05
CG-3, 2021	**p<0.05**	p>0.05	-

For a more detailed analysis of the PPCI changes, we have shown on the diagram the ratio of physical condition assessments of the first-year cadets in 2019, 2020 and 2021 recruiting years (**Figure 1**).

The comparative analysis of the first-year cadets' physical condition assessments of the 2019, 2020 and 2021 years of recruitment demonstrates a gradual, significant decrease in the number of "high" physical condition ratings: 12% among CG-1 cadets (2019 year of recruitment); 9% among CG-2 representatives (2020 year of recruitment) and only 3% among CG-3 cadets (2021 year of recruitment).

The percentage of respondents with physical condition assessment ratings "Higher than average"

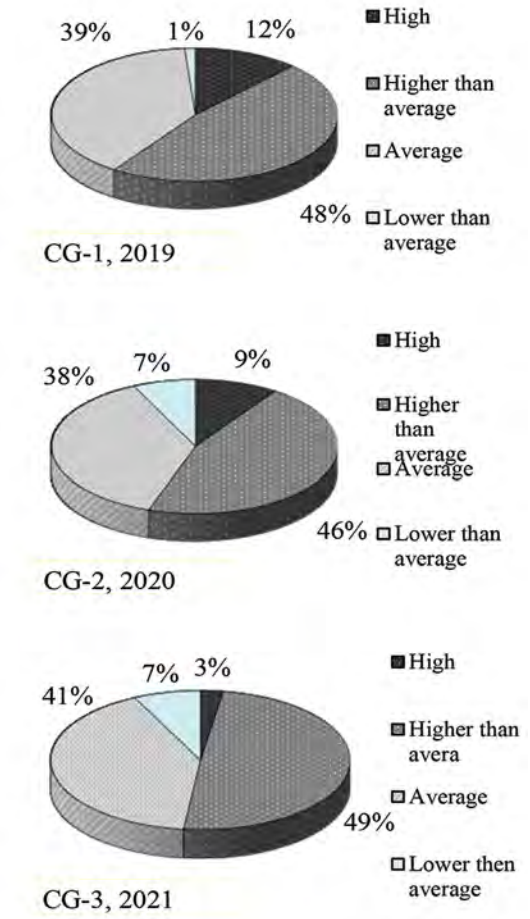

Fig. 1 – Physical condition assessments rating diagram of the first-year cadets in 2019-2021

and "Average" almost did not change: respectively 48% and 39% among cadets of CG-1 (2019 year of recruitment); 46% and 38% among cadets of CG-2 (2020 year of recruitment); 49% and 41% among cadets of CG-3 (2021 year of recruitment). However, over three years, the percentage of representatives with physical condition assessment rating "Lower than average" has increased significantly: 1% among

cadets of CG-1 (2019 year of recruitment); 7% among cadets of CG-2 (2020 year of recruitment); 7% among representatives of CG-3 (2021 year of recruitment).

Discusion. The results of the conducted research confirmed the data of our previous studies about the gradual decrease of the physical condition level of candidates for training in higher military educational institutions in Ukraine [25]. Current anthropometric indicators of cadets obtained during our experiment also vindicated the data available in the scientific and methodological literature about the anthropometric indicators of candidates for training in higher military educational institutions of Ukraine [7, 13, 23].

Authors of many scientific papers argue that success of the military-professional activity and results of professional training of cadets depend on their physical condition level [3, 12, 24]. The results of the conducted research confirmed the materials of domestic researchers Yu. Verenga, K. Prontenko, V. Bondarenko, S. Bezpalyy, O. Khutoryanskyy about the level of physical condition of conscripts serving in units of the security and defense sector of Ukraine, which indicates the uniformity of functional indicators of draft age young men in our country [18].

As follows, current research data indicates a gradual deterioration in physical condition and health level of young male population of Ukraine during the last 10–20 years.

Conclusion. The conducted experiment confirmed the results of previous studies about gradual deterioration of the physical condition of candidates for training in higher military educational institutions. The PPCI of the cadets of 2021 year of recruitment is statistically significantly worse by 4.7% than the 2019 year index. A comparative analysis of physical condition assessment rating of cadets of 2019 and 2021 showed a decrease of the share of “High” physical condition assessments from 12% to 3%, and an increase of the share of “Lower than average” assessments from 1% to 7%, in accordance with the total number. The study confirmed the assumption of scientists about the gradual deterioration of the physical condition of millitary recruits in Ukraine.

Perspective of further research. It is planned to focus on researching the level of physical fitness of cadets in higher military educational institutions.

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АНАЛІЗ ФІЗИЧНОГО СТАНУ КУРСАНТІВ 1 КУРСУ ВИЩИХ ВІЙСЬКОВИХ НАВЧАЛЬНИХ ЗАКЛАДІВ

Курішко Євген, Корчагін Микола

Резюме. *Мета* – визначити динаміку антропометричних та функціональних показників фізичного стану курсантів першого курсу за три останніх роки (з 2019 по 2021 рік).

Об'єкт та методи. Дослідження проводилось на базі Харківського національного університету Повітряних Сил імені Івана Кожедуба. Для проведення дослідження було залучено три контрольні групи курсантів наборів 2019, 2020 та 2021 років, загальна кількість 252 особи. Вік респондентів від 17 до 22 років. У ході дослідження визначено антропометричні показники курсантів за стандартними методиками та обчислено оцінку фізичного стану за індексом О. Пірогової. Індекс фізичного стану – це комплексний показник, побудований на основі частоти серцевих скорочень, систолічного і діастолічного артеріального тиску, віку, маси тіла та довжини тіла.

Результати. У статті представлено дослідження фізичного стану вступників до вищого військового навчального закладу. Результати дослідження показали, що середні значення більшості антропометричних і функціональних показників курсантів першого курсу не зазнали статистично значущих змін протягом трьох років, за виключенням середнього значення систолічного артеріального тиску (показники представників наборів 2019 року та 2021 року відрізняються статистично достовірно при $p < 0.05$). Обчислення індексу фізичного стану демонструє наступні середні значення ІФС: КГ-1 (набору 2019 року) 0,704 ум. од., КГ-2 (набору 2020 року) 0,688 ум.од., КГ-3 (набору 2021 року) 0,671 ум.од. Результати експерименту засвідчили статистично достовірне погіршення на 4,7 % індексу фізичного стану курсантів набору 2021 року у порівнянні з представниками 2019 року. Аналіз оцінок фізичного стану курсантів наборів 2019, 2020 та 2021 років демонструє зменшення кількості «високих» оцінок фізичного стану: 12 % серед курсантів КГ-1 (набору 2019 року); 9 % серед курсантів КГ-2 (набору 2020 року); 3 % серед представників КГ-3 (набору 2021 року). Проте, за три роки значно збільшився відсоток представників з оцінкою фізичного стану «нижче середнього»: 1 % серед курсантів КГ-1 (набору 2019 року); 7 % серед курсантів КГ-2 (набору 2020 року); 7 % серед представників КГ-3 (набору 2021 року).

Висновок. За останні 3 роки спостерігається погіршення загального фізичного стану вступників до вищих військових навчальних закладів.

Ключові слова: оцінка фізичного стану, курсанти, вищі військові навчальні заклади.

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